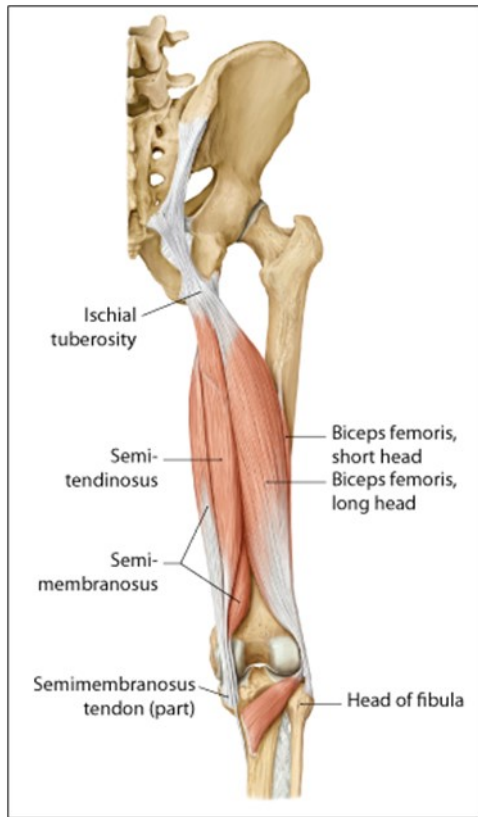


What's up with all the hamstring injuries in sports?



The hamstring is comprised of three muscles—the biceps femoris (long and short heads), the semitendinosus, and the semimembranosus. All but the short head of the biceps originate on the lateral ischial

For decades, sports medicine physicians, coaches, athletic trainers and researchers have been trying to prevent hamstring injuries. Yet despite their efforts, they remain the most common injury for missed playing time by professional football players and baseball players. In the National Football League (NFL), hamstring injuries comprise 75 percent of the reason for a player on the disabled list. In Major League Baseball (MLB), hamstring injuries reached an all-time high this year up 193 percent compared to the same time in 2019, and that was just through May. Some have speculated that downtime because of COVID-19 is a major contributor, but hamstring injuries are not a new phenomenon. In fact, in July the NFL Scientific Advisory Board provided the University of Wisconsin with a four-year, \$4 million award to study the prevention and treatment of hamstring injuries for elite football players. The award is part of the League's multi-year effort to better understand and prevent lower extremity injuries including hamstrings.

occurrence and type to lower extremity injuries to better identify ways we can further reduce them," said Dr. Allen Sills, NFL Chief Medical Officer.

"At the League, we recognize the significant burden hamstring injuries have on our elite athletes year after year and have dedicated resources to analyzing the

Lead researcher at the University of Wisconsin believes it will take a study of unprecedented size and scope to truly understand and reduce hamstring injuries. "Thanks to the NFL's commitment and funding, our multi-disciplinary team of researchers can now undertake an innovative, data-driven approach to this study and assist sports medicine clinician in advancing strategies for injury prevention and interventions to return athletes to sport quickly and with reduced risk for re-injury," he said.

The NFL-funded research is not the first to look into hamstring injuries in professional athletes. Researchers at Henry Ford Hospital in Detroit published their findings in 2019 from prospective

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data on hamstring injury trends in major and minor league baseball in the *Orthopaedic Journal of Sports Medicine* journal. Every MLB and minor league (MiLB) team's injury data was recorded in the MBL Injury Tracking System from 2011 through 2016.

During that seven year period, the researchers found there were 2,633 hamstring strains in professional baseball with 441 occurring in the MLB and 2,192 in the MiLB. This represents a marked increase in the MLB from one injury every 39 games in 2011 to one injury every 30 games in 2016. In the MiLB it equates to one injury every 35 games in 2011 compared with one injury in 30 games in 2016. Of the 2,633 injuries, 1,986 (74 percent) were partial hamstring tears, 624 (23.7 percent) hamstring strains and 23 (0.9 percent) were complete tears. The researchers also noted that 72 MLB and 311 MiLB hamstring injuries were recurrent, 15 MLB and 85 MiLB injuries were season ending while nine MLB and 11 MiLB injuries required surgery.



Other notable findings researchers learned was that April and May accounted for 40 percent of all MLB hamstring injuries compared with other months. Infielders suffered the most injuries with pitchers leading the list at 457 and base running, specifically to first base, was cited as the reason for other position player injuries.

The remaining item the researchers reported was time lost as a result of hamstring injuries. According to their findings, a mean of 14.5 days were missed. Overall, one-half of the hamstring strains in both the MLB and MiLB resulted in more than seven days of time lost and 71 MLB and 22 MiLB players missed more than 30 days.

Although the data in the study pinpointed areas of concern with regard to an increase in hamstring injuries, the researchers noted that much more needs to be studied including location and temperature, as well as data from spring training which wasn't part of their study possibly reflecting an underreporting of recurrent injuries. It also did not provide enough data to help determine injury prevention recommendations.

While the research studies cited in this article examined hamstring injuries in football and baseball, hamstring injuries also are a significant contributor to lost playing time in soccer,

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track, basketball, rugby and lacrosse. Countless research has been done on athletes in these sports without arriving at a consensus for a cause or treatment

In the July 1992 issue of the *Journal of Orthopaedic Sports Physical Therapy*, researchers reviewed clinical and animal research literature concerning the role of strength, flexibility, warm-up and fatigue in hamstring muscle injuries and presented an evaluation and rehabilitation suggestions to help prevent hamstring muscle injuries.

The authors recommendations based on their findings include:

- **Preseason and rehabilitation screening**

During preseason screening and rehabilitation following hamstring muscle injury, clinicians should consider the influence of hamstring strength, flexibility, warm-up and fatigue on muscle performance noting more research concerning these factors is needed.

- **Muscle strength**

Imbalance may be a factor contributing to hamstring injuries. Hamstring muscles are subjected to high forces during both open and closed kinetic chain activities of sprinting. Since the ability of connective and muscle tissue to absorb force is directly proportional to both passive and active components, it is logical that a stronger hamstring muscle group can absorb greater forces. However, the inability of research to consistently demonstrate a significant relationship between hamstring strength and injury may be due to methodological differences or confounding variable. Therefore, further research clarifying the relationship of hamstring strength to hamstring muscle injury is needed. Specifically, prospective research comparing hamstring and quadriceps concentric and eccentric strength indices to one another and to body weight measures is needed.

- **Flexibility**

Several studies investigated the relationship between hamstring flexibility and hamstring injury both supporting correlation and dismissing any association. However, the authors noted multiple instances that a less flexible extremity existed prior to hamstring injury and also observed evidence of inflammation and adhesion that occur following hamstring muscle injury. Furthermore, calcification within the hamstring muscles following muscle strain has been documented on C.A.T. scans (computed tomography) leading to the thought that loss of hamstring flexibility is “a possible sequelae to hamstring muscle injury.” Therefore, the importance of hamstring flexibility in recovery after a hamstring injury can’t be overemphasized.

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- **Warm-up**

Not surprising the authors found numerous studies where athletes most often suffered a hamstring injury early in practice often when sufficient warm-up was not done. Additionally, lab tests on rabbits demonstrated that a preconditioned (exercised) muscle required significantly more force to failure than the muscles that were not exercised. Therefore, the authors concluded a warm-up period prior to participation may prevent injury to the musculotendinous unit by increasing its elasticity and force absorption capability.

- **Fatigue**

The authors also found athletes suffered hamstring injuries late in a game because of muscle fatigue. The role of muscle fatigue and injury is extremely difficult to study in the field so researchers using an animal model were able to test the role of muscle fatigue and eccentric muscle contraction in muscle injury. The anterior tibialis muscle was electrically stimulated under isometric, concentric, and eccentric contractions (1,800 contractions over 30 minutes). The authors reported tears in myofibrils only in the eccentric exercised group. During the fatigue protocol, the authors reported no significant muscle injury occurred in the concentric or isometric exercised groups. The damage seen to the muscles was similar to that seen in human muscles following exhaustive eccentric contraction leading the authors to suggest further research is needed concerning fatigue and hamstring muscle injury in athletes.

- **Prevention Recommendations**

- ◆ A comprehensive approach should be used and incorporated into preseason screening and evaluation procedures.
- ◆ Measure and maintain hamstring strength and flexibility.
- ◆ Traditional hamstring stretching exercise of bringing the head/chin toward the knee in a seated or standing position was found to be inadequate. Clinicians need to teach good flexibility/warm-up activities and monitor whatever exercise is used to ensure hamstring length improves.
- ◆ Any protocol that addresses hamstring rehabilitation should consider the dynamic role of the hamstring muscle group during sprinting, high speed isokinetic concentric and eccentric protocols, stretching performed before and after activity, and that a warm-up period of functional activities prior to maximal sport activities is recommended.
- ◆ Avoid over training and fatiguing the hamstring muscles prior to competitions.