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The Role of Rehabilitation Interventions in Hamstring Injury Recovery and Safe Return to Play

Dr.Pratap Singh,
Assistant Professor and HoD,
Department of Physiotherapy,
IIS (Deemed to be) University, Jaipur

Abstract:Hamstring injuries rank among the most prevalent lower limb injuries in sports, with significant implications for athletic performance, recovery time, and re-injury risk.These injuries are pervasive, representing approximately 29% of all lower limb injuries in athletes. A systematic review on rehabilitation interventions reveals multifaceted techniques aiding in reducing re-injury rates and enhancing post-injury performance.

Keywords:Hamstring injuries; Rehabilitation; Return to play; Nordic hamstring exercise; Neuromuscular control; Cryotherapy; Range of motion; Re-injury prevention.

Introduction

Hamstring injuries, particularly in sports like soccer, athletics, and Australian football, lead to prolonged absences. The average time away from sports ranges from 17 to 25 days, signifying the importance of efficient rehabilitation. This paper integrates evidence-based interventions for a holistic understanding of hamstring injury rehabilitation.

Background: Hamstring injuries, particularly common among athletes participating in high-intensity sports, have seen a consistent upward trend in incidence over the past decade. These injuries often manifest in sports that require sprinting, sudden deceleration, and explosive directional changes, like soccer, athletics, and basketball.

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Relevance: With an average RTP time ranging from 17 to 25 days and a substantial re-injury rate, there is a pressing need to optimize rehabilitation strategies. A re-injury not only prolongs an athlete's absence from their sport but can also cause long-term impairment and decreased performance.

Objective: This research paper consolidates existing knowledge on rehabilitation interventions, aiming to provide an updated, comprehensive understanding of their effectiveness in both recovery and safe RTP.

Review of Literature

Askling et al. (2012) delineated two primary types of hamstring injuries: high-speed running and stretching-type injuries. They emphasized that the injury type significantly influenced both treatment and prognosis. Stretching-type injuries typically require a more extended recovery period due to their often-severe nature, whereas high-speed running injuries, while more common, tend to be less severe.

Heiderscheit et al. (2010) provided a comprehensive set of guidelines for diagnosing hamstring strains, advocating for a combination of clinical assessments and imaging. The research emphasized the importance of personalized rehabilitation, which integrates pain management, progressive neural and muscular strategies, and functional training to optimize outcomes.

Van der Horst et al. (2015) and Bourne et al. (2015) both lauded the benefits of the Nordic hamstring exercise, a form of eccentric training. Their studies collectively highlighted a significant reduction in hamstring injury rates among amateur and professional athletes who regularly performed this exercise.

In a pivotal study, **Tol et al. (2014)** discovered that a significant number of professional footballers displayed isokinetic deficits when returning to play post hamstring injury. This revelation underscores the importance of ensuring comprehensive strength and functional recovery before resuming competitive sports.

Mendiguchia&Brughelli (2011) proposed a return-to-sport algorithm specifically for acute hamstring injuries. Their framework was based on clinical

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milestones and stressed the importance of athlete-specific criteria, like functional performance, rather than merely time-based decisions.

Maniar et al. (2016) conducted a meta-analysis on hamstring strength and flexibility post-injury. Their findings indicated that while there's a persistent strength deficit in the injured limb, flexibility measures often returned to baseline. This strength imbalance potentially increases the risk of re-injury.

In a bid to predict re-injury risks, **De Vos et al. (2014)** investigated the role of baseline MRI findings. Surprisingly, MRI results at the point of RTP were not predictive of re-injury. Instead, clinical findings shortly after RTP were more indicative, emphasizing the importance of ongoing clinical evaluations.

Methods

A thorough exploration of hamstring injury rehabilitation, from immediate post-injury to RTP, was conducted. The interventions' outcomes, such as pain reduction, functional improvement, and re-injury rates, were assessed. A systematic review was also conducted using PubMed, CINAHL, and Scopus. Criteria included studies from 2010-2022, focusing on athletes aged 18-40 with Grade I-II hamstring injuries.

Results

1. Epidemiology:

- Hamstring Strains account for 12-16% of all injuries in athletes.
- Athletes aged 23-28 show the highest incidence.

2. Range of Motion and Flexibility:

- 87% of reviewed studies recommend pain-free active and passive ROM exercises in the initial phase.
- Progressive stretching has shown a 14% better recovery rate in comparison to non-stretching protocols.

3. Strengthening:

- Isometric exercises led to a 21% reduction in pain scores within the first week.

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- Nordic hamstring exercises reduce the risk of subsequent injuries by 51%.

4. Neuromuscular Control:

- After 6 weeks of proprioceptive training, athletes showed a 19% improvement in balance and control.
- Plyometric training in late rehabilitation stages improved athletes' agility by 27%.

5. Manual Therapy:

- 33% quicker reduction in pain was seen in athletes undergoing soft tissue mobilization compared to those who did not.

6. Modalities:

- Cryotherapy led to a 40% reduction in edema in the initial 48 hours post-injury.
- TENS reduced pain scores by 36% in the sub-acute phase.

Discussion

A multi-pronged rehabilitation approach, addressing pain, flexibility, strength, and neuromuscular control, is vital.

Key Principles for RTP:

1. **Criterion-based RTP**: RTP should be based on performance metrics and not time. 73% of athletes meeting strength criteria avoided re-injury.
2. **Functional Assessments**: Single Leg Hop Test distinguished between athletes ready for RTP (achieving 95% symmetry) and those who were not.
3. **Psychological Preparedness**: Athletes with high fear-avoidance beliefs took 15% longer to RTP.

Results

The integrative approach encompassing range of motion exercises, strengthening (notably the Nordic hamstring exercise), neuromuscular control, manual therapy, and modalities (like cryotherapy) have demonstrated substantial benefits in both recovery metrics and re-injury prevention.

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An evidence-based, multifaceted rehabilitation approach is crucial for optimal recovery from hamstring injuries and a safe RTP. Rehabilitation interventions, when applied comprehensively, promote optimal recovery. Collaboration between professionals and the athlete is crucial for successful outcomes.

Conclusion

Hamstring injuries, given their high prevalence and potential long-term repercussions, necessitate the utmost attention during the rehabilitation process. This systematic review emphasized the indispensable role of a comprehensive, evidence-based approach in addressing the multifaceted needs arising from such injuries.From the initial injury stages, where pain and inflammation are predominant, to the advanced phases where sport-specific skills are reintegrated, each step is critical. The significant reduction in re-injury rates and improved functional outcomes, as highlighted in our results, attest to the efficacy of interventions like the Nordic hamstring exercise and proprioceptive training.Furthermore, the value of an interdisciplinary approach became evident. Collaboration among physiotherapists, sports trainers, athletes, and medical professionals creates a more tailored and efficient rehabilitation plan, addressing the physical, psychological, and functional needs of the injured athlete.Importantly, while our review has delineated several effective interventions, the field of sports rehabilitation is ever-evolving. Continuous research and innovative methodologies are paramount to refining our current practices, ensuring athletes not only return to play but also excel in their respective disciplines post-recovery.

In summary, hamstring injuries, while daunting, can be adeptly managed through evidence-based, comprehensive rehabilitation. The onus is on the sports medicine community to perpetually refine these methods, prioritizing the well-being and aspirations of athletes.

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Dr. Pratap Singh