Protecting the Athlete Spine:

7 Essential Lessons for Keeping Athletes' Spines Healthy

Eric Cressey, MA, CSCS

@EricCressey

2019 MLB Lumbopelvic Injuries

Injury	# Players	DL Days	$ Wasted
Back	43	1,759	$47.2 million
Hamstrings	46	1,313	$33.8 million
Oblique	37	1,294	$19.6 million
Quad	13	452	$12.4 million
Groin	17	909	$11.2 million
Hip	16	743	$9.3 million
Abdominal	6	124	$1.5 million

Source: www.spotrac.com

Spine Struggles

- Deyo R A, Weinstein J N. Low back pain. N Engl J Med 2001344363–370.
- 85% of low back pain has no definitive diagnosis.
- What if most assessment models – and, in turn, the clinicians working in them – really just aren't effective?
- "The medical system is not designed to address a rather complex non homogenous condition like back pain."

Elite Baseball Development Podcast

Episode 16:

Sparing the Spine w/ Dr. Stuart McGill

McGill Podcast Notes

“When you treat the person as an experiment – in other words, you listen to their story of what causes pain, what takes it away, their training regimen, their age, their history, etc. – you can then perform probes to their pain to identify with great precision the positions, postures, and load that cause their pain. You can isolate specific tissues.”

“In other words, you can converge with precision the mechanism of their pain by treating them as an entity where you form a hypothesis and you test it.”

Lesson 1: Assess. And assess more in at-risk populations.

- Weingroff: “The evaluation tells you the cost analysis of the next step. Is it worth it?”
- This spans a large continuum.
- No assessment = throwing darts. This is Crossfit.
- 15 minute doctor’s appointment: you can’t learn what you need to know
- 1 PT, 6 patients doesn’t work. And it works particularly terribly with spine issues.
- Physical exam before diagnostic imaging

Chou R et al. Imaging strategies for low-back pain: systematic review and meta-analysis. *The Lancet, 2009;373* (9662), 463-472.

- Review of imaging for low back pain without significant red flags suggesting serious conditions (cancer, fracture, etc)
- "Lumbar imaging for low back pain without indications of serious underlying conditions does not improve clinical outcomes."
- "Therefore, clinicians should refrain from routine, immediate lumbar imaging in patients with acute or subacute low back pain and without features suggesting a serious underlying condition."
- Some research suggests that MRI leads to poorer outcomes in back pain patients

Jensen MC, et al. Magnetic resonance imaging of the lumbar spine in people without back pain. N Engl J Med.1994 Jul 14;331(2):69-73.

- MRIs of 98 asymptomatic backs

- “52 percent of the subjects had a bulge at at least one level, 27 percent had a protrusion, and 1 percent had an extrusion [82% of subjects]. Thirty-eight percent had an abnormality of more than one intervertebral disk. The prevalence of bulges, but not of protrusions, increased with age. The most common nonintervertebral disk abnormalities were Schmorl's nodes (herniation of the disk into the vertebral-body end plate), found in 19 percent of the subjects; annular defects (disruption of the outer fibrous ring of the disk), in 14 percent; and facet arthropathy (degenerative disease of the posterior articular processes of the vertebrae), in 8 percent. The findings were similar in men and women.”

Soler T, Calderon C. The prevalence of spondylolysis in the Spanish elite athlete. Am J Sports Med. 2000 Jan-Feb;28(1):57-62.

- 8% of elite Spanish athletes affected
- 27% of track & field throwers, 17% of rowers, 14% of gymnasts, and 13% of weightlifters
- L5 most common (84%), followed by L4 (12%).
- Bilateral 78% of the time
- **Only 50-60% of those diagnosed actually reported low back pain**
- Presence of spondylolysis is estimated at 15-63%, with the highest prevalence among weightlifters.
- Presence is estimated at 3-7% in the general population

My Assessment

- Resting Posture
- Passive ROM
  - Thomas Test
  - Hip ER/IR – supine/prone (+ FADIR/FABER?)
  - Active & Passive Straight Leg Raise
  - Abduction
  - Prone Knee Flexion
  - Ankle Dorsiflexion

My Assessment

- 1-leg Balance
- Toe Touch
- Push-up
- Overhead Squat
- Overhead Lunge Walk

Lesson 2: Watch for outliers.

Outlier Examples

- Marked asymmetries.
- Flat lumbar spines
- Excessive passive ROM with poor active control of it.
- Marked limitation to lateral flexion.
- Gross limitations to hip mobility – particularly observable changes over time
- Retroverted and anteverted hips
- Hypermobile people who love yoga

Marked Asymmetries

Posterior Right Rib Hump

Flat Lumbar Spine

Cappozzo et al. Lumbar spine loading during half-squat exercises. Med Sci Sports Exerc. 1985 Oct;17(5):613-20.

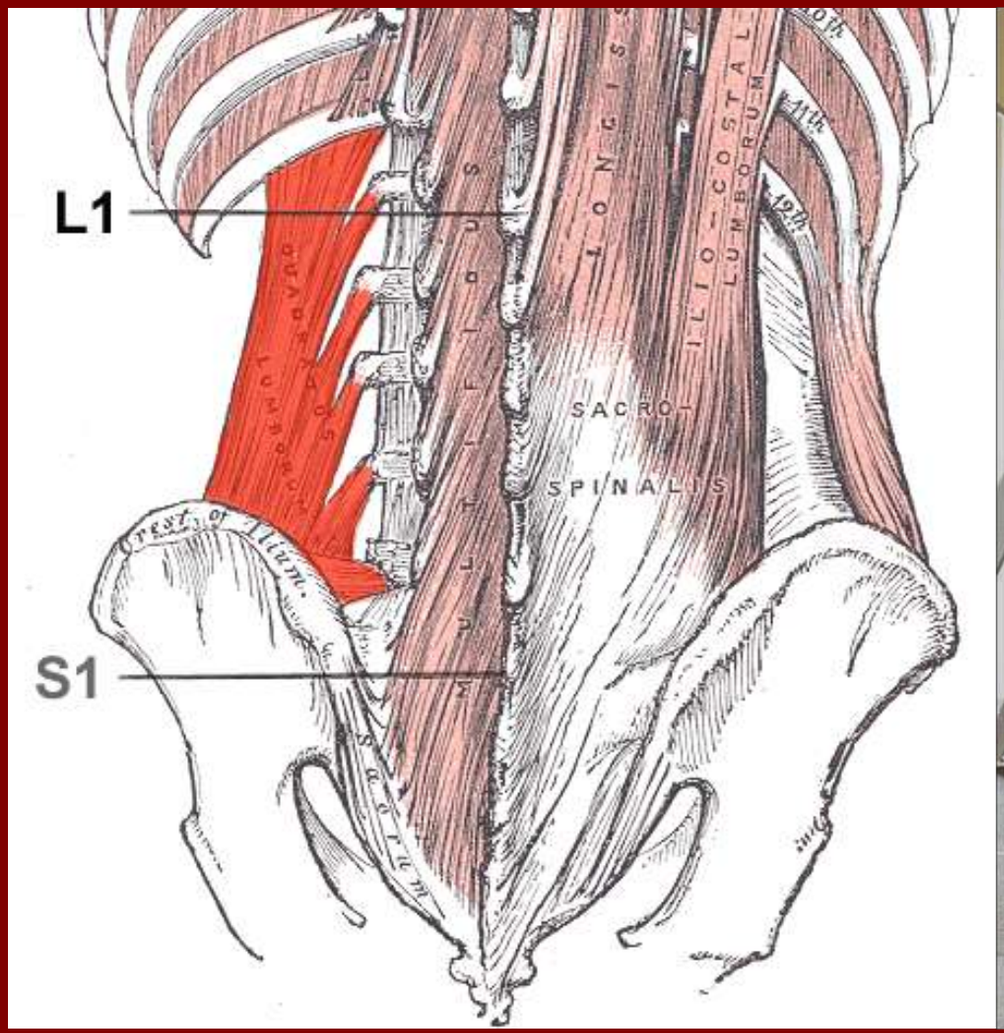
"During half-squat exercises with barbell loads in the range 0.8 to 1.6 times body weight the compressive loads on the L3-L4 segment vary between 6 and 10 times body weight. Erector spinae contraction force was predicted to be between 30 and 50% of the relevant maximal isometric force. ***The magnitude of trunk flexion was found to be the variable which influenced most spinal compression load.***"

Excessive Passive ROM w/Poor Active Control (More to Come)

Limited Lateral Flexion ROM


UNDER ARMOUR

Quadratus Lumborum: Overworked Synergist



Get the Glutes Going!

Get the Glutes Going!

Get the Glutes Going!

Do You Really Need Extreme ROM to Generate Rotational Power?

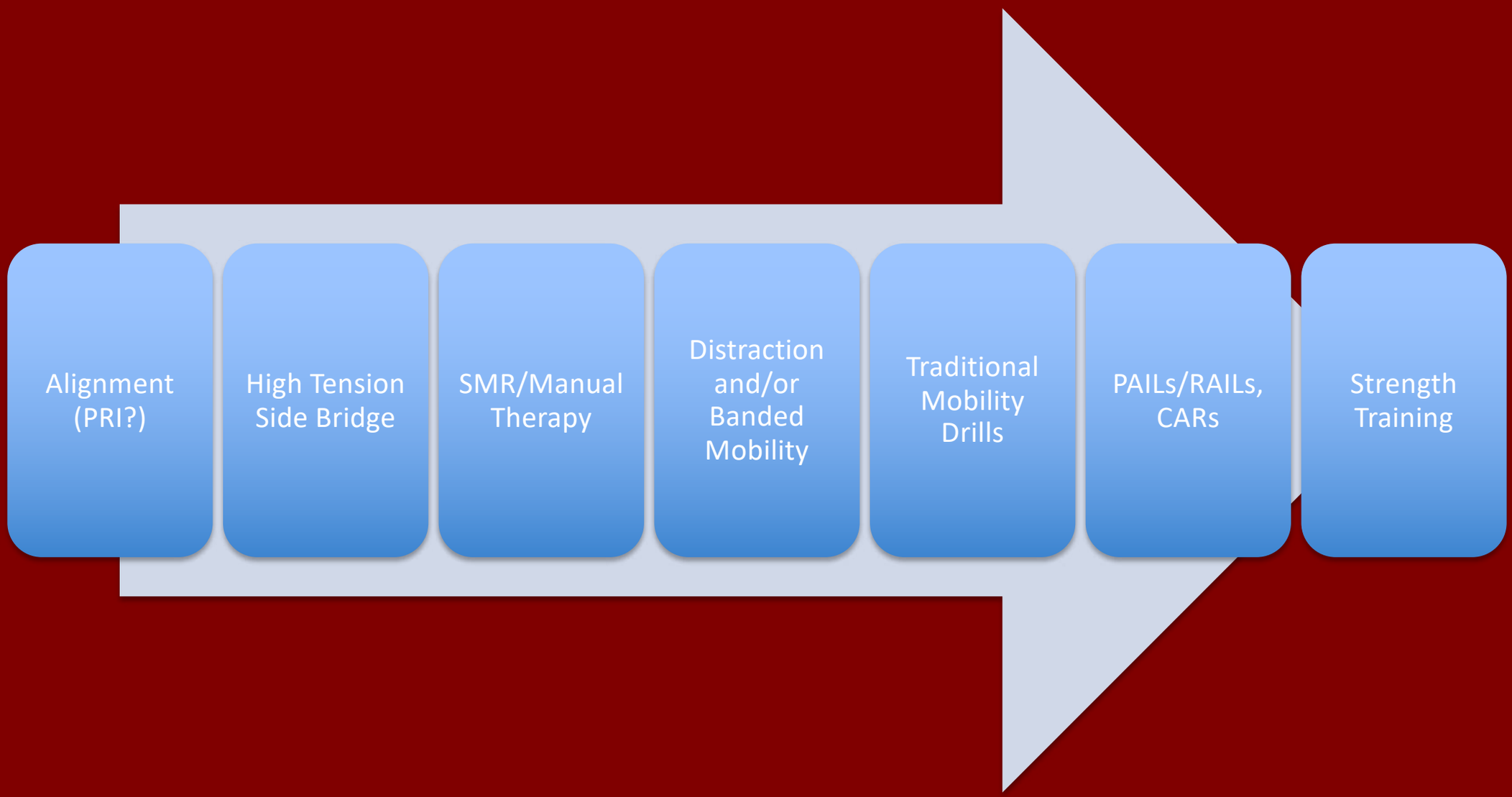
How Much Internal Rotation Does a Pitcher Need?

How Much Internal Rotation Does a Pitcher Need?

Vad VB, et al. Low back pain in professional golfers: the role of associated hip and low back range-of-motion deficits. Am J Sports Med. 2004 Mar;32(2):494-7.

- “Range-of-motion deficits in the lead hip rotation and lumbar spine extension correlated with a history of low back pain in golfers.”
- Joint? Retroversion? Tissue Extensibility? Capsule? Motor control deficits?

Hip Internal Rotation Flowchart



Left-Side-lying Knee Toward Knee

All Fours Belly Lift

High Tension Side Bridge

Manual Therapy/ Self-Myofascial Release

Banded Kneeling Glute Mobs

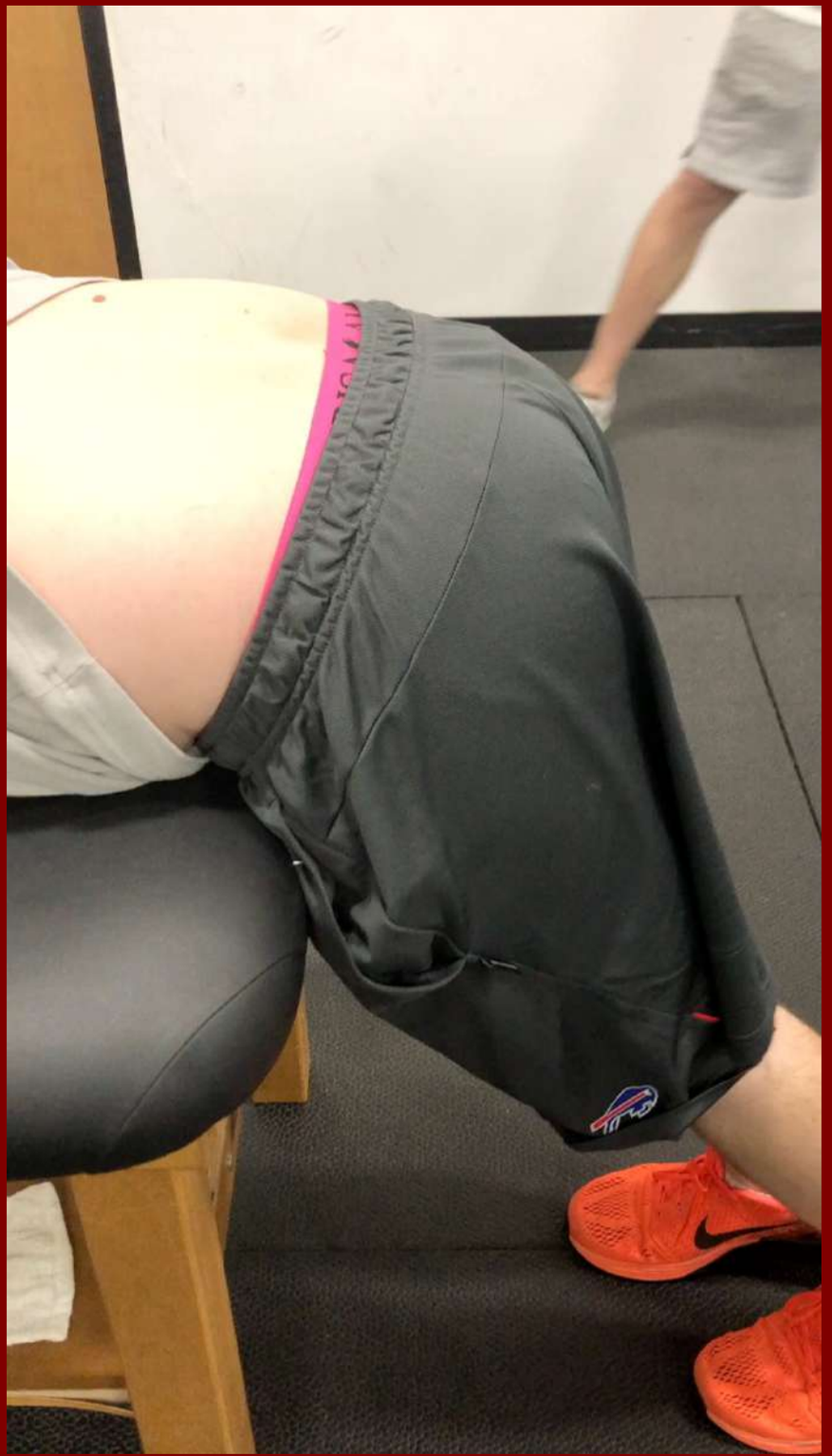
90/90 PAILs/RAILs

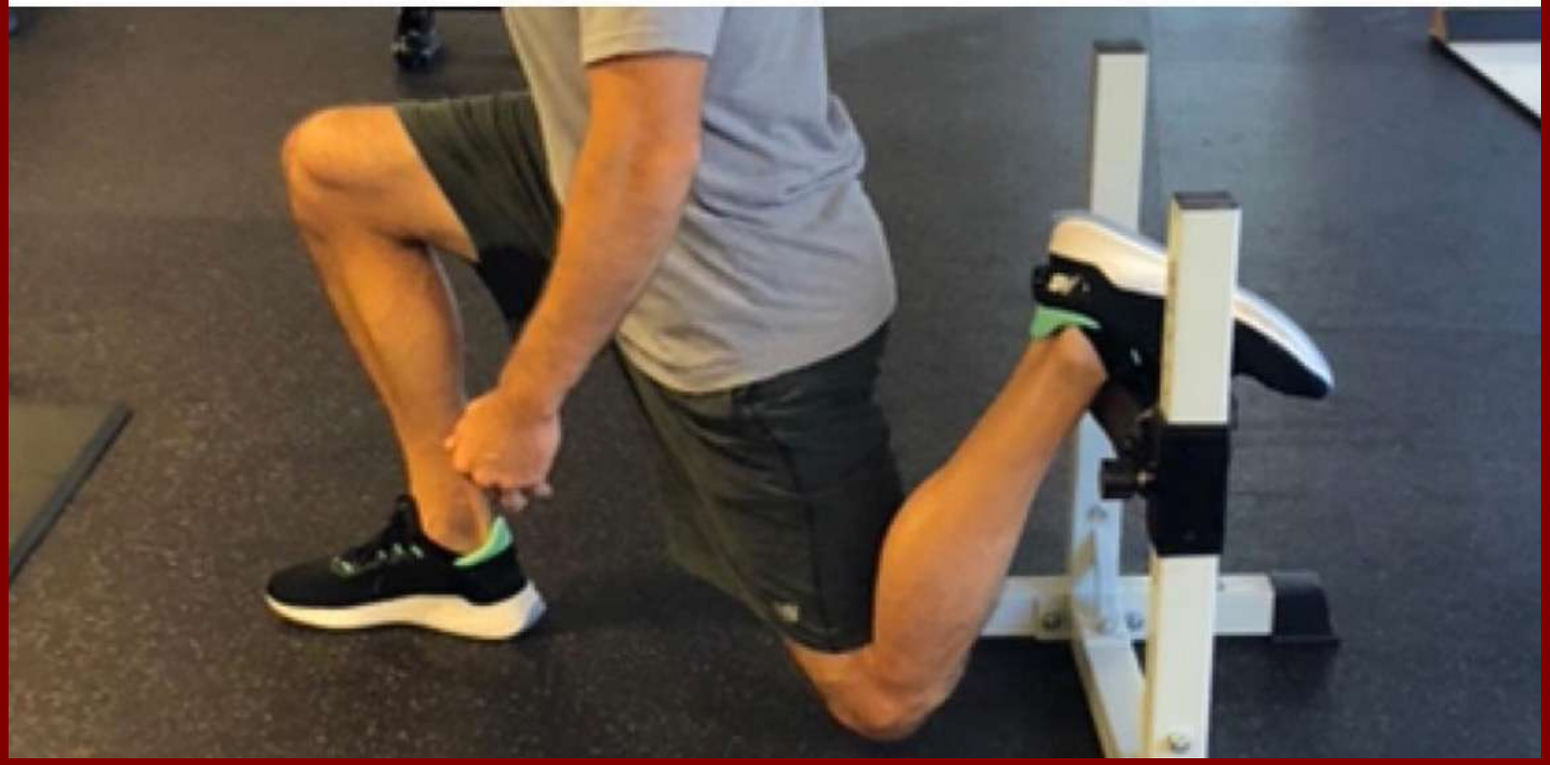
KB Goblet 2-Way Step Down


Calvin Klein


POLLOCK
11


LINDSEY
11





Retroversion

Retroversion w/Poor Anterior Core Control

Anteversion

Hypermobility

Hypermobility

Lesson 3: Don’t train rotational athletes like linebackers – or vice versa.

Spine Rotation

Spinal Level	Degrees of Rotation
T1-2	9
T2-3	8
T3-4	8
T4-5	8
T5-6	8
T6-7	8
T7-8	8
T8-9	7
T9-10	4
T10-11	2
T11-12	2
T12-L1	2
L1-2	2
L2-3	2
L3-4	2
L4-5	2
L5-S1	0-5

More McGill!

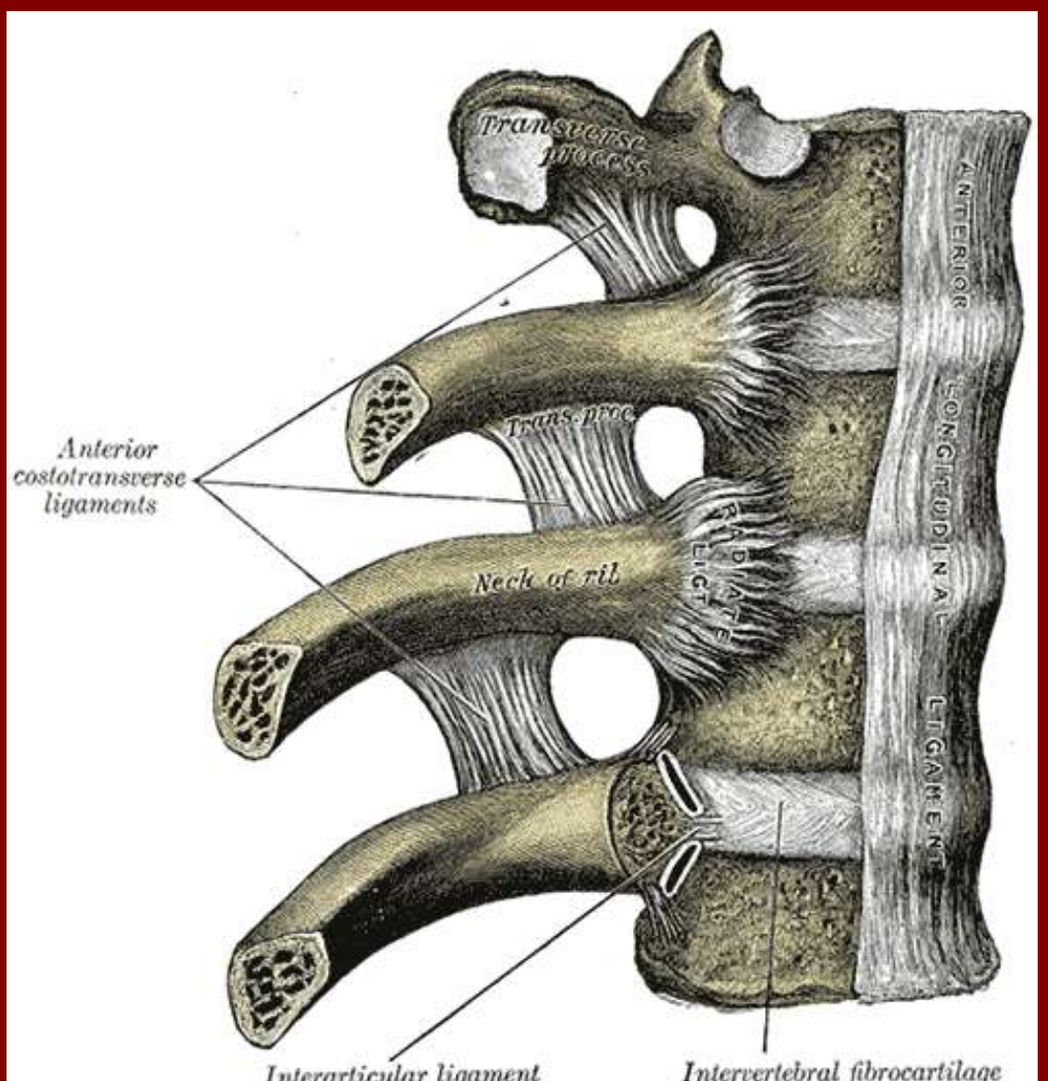
- Spine thickness influences herniation rate
- Thick spines = more stress in bending = predisposition to herniation
- Large disc diameter = better compression capacity
- Some spines are better suited to bending and rotating, and some are better suited to handling compression.

Thoracic Rotation

Lesson 4: Develop the callus, not the blister.

McGill on Disc Injuries

- McGill: pushing absolute loading or flexion + compression increases disc collagen delamination and, in turn, incidence of disc injury.
- “Locking the spine so no motion occurs until the end of the lockout is helpful. But this distinction only holds true with no prior cumulative delamination.”



McGill:

“Now for a paradox: If a guy has a long history of lifting with some flexion, the trabecular bone in the vertebral body will be strongly adapted. It appears as though stronger and denser trabecular bone reduces vertebral end plate damage and the ensuing delamination process. This characterizes the grand old men of powerlifting who have survived years of lifting with a flexed spine. **But a newer lifter has a higher risk since they don't have years of loading history to create the adaptation.** But the loading is needed to stimulate the adaptation, and this is the most perilous time. Some will survive, but others will have the legacy of a problematic back.”

Lesson 5: Recognize that starting positions are unique.

Fujitani R et al. Effect of standing postural deviations on trunk and hip muscle activity J Phys Ther Sci. 2017 Jul; 29(7): 1212–1215.

Muscle	Neutral	Sway-back	Lordosis
Trunk muscle			
Rectus abdominis	1.8 ± 0.9	3.7 ± 3.7*	1.7 ± 0.7
External oblique	8.6 ± 6.3	5.8 ± 3.5	6.5 ± 3.7
Internal oblique	10.2 ± 5.6	4.4 ± 2.3*	8.1 ± 3.9
Thoracic erector spinae	3.7 ± 2.2	1.7 ± 0.9	9.0 ± 5.3*
Lumber erector spinae	4.5 ± 3.8	2.1 ± 1.9	13.5 ± 5.4*
Lumbar multifidus	6.9 ± 3.4	4.3 ± 3.3	16.0 ± 3.3*
Hip muscle			
Iliopsoas	4.0 ± 2.2	2.4 ± 0.8*	3.6 ± 1.2
Tensor fasciae latae	3.7 ± 2.2	2.9 ± 2.0	2.1 ± 2.1
Rectus femoris	3.3 ± 3.4	3.8 ± 3.4	1.6 ± 2.6
Sartorius	2.5 ± 2.3	2.5 ± 2.7	1.3 ± 0.8
Gluteus maximus upper fiber	7.2 ± 5.6	2.9 ± 1.9*	3.9 ± 3.7
Gluteus maximus lower fiber	3.9 ± 3.6	1.7 ± 0.9*	1.8 ± 1.4*

Lesson 6: Having hip ROM is different than owning hip ROM.

- Excessive passive ROM without active control of it is a significant concern
- To appreciate it, you have to review research differently:
  - Examine data sets
  - Appreciate that motor control is a derivative of overall strength
- Functional Range Conditioning has done an excellent job of bringing these approaches to the forefront.

Excessive Passive ROM w/Poor Active Control

Supine Hip Flexion w/Knee Hinges

Left-Stance Toe Touch with Toe Lift and Med Ball

Retro Walking with Aquabag

3D Strap Assisted Coil from Low Setting

Kettlebell Iso Toe Taps

Wall Assisted Load and Explode

Lesson 7: View the hip as a torque converter in rotational athletes.

- Sports demand that you go from rotational to linear as fast as possible.
- Subtalar joint is a torque converter as motion comes up from the ground. Hips likely do the same in rotational athletes. If you can't accept triplanar stress and convert it into sagittal plane direction, you must shift unnecessary stress into the frontal and transverse plane. Chasing early arm speed increases early lumbar rotation and makes it impossible to accept forces in the front hip.

It is NOT lead leg “blocking” (knee dominant strategy, sagittal plane only).

It SHOULD BE front hip *pullback* (hip dominant strategy, tri-planar).

1-leg KB RDL Switches

Forward/Reverse Lunge with Cross-Connect

Bowler Squats

1-leg Anti-Rotation Receive & Release

3D Strap Split-Stance Hip Airplanes

Heiden w/External Rotation Stick

1-arm Cable Rotational Row

Figure 8 Shotput

Step-Behind Rotational Med Ball Scoop Toss

Split-Stance Recoiled Rollover Stomp

Skill-Specific Drills

Thank you!

- www.CresseySportsPerformance.com
- @EricCressey