# Rehabilitation of Acute Hamstring Strain Injuries

Marc A. Sherry, PT, DPT, LAT[a], Tyler S. Johnston, PT, DPT[a], Bryan C. Heiderscheit, PT, PhD[b,c,*]

**KEYWORDS**

• Muscle • Injury • Myotendinous • Physical therapy

**KEY POINTS**

- A previous hamstring strain injury is one of the most cited risks for future injury, with as many as one-third of athletes experiencing a reinjury within 2 weeks of returning to sport activity.
- A comprehensive patient evaluation assists in coming to an accurate diagnosis, providing a reasonable prognosis for time to return to sport, and helping define the rehabilitation options necessary for full recovery.
- Upon return to sport, athletes often exhibit a persistent strength deficit compared with the contralateral limb, highlighting the importance of comprehensive rehabilitation and adequate testing to determine readiness to return to sport for reducing risk of recurrent hamstring strains.

## INTRODUCTION

Acute hamstring injuries are one of the most common injuries resulting in loss of time for athletes at all levels of competition.[1–8] Those involved in sports that require high sprinting speeds, such as track, football, and rugby, are especially prone to injury.[9,10] Previous literature has indicated that nearly 1 in 3 hamstring injuries will recur and that many of these would happen within the first 2 weeks on return to sport.[1,2] This high rate of recurrence may be due to a combination of ineffective rehabilitation and inadequate return to sport criteria.

Two specific injury mechanisms have been defined that seem to influence the injury location and rehabilitation requirement, high-speed running and excessive

[a] Sports Medicine, University of Wisconsin Hospital and Clinics, 621 Science Drive, Madison, WI 53711, USA; [b] Department of Orthopedics and Rehabilitation, University of Wisconsin-Madison, 1300 University Avenue, Madison, WI 53706, USA; [c] Department of Biomedical Engineering, University of Wisconsin-Madison, 1300 University Avenue, Madison, WI 53706, USA

* Corresponding author. Department of Orthopedics and Rehabilitation, University of Wisconsin-Madison, 1300 University Avenue, Madison, WI 53706.
*E-mail address:* heiderscheit@ortho.wisc.edu

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stretching. During high-speed running, the terminal swing phase has been identified as the time of hamstring injury occurrence, most often involving biceps femoris long head.[11,12] During this phase of the gait cycle, the hamstring muscles are active while lengthening (eccentric contraction) to absorb energy to slow the advancing limb in preparation for foot contact.[13–15] These injuries typically involve the intramuscular tendon, or aponeurosis, and the surrounding tissues.[16] The second defined injury mechanism involves an overstretch, which more commonly injures the proximal free tendon of the semimembranosus.[17,18] These injuries are common to dancing and kicking activities, in which a combined hip flexion with knee extension movement occurs. Current evidence indicates that athletes with injuries involving the proximal free tendon take longer to recover, such that return to sport may be prolonged.[18] Despite the differences in mechanism, structures involved, and healing rates, current rehabilitation approaches do not differ greatly when treating high-speed running versus overstretch injuries. This topic is an area for future research and investigation.

The goals of rehabilitation for hamstring injuries are to return the athlete to sport, return to prior level of performance, and return to participation with minimal risk for reinjury.[19] As such, deficits experienced as a direct result of the injury (eg, pain, swelling, weakness, reduced range of motion) must be addressed throughout the rehabilitation process. In addition to treating the muscle injury, underlying mechanical imbalances may be corrected to reduce the risk of recurrent injuries. Previous research has identified risk factors for initial hamstring injury. Of these, modifiable risk factors include hamstring weakness, fatigue, reduced flexibility,[20–23] imbalances in hamstring eccentric and quadriceps concentric strength,[24–26] decreased quadriceps flexibility,[27] and strength and coordination deficits of the pelvis and trunk musculature.[2,28] It can be speculated that addressing these issues after hamstring injury would also likely decrease reinjury risk.

## PATIENT EVALUATION OVERVIEW

Determining the exact source of injury is critical in determining the most appropriate treatment and expediting safe return to play. Considering the potential causes of posterior thigh pain, the differential diagnosis for acute hamstring muscle strain injury includes hamstring tendon avulsion, ischial apophyseal avulsion, adductor muscle strain injury, proximal hamstring tendinopathy, and referred posterior thigh pain.

Differential diagnosis

- Complete or partial tendon avulsion
  - Mechanism: Forceful overpressure with combined knee extension and hip flexion, such as failed water ski starts, slipping into the splits, or getting tackled with overpressure[29,30]
  - Demographics: Middle- to old-aged adults, men more than women
  - Common subjective findings: Athlete may report hearing a loud pop and experience significant pain and immediate loss of function
  - Common objective findings: Extensive ecchymosis, palpable defect (after hematoma has resolved), positive result of bowstring test, inability or significant difficulty performing a prone leg curl, positive findings on magnetic resonance imaging (MRI) for tendon avulsion with or without retraction[31–33]
- Hamstring muscle/aponeurosis injury
  - Mechanism: Eccentric contraction injury, likely during terminal swing phase of high-speed running