

Revisiting the hamstring injury prevention and rehabilitation literature: filling the gaps!

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Hamstring injuries receive widespread attention in sports science and medicine due to their impact on athlete performance, health and time loss burden. On the topic of hamstring injury prevention and rehabilitation, ~30 reviews have been published since 2011, alongside clinical practice guidelines (comprehensive list in online supplemental material) and a recent consensus.¹⁻³ The aim of this editorial is to offer a perspective on the existing hamstring injury prevention and rehabilitation literature, highlighting current limitations that could benefit from different research paths in the future.

PREVENTION LITERATURE WILL BENEFIT FROM DIRECT ASSESSMENT OF INJURY OCCURRENCE

Research on hamstring injury risk has provided rich evidence on surrogate outcomes (eg, strength or flexibility), which may deliver valuable information about injury risk factors. Surrogate outcomes are easier to collect, particularly in shorter time frames,⁴ and may provide important cues for developing larger trials on injury prevention. Injury

prevention trials are usually expensive and time-consuming and are less commonly performed. For example, a recent systematic review included 108 published randomised controlled trials (RCTs) on hamstring prevention and risk factor management.⁵ Only four RCTs (3.7% of all trials) were focused on prevention and assessed injury incidence, all other trials assessed risk factor management (through surrogate outcomes).⁵ This suggests a research imbalance that could benefit from more intervention studies providing direct evidence of the efficacy and effectiveness of injury prevention strategies in reducing injury occurrence. Potentially, multicentre trials may be required to attain the statistical power required and guarantee the necessary human and financial resources.

Exercise-based hamstring injury prevention programmes propose including eccentrically focused strength training, sprinting and plyometrics.⁵ Current evidence supports the use of the Nordic hamstring exercise (NHE), other eccentric hamstring exercises and the FIFA 11+ as prevention strategies.⁶⁻⁸ However, the quality of the evidence has ranged from very low to high⁶ and the meta-analyses have in some cases been questioned.⁹ Excessive optimism regarding the NHE in isolation is cautioned, as prevention studies often incorporate other exercises in addition to the NHE.⁹ These protocols are likely worthy of inclusion in hamstring injury prevention strategies, although uncertainty regarding their effectiveness remains.

REHABILITATION LITERATURE SPREAD TOO THIN AND LACKING REPLICATION

Interventions for hamstring injury rehabilitation are too heterogeneous and lack replication. A recent systematic review¹⁰ found 14 controlled studies (12 randomised) of conservative rehabilitation of hamstring injuries, with comparisons between interventions so diverse that meta-analyses were not attempted. While it was possible to determine that

platelet-rich plasma injections are likely an ineffective adjunct in the rehabilitation of hamstring injuries, there was no strong evidence in favour of specific exercise modes compared with others.¹⁰ Potentially, interventions with appropriate loads, dosages and progression of exercise may be more relevant than the specific exercise selection.

The rehabilitation studies implemented different exercise protocols (eg, L-protocol, progressive agility and trunk stabilisation), but no protocol was investigated in more than two studies (or was combined with other procedures), and only one specific comparison (the L-protocol emphasising lengthening exercises vs the C-protocol focused on conventional exercises with less emphasis on lengthening) was investigated twice.¹⁰ There was considerable heterogeneity in injury diagnosis and classification, return to play criteria and in how outcomes were registered and reported, which hampers more direct comparisons.^{10 11} Clinicians and authors often propose and implement interventions for rehabilitating hamstring injuries that reflect their clinical practice and distinct underlying rationales, or adaptations to different populations and contexts. However, this practice spreads the evidence base too thin, inhibiting replication studies and precluding a meta-analytical synthesis.

IMPLICATIONS FOR STAKEHOLDERS

Researchers should implement some strategic methods: (1) in prevention-related studies, we need more RCTs assessing injury data, preferably with large samples and sufficiently long time frames, which may require multicentre collaborations; (2) in rehabilitation studies, replicating comparisons between different interventions is required; these studies will provide the foundation for establishing general and more robust guidelines and (3) as a complement, small-scale studies with qualitative approaches may help to understand what mediates buy-in and compliance, helping to better individualise interventions.

Clinicians, coaches and other sports and health professionals should be aware that the current evidence regarding the effectiveness of hamstring injury prevention interventions to reduce injury risk is limited in scope and rigour. Despite a wide body of research analysing surrogate outcomes, actual data on injury occurrence is still required. For now, eccentric hamstring exercises are a promising

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avenue, but should not blind us to the exploration of other interventions.

For hamstring injury rehabilitation, the appropriateness of the load applied, the dose and progression may be more relevant than the specific exercise or exercise mode that is being applied. Despite some support for eccentric exercises, there is a need to identify the essential elements of rehabilitation more accurately.

In summary, the hamstring injury prevention and rehabilitation literature has provided rich insights but there is room for improvement. Injury prevention RCTs that assess injury occurrence are still scarce, and the rehabilitation literature could benefit from replication studies. Wider collaboration with multicentre participation is encouraged to fill our existing knowledge gaps.

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