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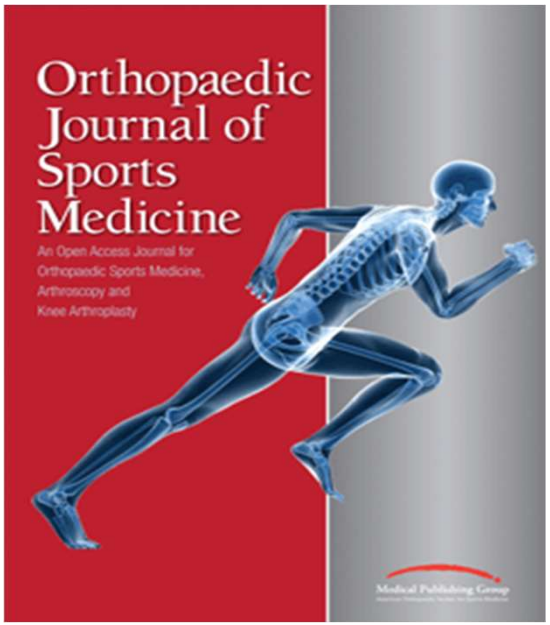
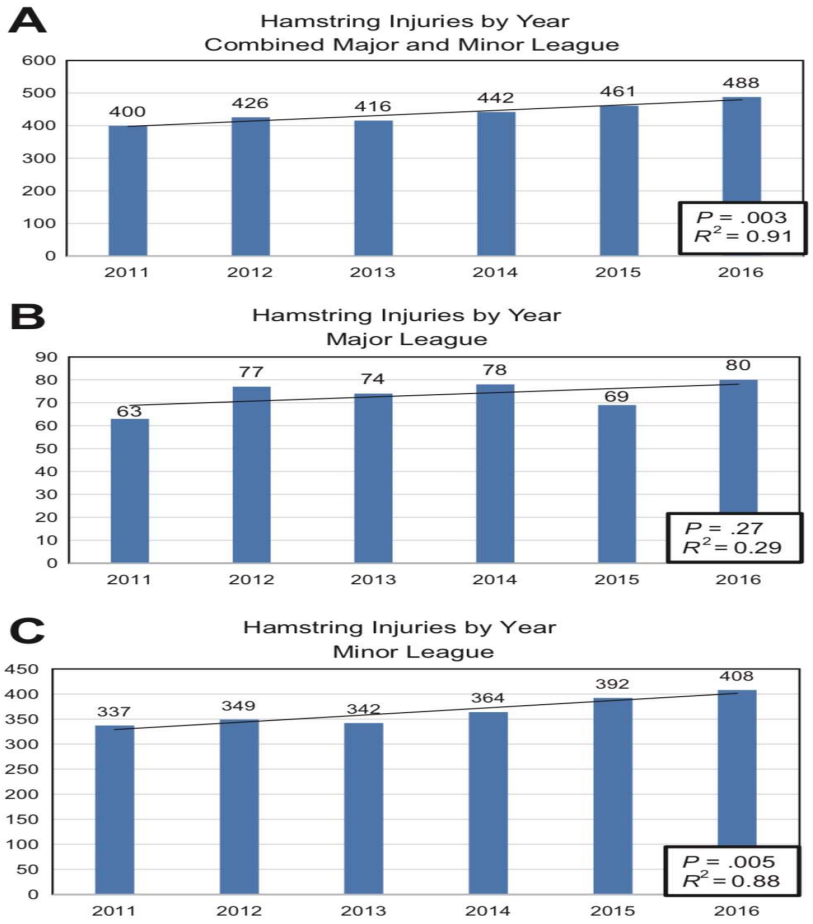
Hamstring Prevention in Baseball

How many Hamstring injuries are we seeing in Professional baseball?[4] *Okoroha et al*





What kind of hamstring injuries are we seeing in baseball?

The Orthopaedic Journal of Sports Medicine

TABLE 1
Hamstring Injury Characteristics[a]

	Major League Baseball	Minor League Baseball
Total	441 (16.7)	2192 (83.3)
Injury type		
Grade 1 (hamstring strain)	52 (11.8)	572 (24.8)
Grade 2 (partial tear)	377 (85.5)	1609 (74.7)
Grade 3 (complete tear)	12 (2.7)	11 (0.5)
Injury side		
Left	252 (57.1)	1107 (51.5)
Right	187 (42.4)	1061 (48.4)
Both	2 (0.5)	24 (1.1)
Initial injury or reinjury		
Initial injury	369 (83.7)	1880 (85.8)
Reinjury	72 (16.3)	312 (14.2)
Season-ending injury		
Yes	15 (3.4)	86 (3.9)
No	426 (96.6)	2106 (96.1)
Surgery required		
Yes	9 (2.0)	10 (0.5)
No	432 (98.0)	2182 (99.5)
Position		
Infielder	163 (37.0)	826 (37.7)
Outfielder	162 (36.7)	781 (35.6)
Pitcher	89 (20.2)	368 (16.8)
Catcher	26 (5.9)	217 (9.9)
Designated hitter	1 (0.2)	0 (0.0)

[a]Data are shown as n (%).

TABLE 6
Magnetic Resonance Imaging Findings for Hamstring Injuries

	n (%)	Return-to-Play Time, d
Total	327 (100.0)	29.5
Specific hamstring muscle affected		
Biceps femoris	181 (55.4)	30.0
Semitendinosus	68 (20.8)	31.2
Semimembranosus	34 (10.4)	32.5
Common hamstring	38 (11.6)	21.2
Other	6 (1.8)	29.0
Location of injury		
Proximal	134 (41.0)	27.8
Middle	36 (11.0)	32.9
Distal	146 (44.6)	31.9
Unknown	11 (3.4)	13.7
Injury type		
Grade 1	128 (39.1)	22.8
Grade 2	143 (43.7)	33.5
Grade 3	56 (17.1)	38.2

Breaking Down the Injuries

American journal of sports medicine - Major and Minor League Baseball Hamstring Injuries: Epidemiologic Findings From the Major League Baseball Injury Surveillance System - Ahmad

TABLE 2
Top 10 Time-Loss Injuries by Body Part and Injury Type, Major and Minor Leagues, 2011[a]

	Major League		Minor League	
Injury Diagnosis	No.	%	No.	%
Hamstring strain	50	5.7	218	5.9
Adductor groin strain	36	4.1	85	2.3
Oblique muscle strain	36	4.1	88	2.4
Hand contusion	32	3.7	203	5.5
Leg contusion	26	3.0	124	3.4
Knee contusion	26	3.0	88	2.4
Quadriceps strain	25	2.9		
Foot contusion	22	2.5	104	2.8
Concussion	18	2.1	101	2.7
Paralumbar muscle strain	18	2.1		
Other shoulder injury			78	2.1
Elbow contusion			73	2.0

[a]Frequencies are given in descending order by major league. Empty cells indicate an injury occurrence did not reach the top 10 in that league.

TABLE 3
Time-Loss Hamstring Strains by Activity, Major and Minor Leagues, 2011[a]

	Major League		Minor League	
	No.	%	No.	%
Base running	31	62.0	154	70.6
Fielding	10	20.0	29	13.3
Unknown	4	8.0	8	3.7
Pitching	2	4.0	14	6.4
Other	1	2.0	2	0.9
Catching	1	2.0	3	1.4
Hitting	1	2.0	6	2.8

[a]Frequencies are given in descending order by major league.

Timing of These Hamstring Injuries!

American journal of sports medicine - Major and Minor League Baseball Hamstring Injuries: Epidemiologic Findings From the Major League Baseball Injury Surveillance System - Ahmad

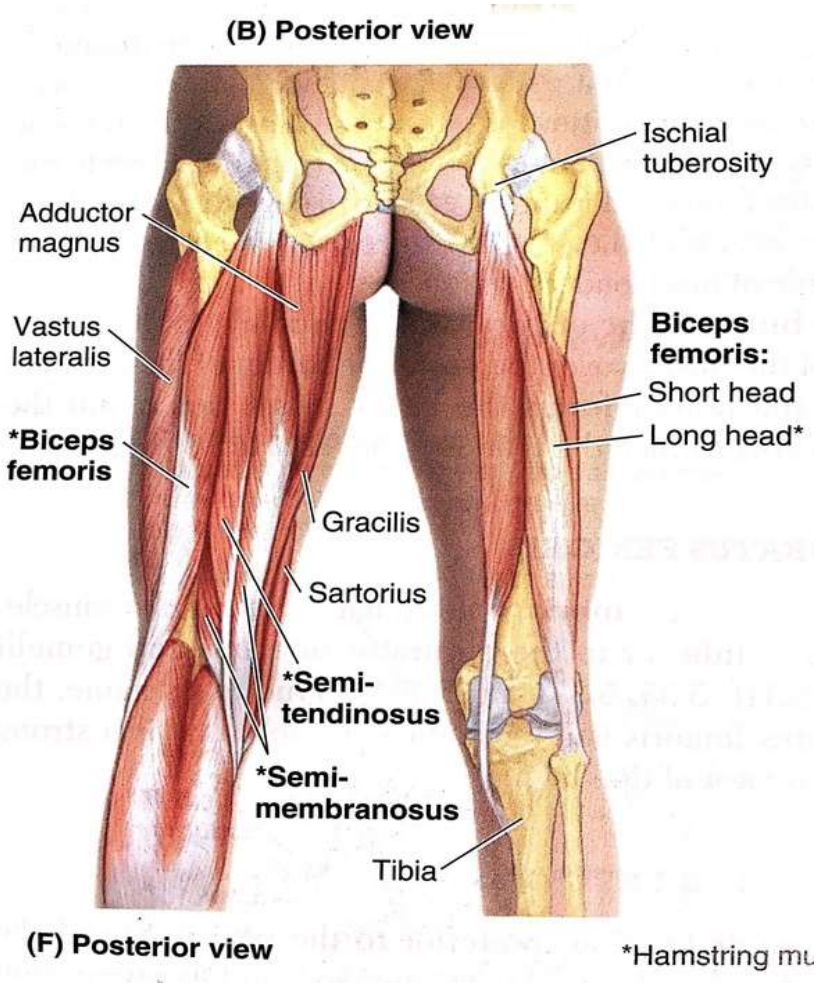
TABLE 6
Regular Season Time-Loss Hamstring Strains by Month, Major and Minor Leagues, 2011

	No. (% of Total)	Total No. of Games	Injury Rate (1 Hamstring Injury Every *n* Games)	Average Temperature, °F
Major league[a]				
April	6 (12)	392	65	63
May	13 (27)	420	32	68
June	6 (12)	400	67	75
July	8 (16)	395	49	82
August	3 (6)	420	140	78
September	3 (6)	117	39	72
Minor league[b]				
April	33 (15)	1370	42	
May	44 (20)	1892	43	
June	28 (13)	2506	89	
July	45 (21)	3161	70	
August	41 (19)	2855	70	
September	7 (3)	322	46	

[a]This analysis excludes 11 hamstring injuries that occurred in spring training or postseason games.
[b]This analysis excludes 20 hamstring injuries that occurred in spring training or postseason games

Understanding Hamstring Functional Anatomy

- Hamstrings are the Most Important Locomotor Muscle
- Hamstrings are very powerful in the transverse plane
- Eccentrically slow down forward momentum, followed by concentric explosion
  - Need to train eccentrically and in all planes, especially the transverse plane
  - Control the Reins of the "Horse"



Understanding the risk factors

- Age
- Previous injury history
- Poor Lumbar posture and core stability
- Fatigue
- Hamstring strength vs quad strength
- Hamstring eccentric strength
- Mobility/flexibility

Five point strategy to HSI prevention

- Strengthen the hamstrings
- Optimize the training balance - workload
- Implement a lumbo-pelvic hip stability program
- Focus on movement quality
- High speed running

British Journal of Sports Medicine

Recommendations for hamstring injury prevention in elite football: translating research into practice – Matthew Buckthrope – Br J of sports med. 11/19

Hamstring Strengthening – Posterior Chain Exercises

Nordic Hamstring Exercise

Giants Protocols:

Off season:

- 2 x per week – 4 sets of 6-8 reps
- Increased volume

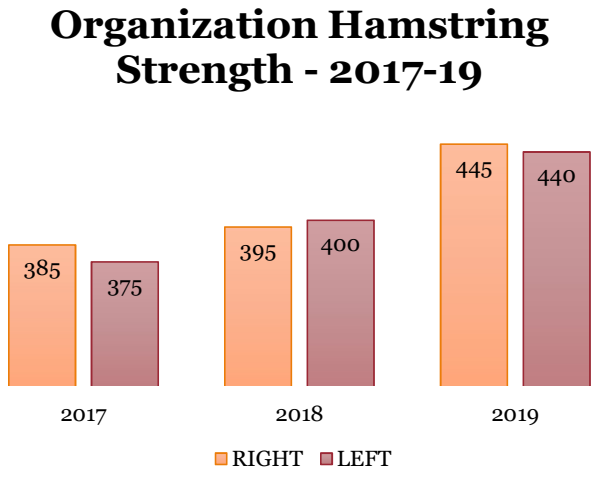
In Season

- 1 x per week – 2 set of 3-4 reps
- Less volume, increased intensity
- May add external load

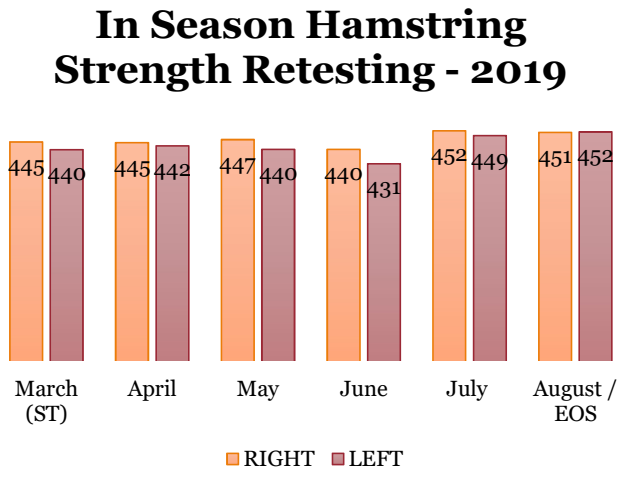
Nord board video

Test/Re-Test Method

- Yearly Eccentric Hamstring Strength Trends



- 2019 Monthly Eccentric Hamstring Strength Trends

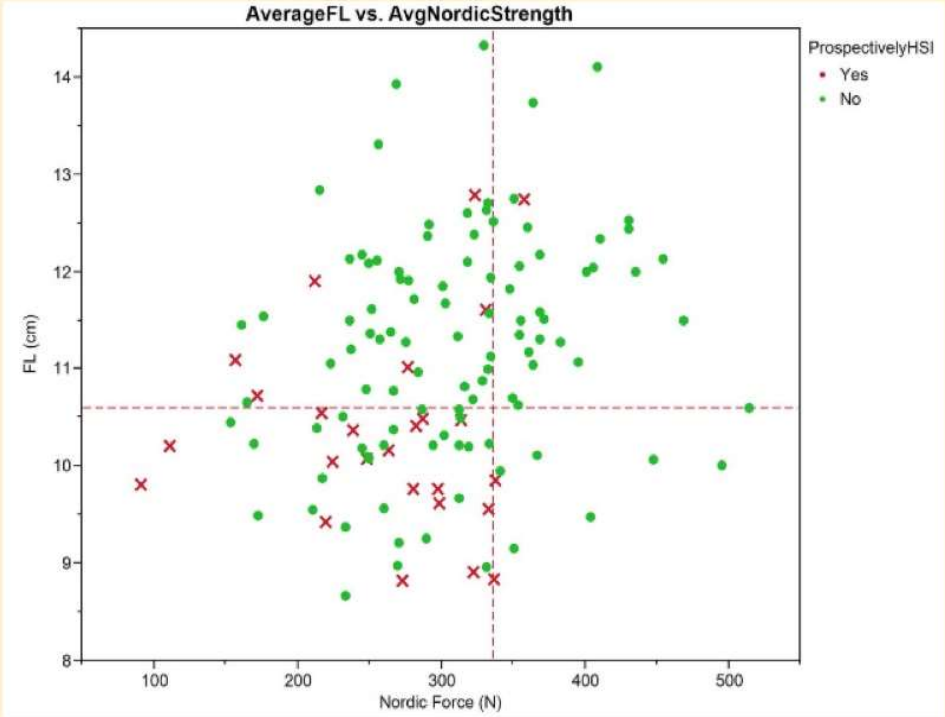


Long and Strong is Best

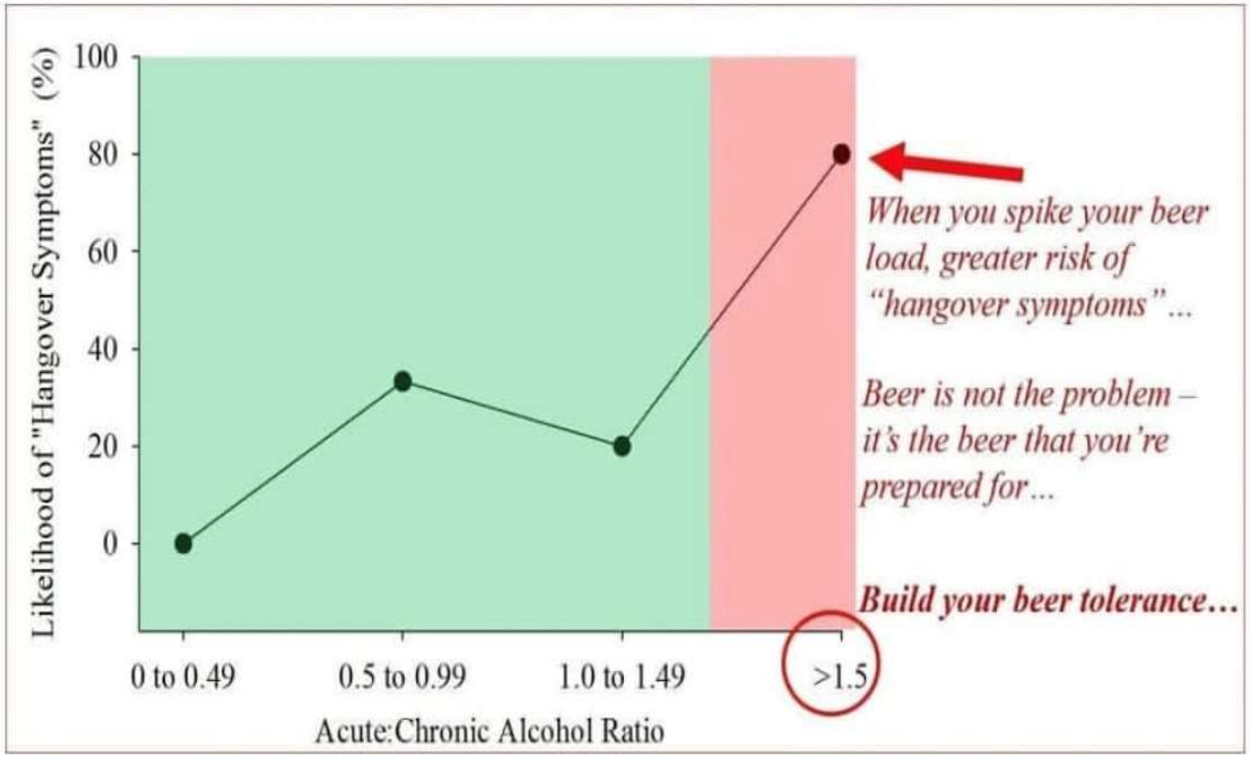
sports injury bulletin.com

- Doing Nordic exercise results in alteration of muscle architecture – elongation of the bicep femoris-long head 16-30% after 10 weeks of training
- Longer fascicles allow for greater muscle extensibility and reduce the risk of over lengthening during eccentric contraction. This is a potential dilemma for the BFLH as it is required to undergo the greatest lengthening of all the hamstrings during sprinting
- May not be the increase in eccentric strength by itself that protects against injury, but could be the **architectural changes seen around the myotendonis junctions as an adaption** to supramaximal eccentric loads. **Typically an increase in fascial length, increased tendon stiffness,** and distal hypertrophy is observed.
  Ducloy 2009

Figure 4: Quadrant of doom



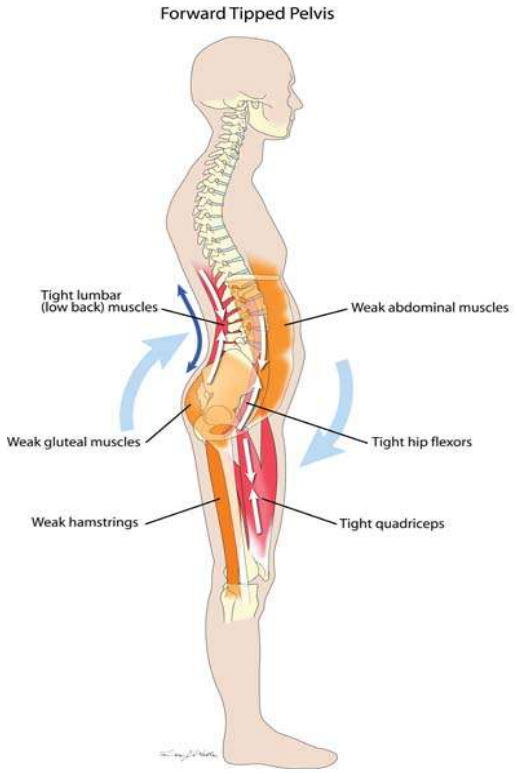
Optimize the Training Balance- Work load



Lumbo-Pelvic Hip Stability

Not a lot of evidence to support this, but there is a wide belief that is important to prevent HSI.

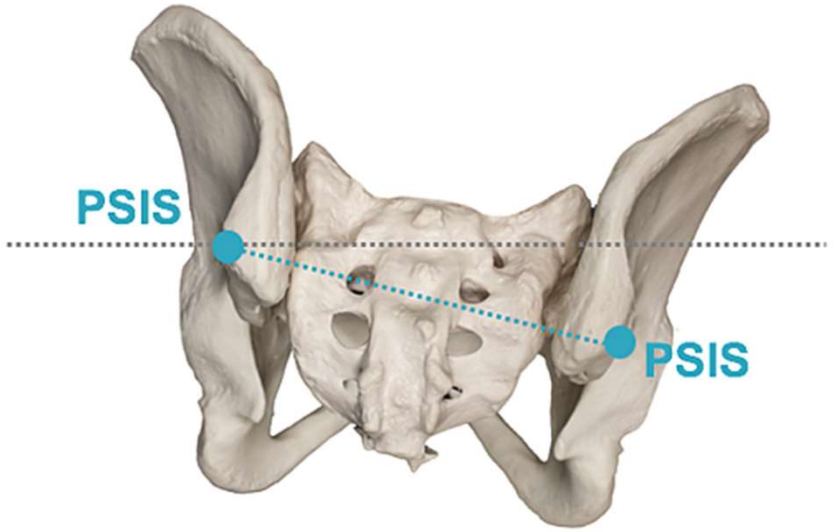
- Anterior pelvic tilt
  - hip flexor tightness – risk factor for HIS
  - Glute max inhibition and position of mechanical disadvantage
- Trunk motion – lateral trunk tilt – increase HSI
- Pelvic obliquities
  - Creates leg length discrepancy's – shown to increase tension on the BFLH on terminal leg swing



Pelvic Obliquities

- Must asses pelvic asymmetries to address the strength or flexibility deficits in the lumbopelvic muscles

A significant association between functional leg length asymmetries of greater than ***1.8cm*** and approximately 4x greater risk of hamstring muscle injuries



Pelvis continued

- A portion of the long head of the biceps femoris tendon was continuous with the sacrotuberous ligament.

  Therefore a hamstring effects the SI joint function and vice versa.

- Many Researchers have shown that spinal manipulative therapy of the SI joint has beneficial effects on the strength and mobility of the hamstring muscle group

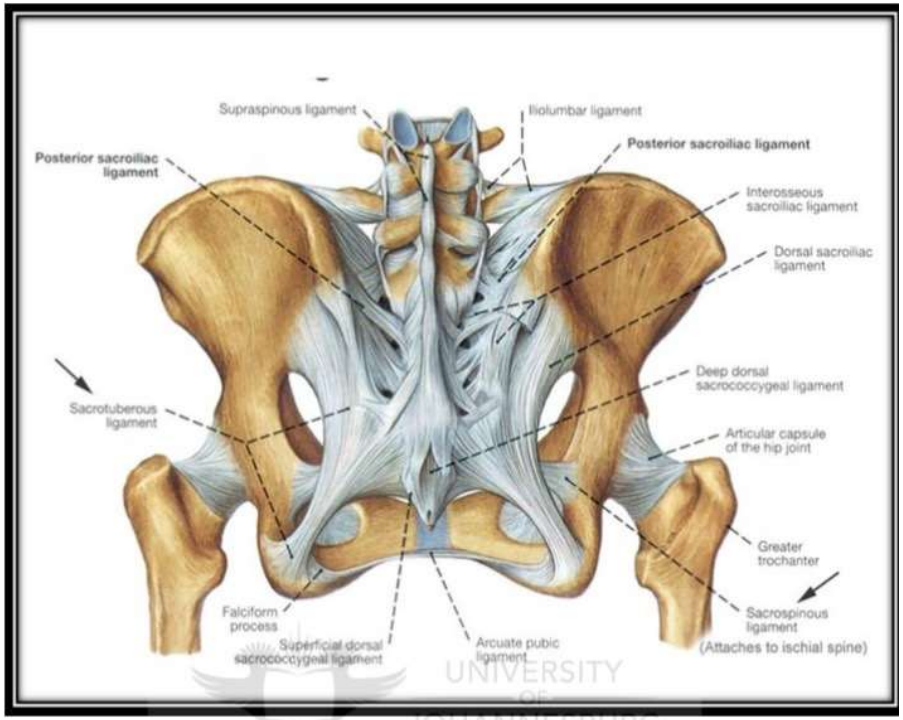


Figure 2.1: Sacral and pelvic ligaments (Moore and Dalley, 2008)

Sprinting as a Vaccine for HMI?

-Pascal Edouard, Jurdan Mendiguchia

Sprinting is the only exercise
that induces a sprint-specific hamstring muscles activation
(both in terms of amount and timing): impossible to replicate
by usual strengthening exercises that can reach only 18 to
75% of the electromyographic activity reached by hamstrings
during sprinting.(8) - Pascal Edouard

Athletes who sprinted at high intensity (>95% of their maximal velocity)
during sport practice showed a lower risk of lower limb injuries
Than those who produced lower maximal velocity (<85%).

High Speed Running

- High speed running to help prevent hamstring strains
  - Must be 85-90% max
    - Use timer
    - Technology
    - Determine amount based on individual player
    - Player competition
    - Watch training load

High Speed Treadmill Running

- Can supplement running in the weight room
  - Running on the curve
  - Short duration
  - High intensity
  - Low volume

Sprinting on the Field

- Sprint work in the outfield
  - High intensity
  - Short distances
  - Incorporate deceleration work
- Running the curves
  - Non linear
- Base running
  - Baseball specific
  - Again intensity is the key
  - This is where we see a majority of in game hamstring injuries

Things to continue to think about

- Continue to look at risk factors
- Eccentric strengthening and its benefits to your prevention program
- Work load and fatigue
- Posture and spinal mobility
- Sprinting to prevent HIS

Thank you.


It isn't
Hard
to be good from
time to time
in sports.
What is
tough
is being good
every day.
- Willie Mays

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