

Hamstring Injury Prevention and the Impact of Strength and Conditioning on Injury Risk Reduction

By Emma Edge and Johnny Copley



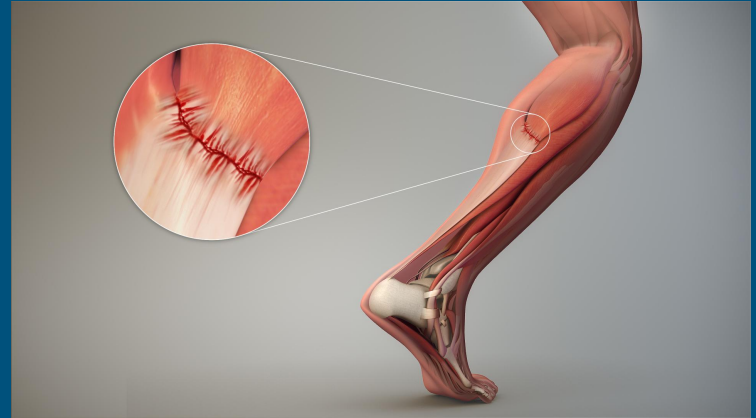
Objectives

By the end of this presentation, you should be able to...

1. Discuss the physiology of a muscle strain injury
2. Understand the mechanism of injury for hamstring injuries
3. Be able to incorporate hamstring injury prevention practices into a workout or treatment session
4. Apply strength and conditioning principles for optimal hamstring training and injury prevention

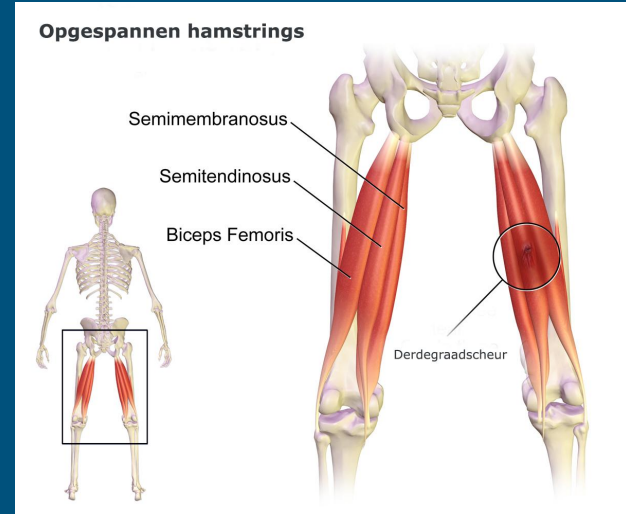
What is a muscle strain?¹

- A muscle strain consists of micro-tearing of muscle fibers near the muscle-tendon junction
- A muscle strain is the result of a muscle being excessively stretched or stretched while the muscle is simultaneously being activated
- Muscles that cross multiple joints or that have a more complex architecture (orientation of fibers compared to mechanical output) are more prone to strains, such as the hamstrings



Primary Risk Factors²

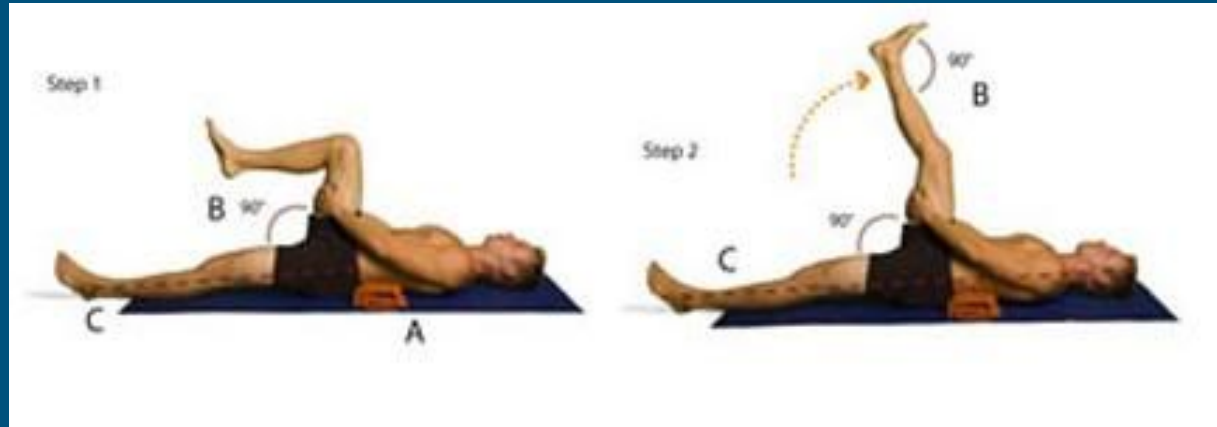
1. History of hamstring injury
2. Older age
3. Previous ACL injury
4. Previous calf strain injury



- More research and evidence is likely needed to address other potential risk factors such as hamstring length, running activity, and other factors related to sports performance.

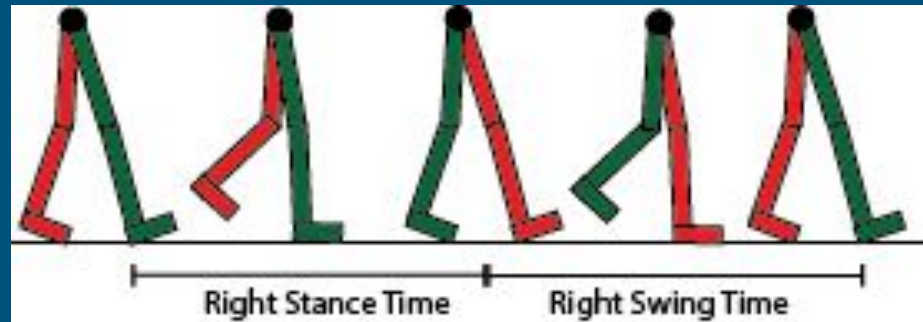
Risk Factors Cont.¹¹

- Decreased Flexibility
- Muscle Imbalance or Weakness
- Improper warm-up
- Fatigue



Mechanism of Injury³

- A hamstring strain is associated with extensive hip flexion with an extended knee.
- These injuries are often sustained during sprinting due to excessive muscle strain with eccentric muscle contraction that occurs during the late swing phase of gait.



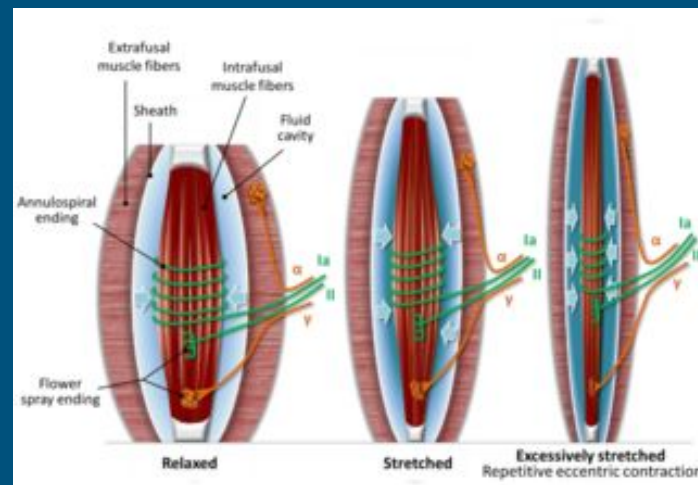
Examples of Injury in Sport⁴

- While hamstring injuries are often caused by activities in which they are stretched, there are common examples of activities within sport where these injuries may occur:
 - Kicking motion
 - Sprinting
 - Jumping
 - Rapid deceleration
 - Hurdling



Hamstring Injury Prevention⁵

- There are multiple ways in which you can prevent hamstring injuries
- One of the most commonly researched methods to prevent these injuries is through eccentric strengthening
- Eccentric hamstring strengthening has been found to improve hamstring strength, fascicle length, H/Q ratio and limb asymmetry.

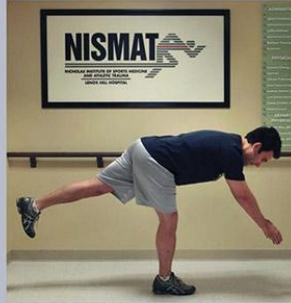


Examples of Eccentric Hamstring Exercises^{6,7}

Hip Ext. w/ Theraband[®]



Diver



Glider

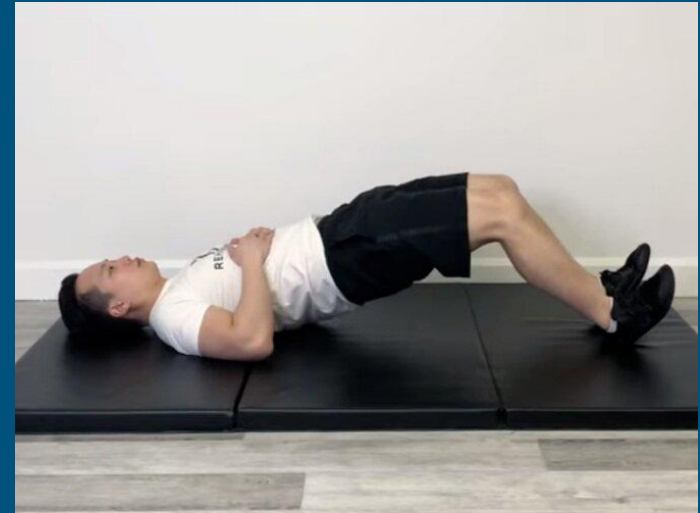


Slider



More Research on Injury Prevention^{5,8-10}

- In a review on exercise interventions for hamstring strain prevention, stability training and eccentric strengthening, specifically Nordic hamstring curls, have been found to be most effective among a variety of athletic populations.
 - NHC found to decrease strain rates by 51%¹³
- Some examples of stability training for this area of prevention include hamstring bridges, single-leg balance exercises, and lateral band walks.



Strength & Conditioning Application^{11,12}

- Important muscle groups to be addressed:
 - Hamstrings
 - Quadriceps to address muscle imbalances
 - Glutes
 - Core/Trunk
- Exercise examples commonly used in prevention programs:
 - Hamstring: nordic hamstring, supine plyo ball hamstring curl, RDLs, kettlebell swings, leg curls
 - Quadriceps: walking lunges, leg extensions, squats
 - Glutes: hip thrusts, banded abduction (walks or seated), hip extensions
 - Core/Trunk: side plank, palloff press, plank

Exercise Dosing for Injury Prevention¹⁶

- Example of Nordic hamstring exercise specific dosing progression:

WEEK 1: 2 SETS X 5 REPS, 1/WEEK

WEEK 2: 2 SETS X 6 REPS, 2/WEEK

WEEK 3: 3 SETS X 6-8 REPS, 3/WEEK

WEEK 4: 3 SETS X 8-10 REPS, 3/WEEK

WEEKS 5-10: 3 SETS X 12/10/8 REPS, 3/WEEK

WEEKS 10+: 1 SET, X 12/10/8 REPS, 1/WEEK

*This specific progression found a hamstring injury reduction of 70% and reduction of re-injury by 85%

S&C Cont.

- Warm-ups:^{14,15}
 - Aim for a warm up of about 10-15 minutes with low-moderate intensity to prepare for sport specific movements
 - Incorporate functional movements depending on sport:
 - Progress to sprints if track & field athlete, kicking for soccer players, jumping for hurdling/gymnasts/etc.
 - Include dynamic stretching/functional movements:
 - dynamic hip flexion in supine, hip airplanes, unweighted RDLs/hip hinges, glute bridges, SL balance/star excursion
- Stretching:
 - Dynamic stretching prior to exercise
 - Static stretching of quads, hips, calves and hamstrings post-exercise
 - Incorporate stretches that are movement specific according to the sport being played - ex. exaggerated strides for track athletes, walking/jogging high kicks for soccer players, etc.
 - “Contract-relax of hamstrings prior to practice/games to reach max ROM to prepare for max effort”¹⁷

Interdisciplinary Nature of Hamstring Injury Prevention

Individuals involved in preventing hamstring injury:

- **Physical therapist**
 - Preventative education, proper biomechanics, rehabilitation, return to sport if injured
- **Coach**
 - Implementing proper warm-ups, educating parents and athletes on prevention and importance of warm-up and recovery
- **Athlete**
 - Implementing proper nutrition, sleep, warm-ups before practices and workouts, prioritizing proper form
- **Strength and conditioning coach/personal trainer**
 - Educate on proper form, exercise dosing, variations in exercises, assist with return to play and sport-specific functional training

Resources for Further Information:

- Youtube Video: Exercise Program Guidelines for for Hamstring Injury Prevention by Dr. Jordan Taylor, PhD, CSCS
 - <https://www.youtube.com/watch?v=1VdxQFxa6Q>
 - Exercise prescription guidelines for hamstring injury prevention programs (breakdown of dosing for hamstring and abdominal specific exercises)
- Podcast Episodes:
 - **JOSPT insights podcast episode 17: Hamstring injury research round up**
 - Summary of 5 research articles on recent hamstring research
 - **FMPA podcast: Prevention and rehab of hamstring injuries**
 - Interview with an elite athlete S&C coach (soccer/track & field)
 - **Ortho Bullets podcast: Knee & Sports: Hamstring Injuries**
 - Very detailed overview of hamstring anatomy, biomechanics, MOI

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