

Structural and Functional Adaptations Affecting the Hockey Athlete

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Thank You

- Art Horne & Dan Boothby
- Mike Potenza, Sean Skahan, Darryl Nelson
- HockeySC.com members
- Mike Boyle
- David Lasnier & Matt Siniscalchi
- Endeavor Athletes
- All of you!

Background

- Endeavor Sports Performance (Pitman, NJ)
 - Primary athlete base is hockey:
 - Team Comcast Tier I Youth Hockey Organization
 - New England Prep, EJHL, USHL, BCHL, OHL, etc.
 - NCAA Div I & III
 - ECHL, AHL, NHL
- US Women's National Hockey Team
- Massage Therapist, ART, FRR
- Heavily influenced by Functional Movement Systems & Postural Restoration Institute



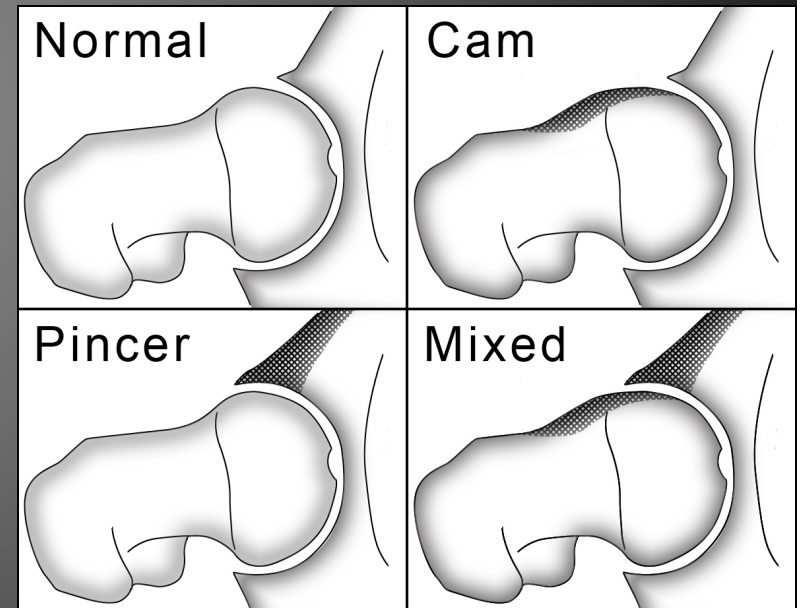
Common Hip/Abdominal Pathology

- Femoracetabular Impingement
- Acetabular Labral Tears
- Athletic Pubalgia/Sports Hernias
 - Lower Abdominal Strain?
- Osteitis Pubis
 - Inflammation of pubic symphysis
- Oblique Strains

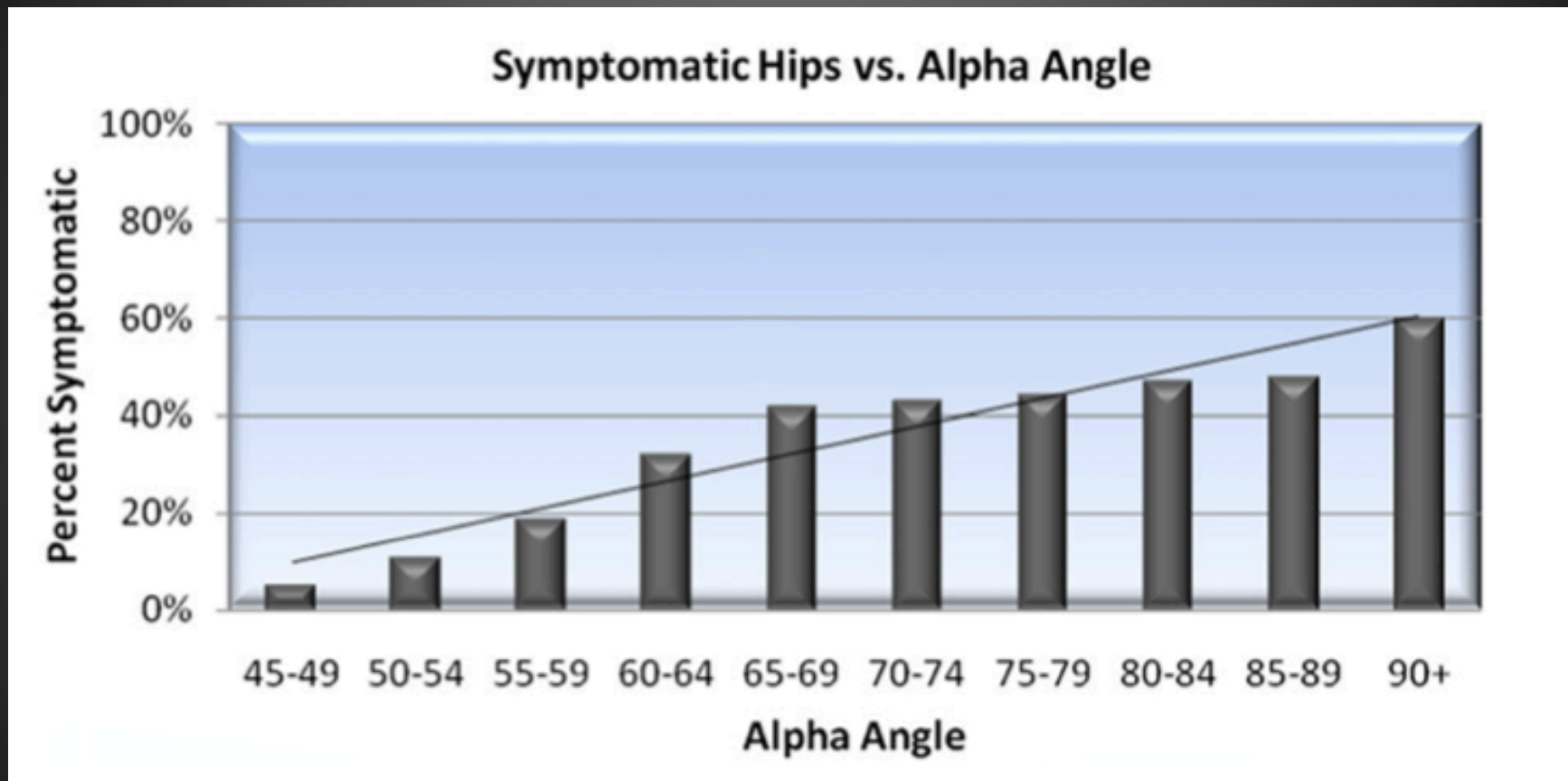
All co-occurring symptoms of the same pattern?

Common Hockey Pathology

- Philippon et al, 2007
 - 45 pro athletes with FAI (24 hockey players)
 - 49% isolated CAM, 47% mixed CAM & Pincer
 - 100% of athletes had labral tears
- Silvis et al, 2011
 - MRI from 21 pro & 18 NCAA D1 ASYMPTOMATIC players
 - 14 (39%) dysfunction of adductor-rectus abdominis insertions
 - 25 (64%) pathologic hip changes
 - 30 (77%) have MRI finding of hip or groin pathologic abnormalities



Progression & Symptoms



Taken from Larson, et al. (2013). Increasing Alpha Angle is Predictive of Athletic-Related “Hip” and “Groin” Pain in Collegiate National Football League Prospects

FAI -> Labral Wear -> Osteoarthritis

“Abnormal femoral geometry was associated with more frequent wear primarily at the anterosuperior acetabulum for individuals younger than 40 years of age and globally for individuals older than 60 years of age.”

-Streit, et al. (2013). The Shape of the Proximal Femur Influences Acetabular Wear Patterns Over Time

FAI = Osteitis Pubis = AP

“Dynamic femoroacetabular impingement as caused by the presence of a cam lesion causes internal rotation motion at the pubic symphysis. Repetitive loading of the symphysis by cam impingement is thought to lead to increased symphyseal motion, which is one possible precursor to athletic pubalgia.”

-Birmingham, et al. (2012). The Effect of Dynamic Femoroacetabular Impingement on Pubic Symphysis Motion: A Cadaveric Study

Development of FAI

Group	Alpha Angle > 55°	Labral Tear
Peewees (10-12), n=27	37%	48%
Bantams (13-15), n=8	63%	63%
Midgets (16-19), n=26	93%	93%

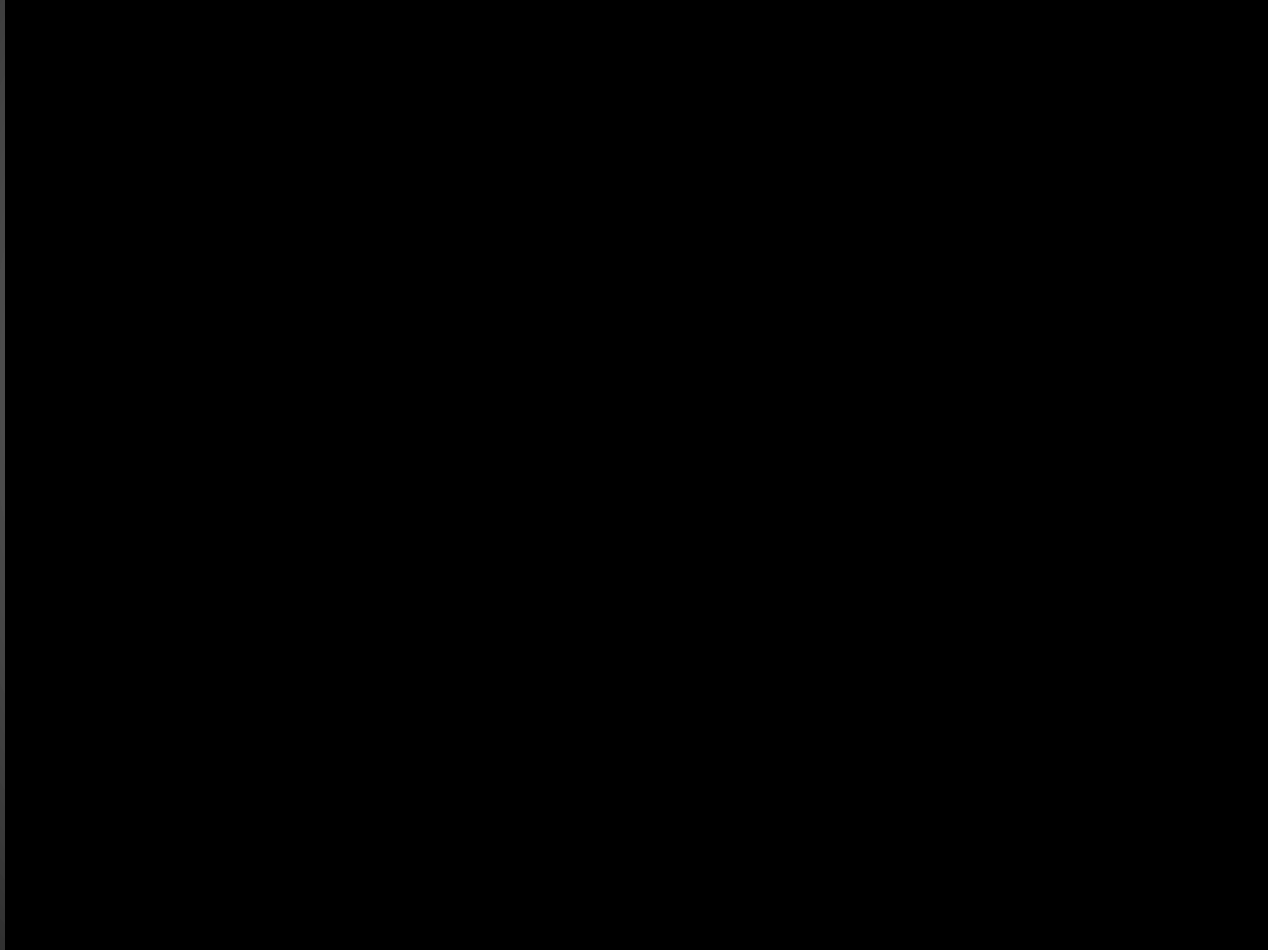
Data taken from Philippon, et al. (2013). Prevalence of Increased Alpha Angles as a Measure of Cam-Type Femoroacetabular Impingement in Youth Ice Hockey Players

Productivity After AP Surgery

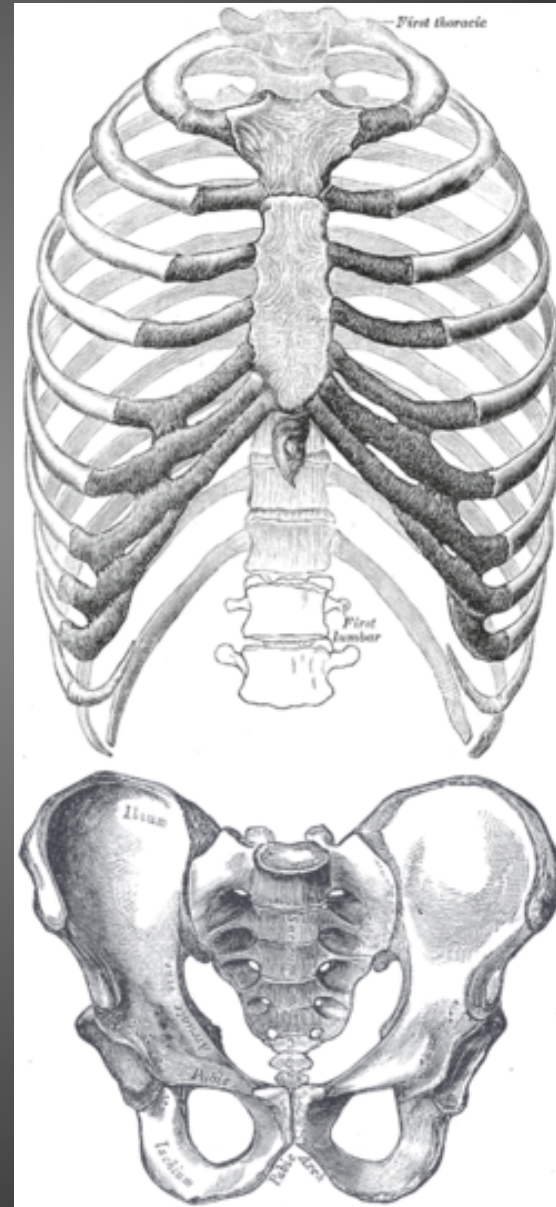
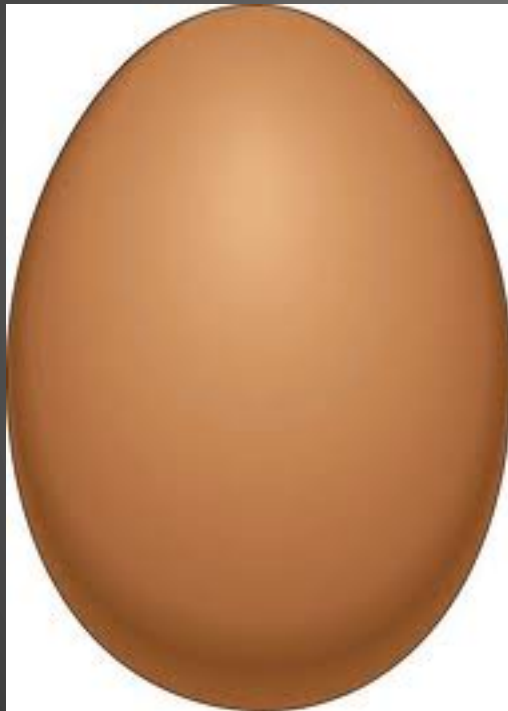
	Games Played		Goals		Assists		Ice Time	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Group A (All); n=32	67.7	54.4	14.8	9.6	23.2	17.0	17.4	17.1
Group B (< 6 Seasons); n=16	65.7	58.4	13.1	11.1	21.6	19.8	16.4	18.4
Group C (> 7 Seasons); n=16	70.5	49.0	17.1	7.8	25.4	13.1	18.6	15.2

Data taken from Jakoi, et al. (2013). Sports Hernia in National Hockey League Players: Does Surgery Affect Performance?

Real-World Example



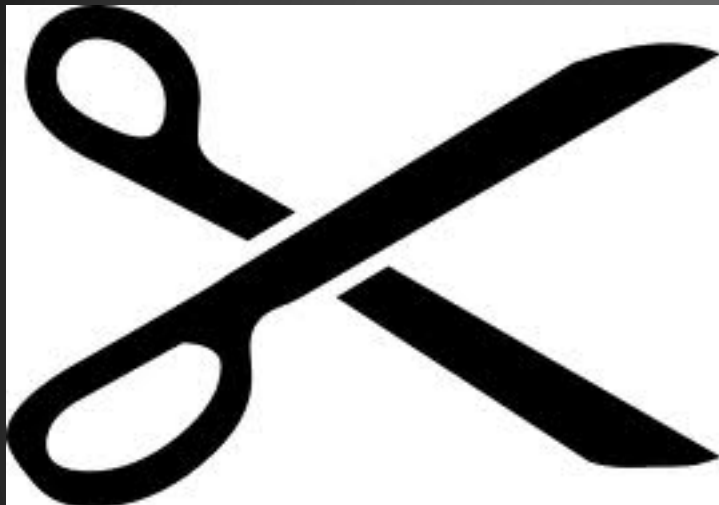
Start With The Egg



Egg Posture Continued

- Ideal: Lower and upper egg halves centered above one another
 - Optimally positions scapulae and acetabulum for full limb ROM
 - Allows coordinated movement between diaphragm and pelvic floor
- Dysfunction often results from one or both halves rotating ant/post, right/left, or shifting laterally
 - Most people present with multiplanar postural misalignments

Open Scissor Posture



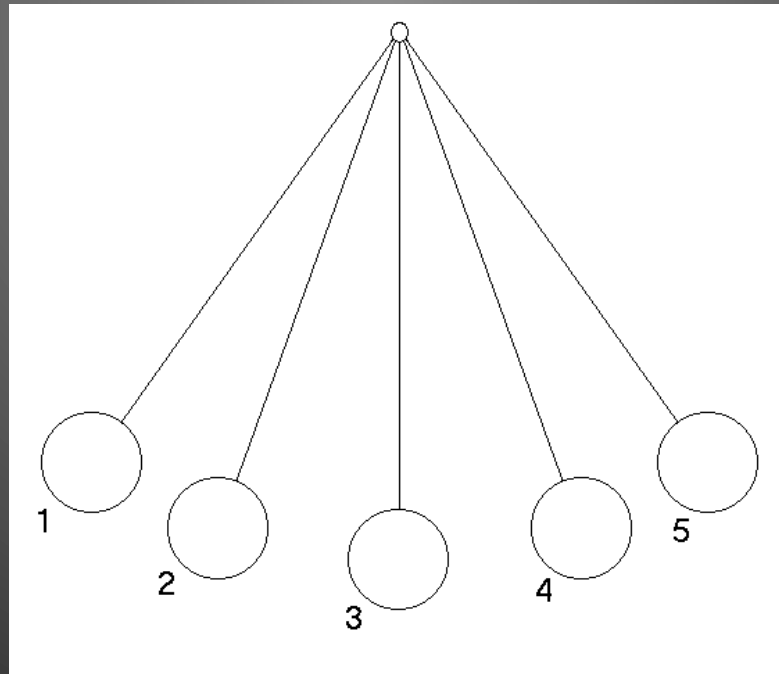
Joint Neutrality

- In order for a joint to have optimal multiplanar movement, it must start from a neutral position
- Appearance of full mobility in the absence of neutrality often indicative of pathology
 - No L Hip Add & Full L Hip Ext
=Anterior Capsule Laxity



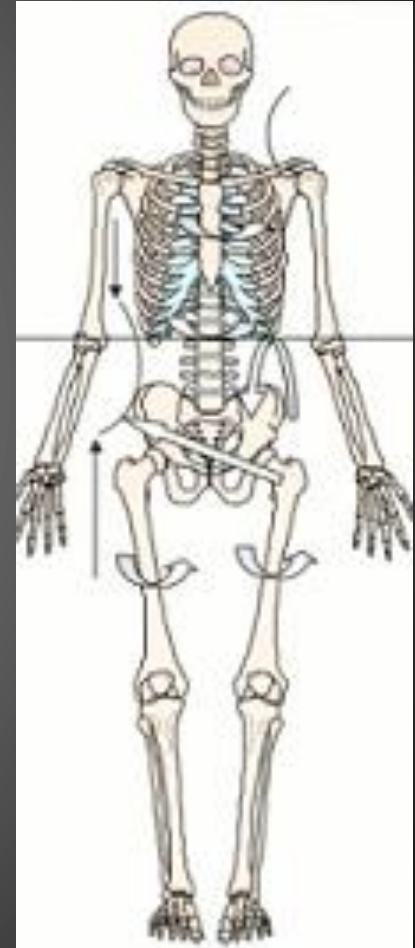
Weingroff's "Core Pendulum Theory"

- Joint centration is dependent upon the available ROM and stiffness characteristics in all directions



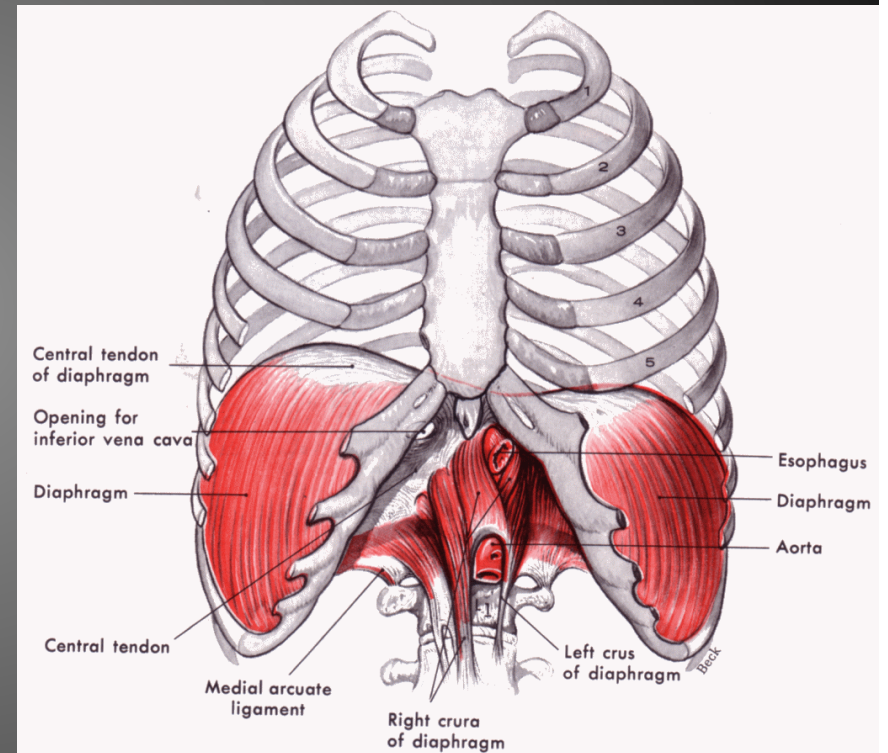
A Common Pattern

- Lower egg (pelvis) rotated and shift R, ant. tilted on L, post. tilted on R
- Upper egg laterally and anteriorly tilted R, rotated and posteriorly tilted L
- Stuck in right midstance position
- PRI: PosturalRestoration.com



Influence on Respiration

- R hemi-diaphragm better positioned to feed air into L chest wall
- L hemi-diaphragm poorly positioned, accentuates spinal extension
- Poor expiration = sympathetic shift



Athlete Examples



Athlete Examples



Influence on ROM

- Pelvic Influence on Hip ROM
 - Decreased L hip adduction and extension
 - Decreased R hip abduction
 - Shift in hip rotation ROM with similar total arc
- Rib Cage Influence on Shoulder ROM
 - Decreased L horizontal abduction
 - Decreased R internal rotation

Influence on Hockey

- L hip positioned in Flex/Abd/Ext relative to R
 - More likely to drive through end range with forward skating stride
 - Difficult to recover stride leg under body without standing up higher
 - Compensatory crossover pattern to left
- R hip positioned in Ext/Add/Int relative to L
 - More likely to drive through end range with crossovers to right (“At risk” position for FAI)
- Crossovers/turning feel more comfortable one direction (typically right)

Influence on Injury Risk Factors

- End range Flexion and/or Add/IR risk for exacerbating FAI development
- Relative ER position risk for posterior capsule stiffness & anterior capsule laxity (Groin/Lower Abdominal Pain)
- Relative IR position risk for development of dense/fibrotic adductors (Athletic Pubalgia)
- Anteriorly tipped pelvis and eccentric abdominal load risk for lower abdominal fraying (Athletic Pubalgia)
- Compromised diaphragm/pelvic floor alignment likely to impair core/pelvic stability
- Entire pattern risk for SI and pubic symphysis instability

Evidence Based Practice

“As with many interventions intended to prevent ill health, the effectiveness of parachutes has not been subjected to rigorous evaluation by using randomised controlled trials. Advocates of evidence based medicine have criticised the adoption of interventions evaluated by using only observational data. We think that everyone might benefit if the most radical protagonists of evidence based medicine organised and participated in a double blind, randomised, placebo controlled, crossover trial of the parachute.” – Smith & Pell, 2003

Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials



Endeavor Sports Performance Training Assessment

Name _____ Date _____

Age _____ Years Playing _____ Team _____

Height _____ Weight _____ Body Fat % _____ Writing Hand _____

Shoot/Throw/Swing Side _____ Kick Side _____ Hand Length _____ Tibia Height _____

Functional Movement Screen

Test	Left	Right	Clearing Test	Final
Shoulder Mobility (Top Hand)				
Active Straight Leg Raise				
Ankle Dorsiflexion				

Range of Motion Assessments

	Left		Right	
	Int. Rotation	Ext. Rotation	Int. Rotation	Ext. Rotation
Hips Flexed				
Glenohumeral				

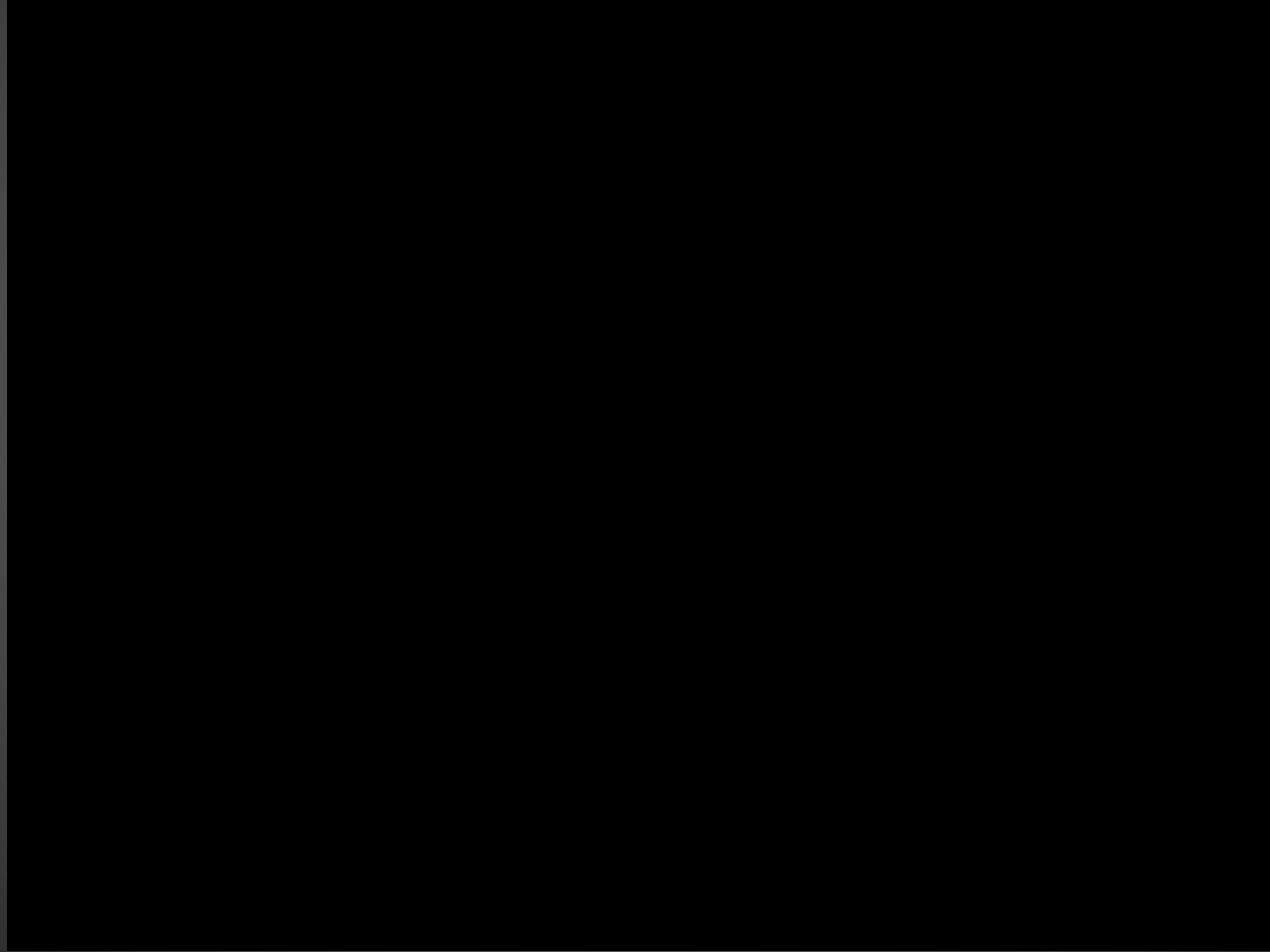
Postural Restoration Assessments

	Left	Right
Extension Drop Test		
Adduction Drop Test		
Passive Abduction Lift Test		
Trunk Rotation		
Hruska Adduction Lift Test		
Horizontal Abduction		
Shoulder Flexion		
Apical Expansion		

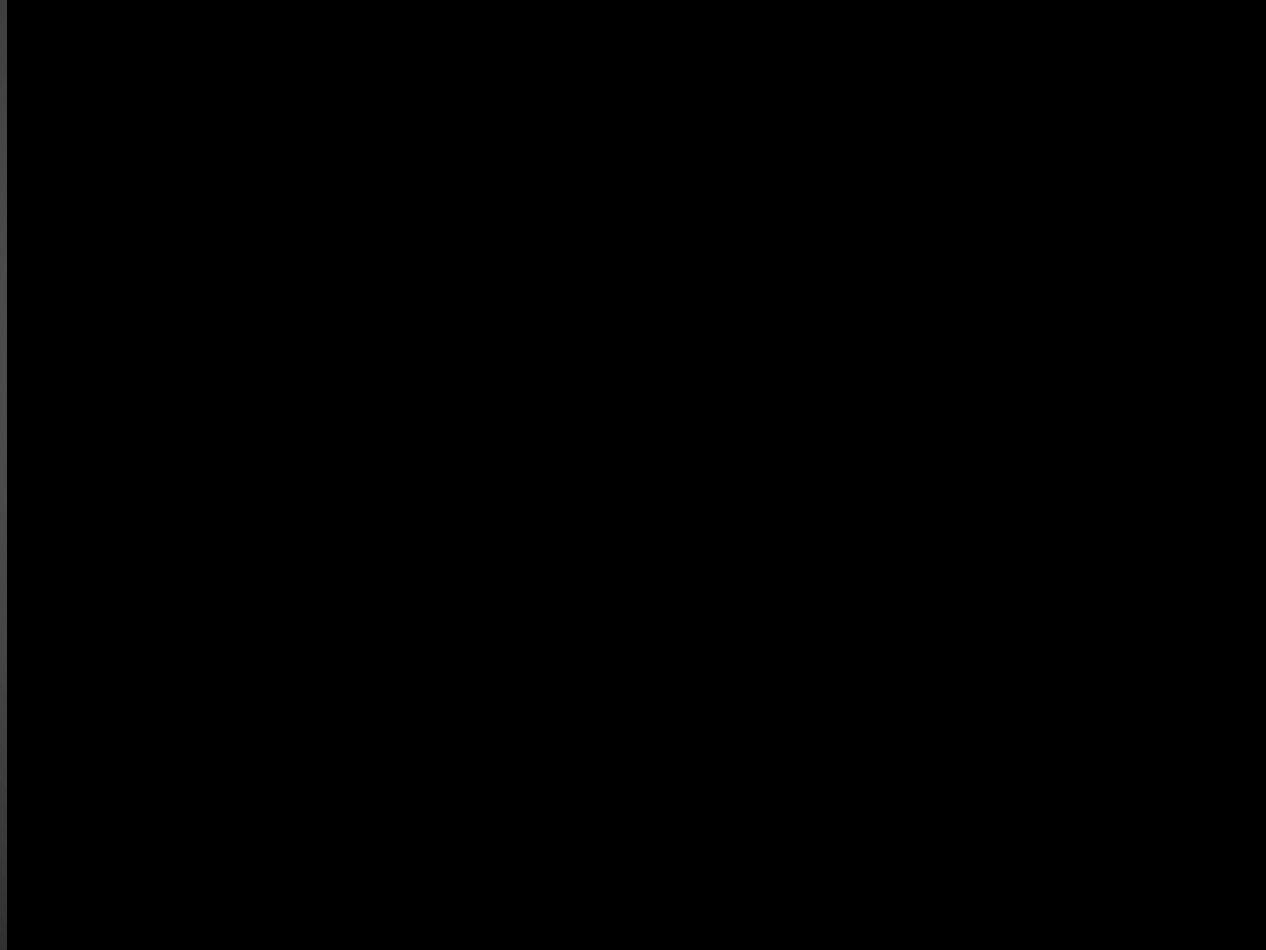
Neck: Flexion _____ Extension _____ Rot. L _____ Rot. R _____ Craig's Test: L _____ R _____

Quadruped Rock: Hip Flexion _____ Anterior _____ Posterior _____

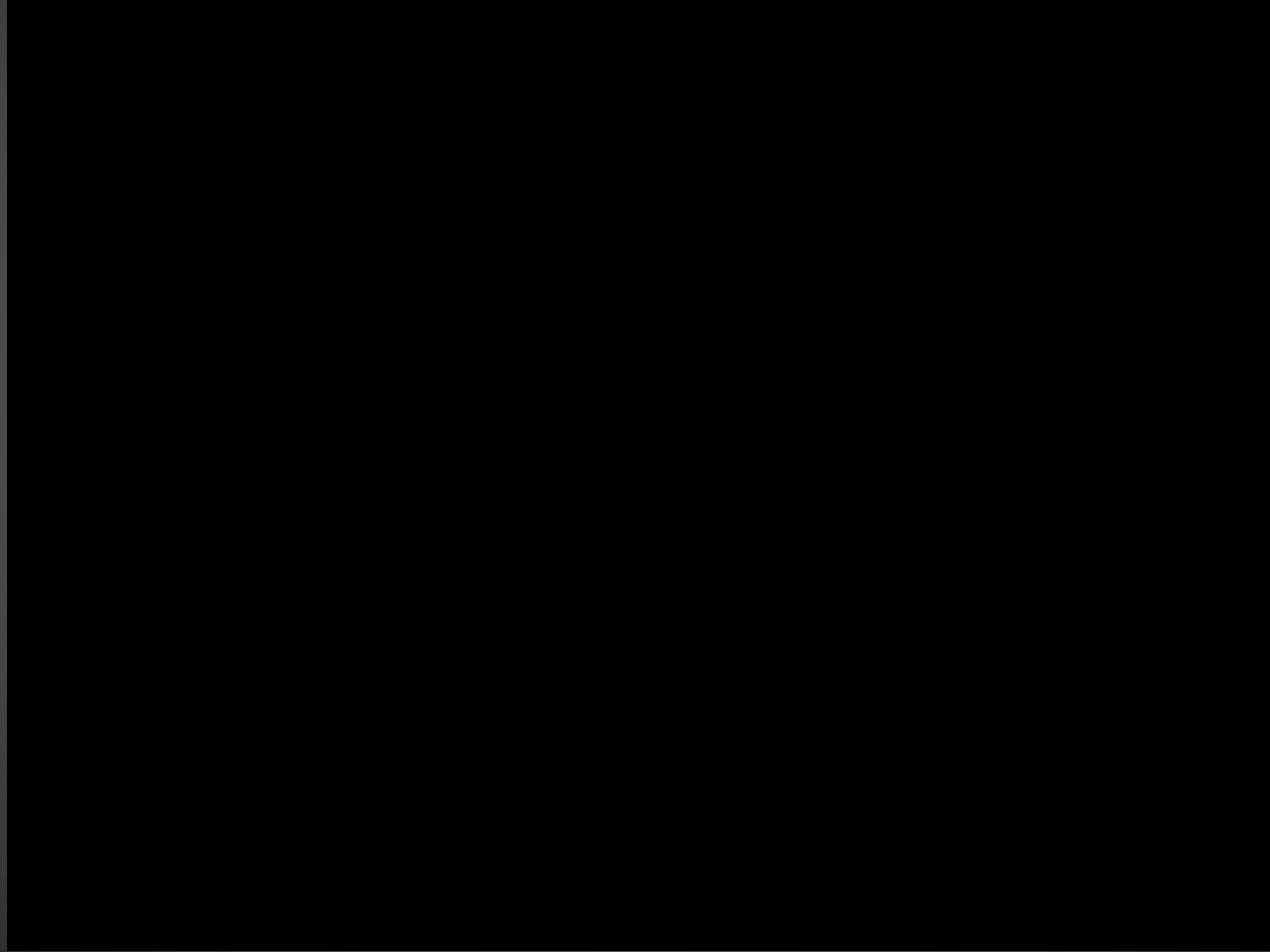
PRI-Add. Drop & Passive Abd. Lift



PRI-Extension Drop Test



Quadruped Rock Test



Endeavor Hockey Testing Results

- 41 Players
 - 27 Forwards, 11 Defenseman, 3 Goalies
 - 5 Pro, 19 NCAA, 17 Junior

Testing Results

- Hip Rotation (n=41)
 - Left: IR-32; ER-39; Total-71
 - Right: IR-34; ER-37; Total-71
 - *Most had 3-8° “shift” in ROM
- Extension Drop Test (n=40)
 - 7 Positives (6B, 1L)
- Adduction Drop Test (n=40)
 - 28 Positives (11B, 17L)
- Passive Abduction Lift Test (n=40)
 - 27 Positives (7B, 2L, 18R)
- Quadruped Rock Test (n=39)
 - 10 (25%) w/ < ~120° hip flexion

What You'll See

- Hip tucking/tilting with hip flexion
 - Hip tuck/tilt during squatting
 - Hip position at bottom of deadlift (rolled back?)
 - Hip tilt during all ½ kneeling exercises
- Excessive lumbar lordosis
 - “Feel it in my back” during slideboard hamstring curls and many anti-extension core exercises
 - May be more likely to be symptomatic during squats/deadlifts
- Excessive anterior rib flare with supine/pressing exercises

Corrective Strategies

- Three pronged approach
 1. Add corrective exercises
 2. Remove provocative exercises
 3. Teach exercise performance based on individual's structure

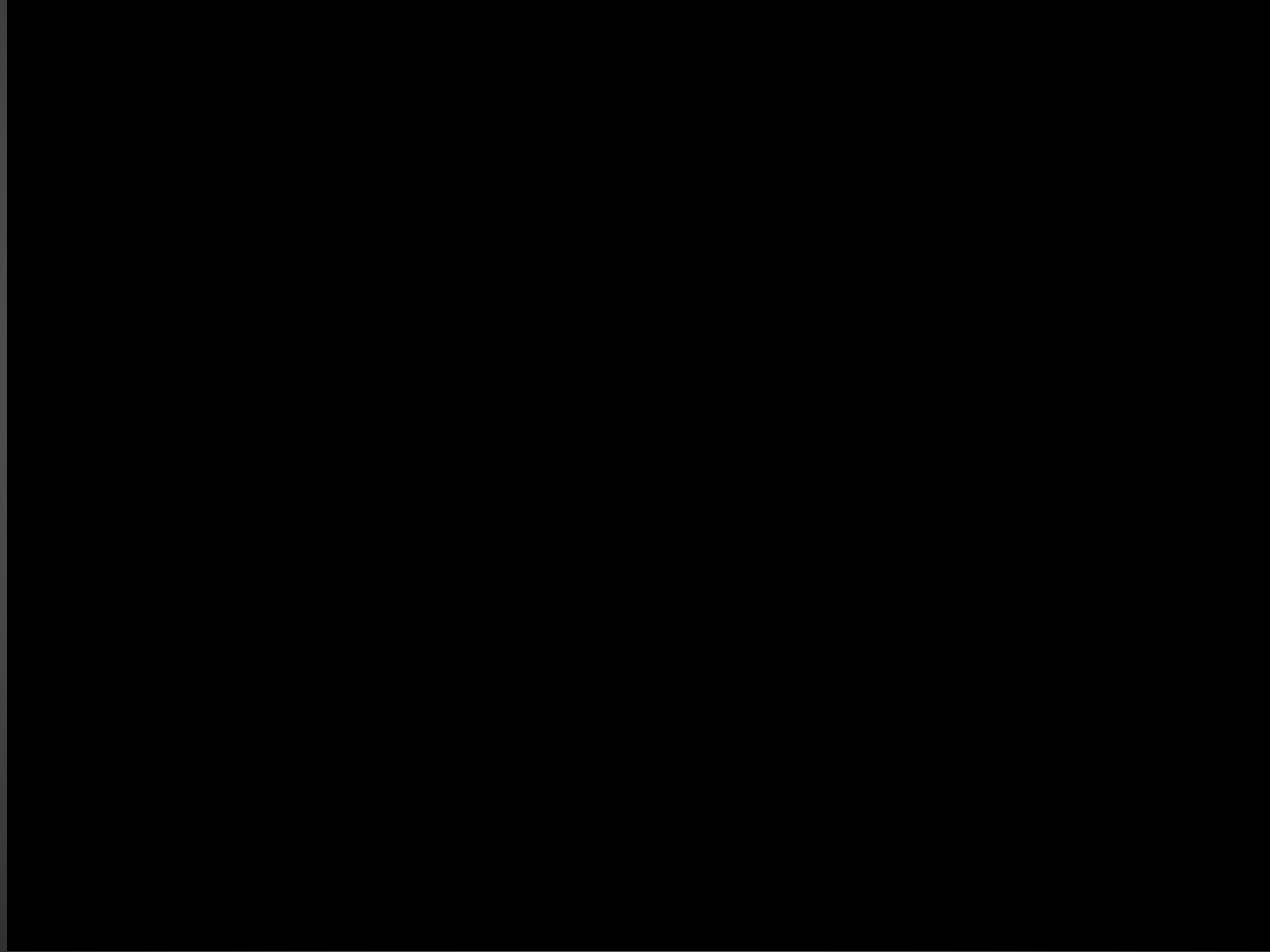
Endeavor Paradigm

- Order of importance:
 - Neutrality (PRI)
 - Structure/Mobility (FMS, ROM, Craig's Test, Quad Rock)
 - Stability*
 - Integrated Movement*
- *Stability and integrated movement patterns largely monitored through training process, but can be quantified with FMS

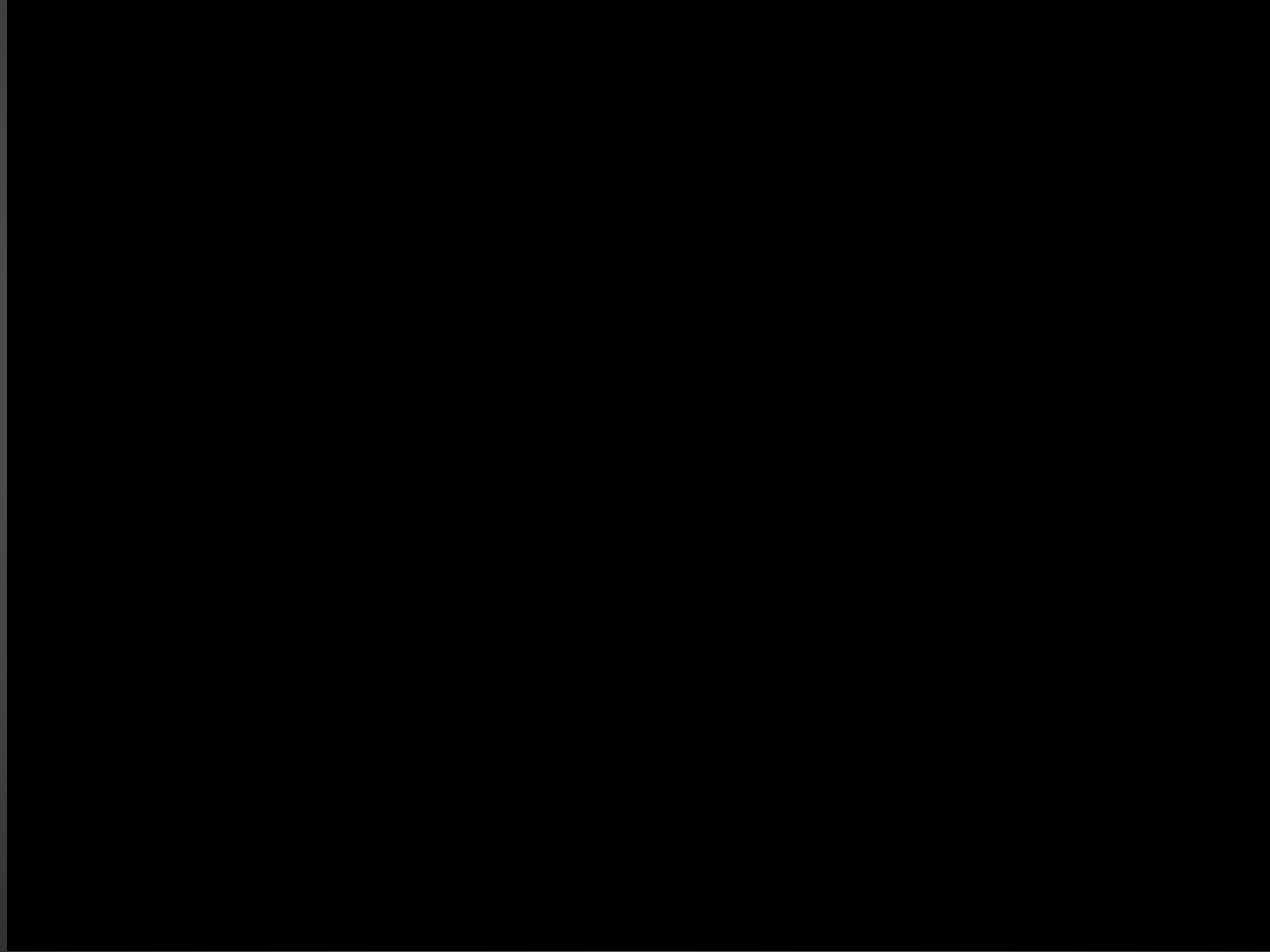
Corrective Exercises

- 4 places to stick corrective work
 - Pre-dynamic warm-up
 - 2-3 exercises for 2-3 sets; ~5-10 mins
 - Active rest between sets
 - Same or complimentary exercises as pre-dynamic
 - Should not compete with main exercise
 - Cool down
 - 2-3 exercises for 2-3 sets; ~5 mins
 - Homework
 - 2-3 exercises for 2-3 sets EVERYDAY for one week

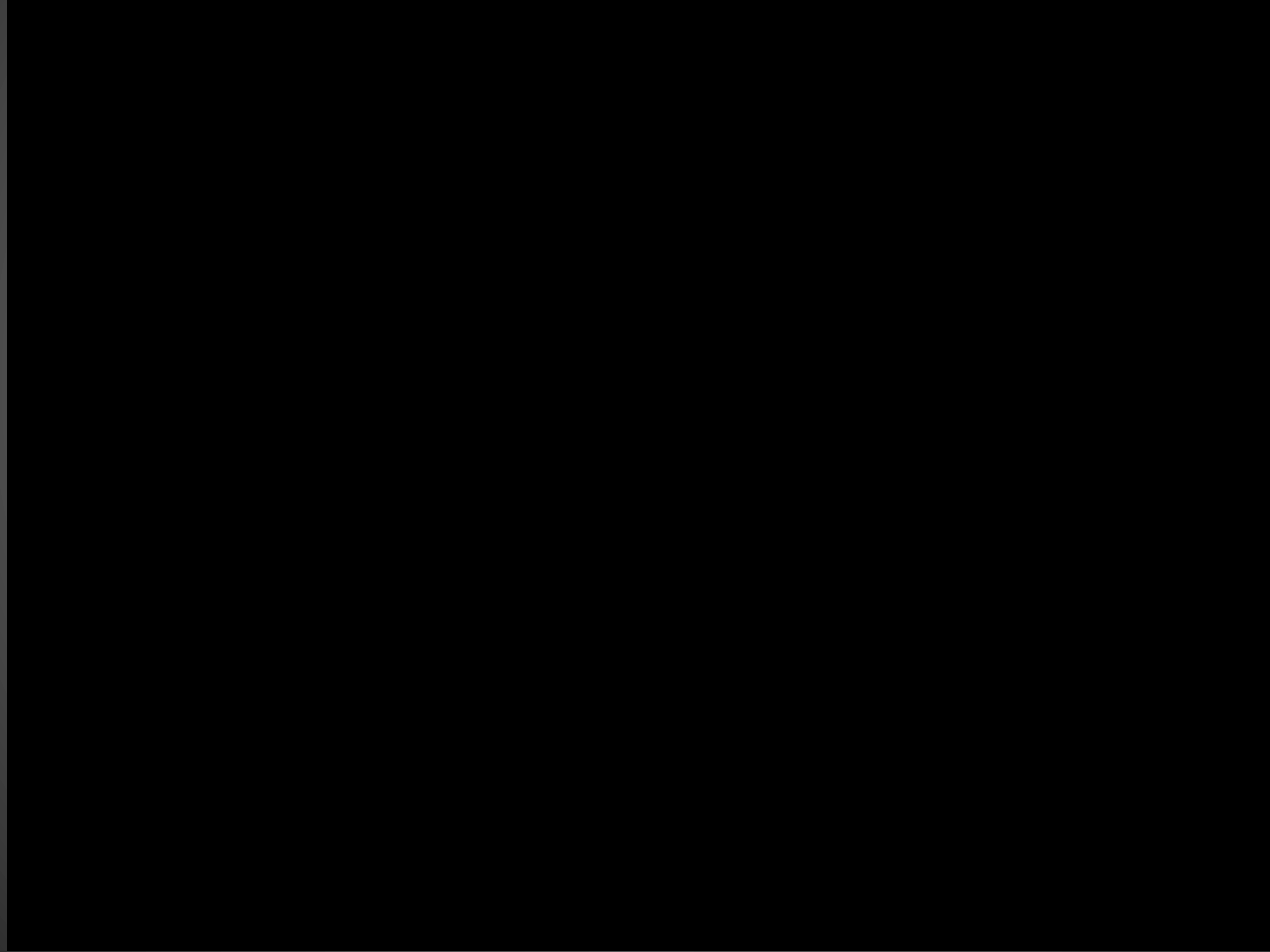
Soft-Tissue Work: Adductors



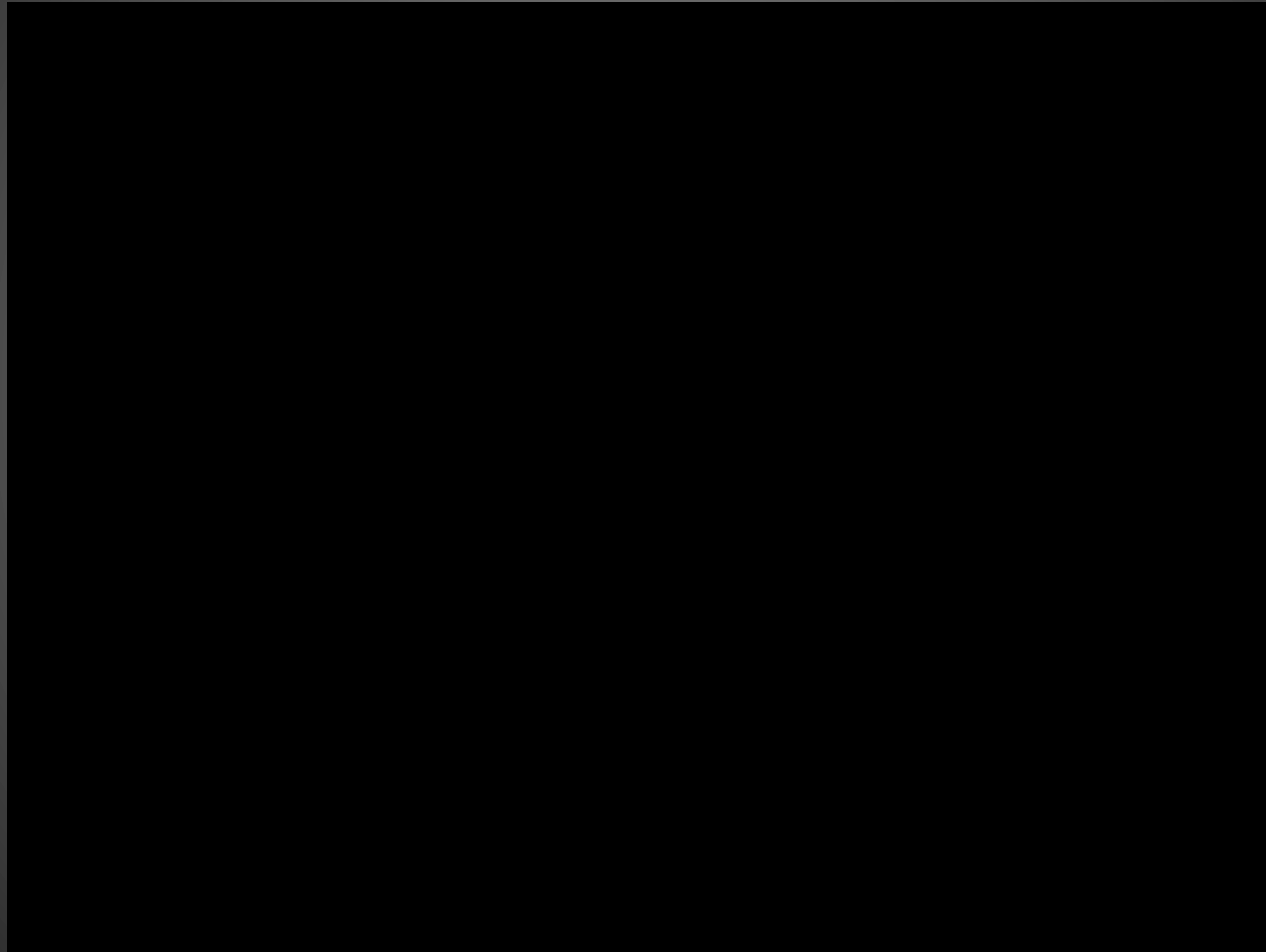
Soft-Tissue Work: Adductors



Quadruped Post. Capsule Mob.



Lying Knee to Knee



Daily Stretch/Mobility Circuit

Half-Kneeling Hip Flexor



Lateral Kneeling Adductor



Quadruped Posterior Hip



Lying Knee to Knee



Lying Glute



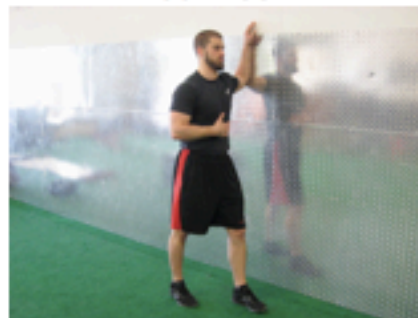
Lying Figure-4



Rear Foot Elevated Quad



90° Pec



Lats



PRI Corrective Progressions

Phase 1 PEC (Negative R Hip Adduction to Progress)

1) 90-90 Hip Lift w/ R Arm Reach & Balloon



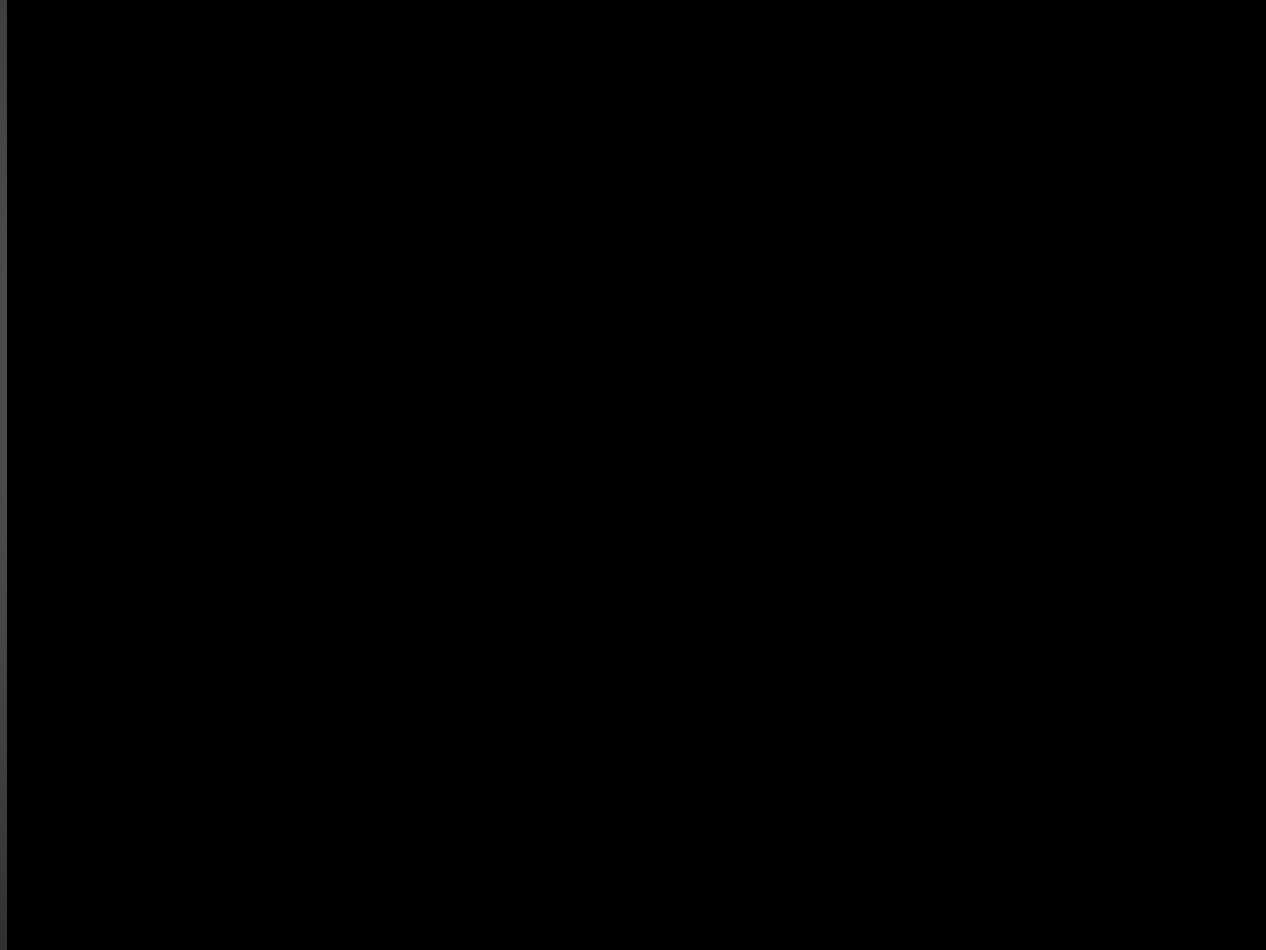
2) Paraspinal Release w/ L Hamstring



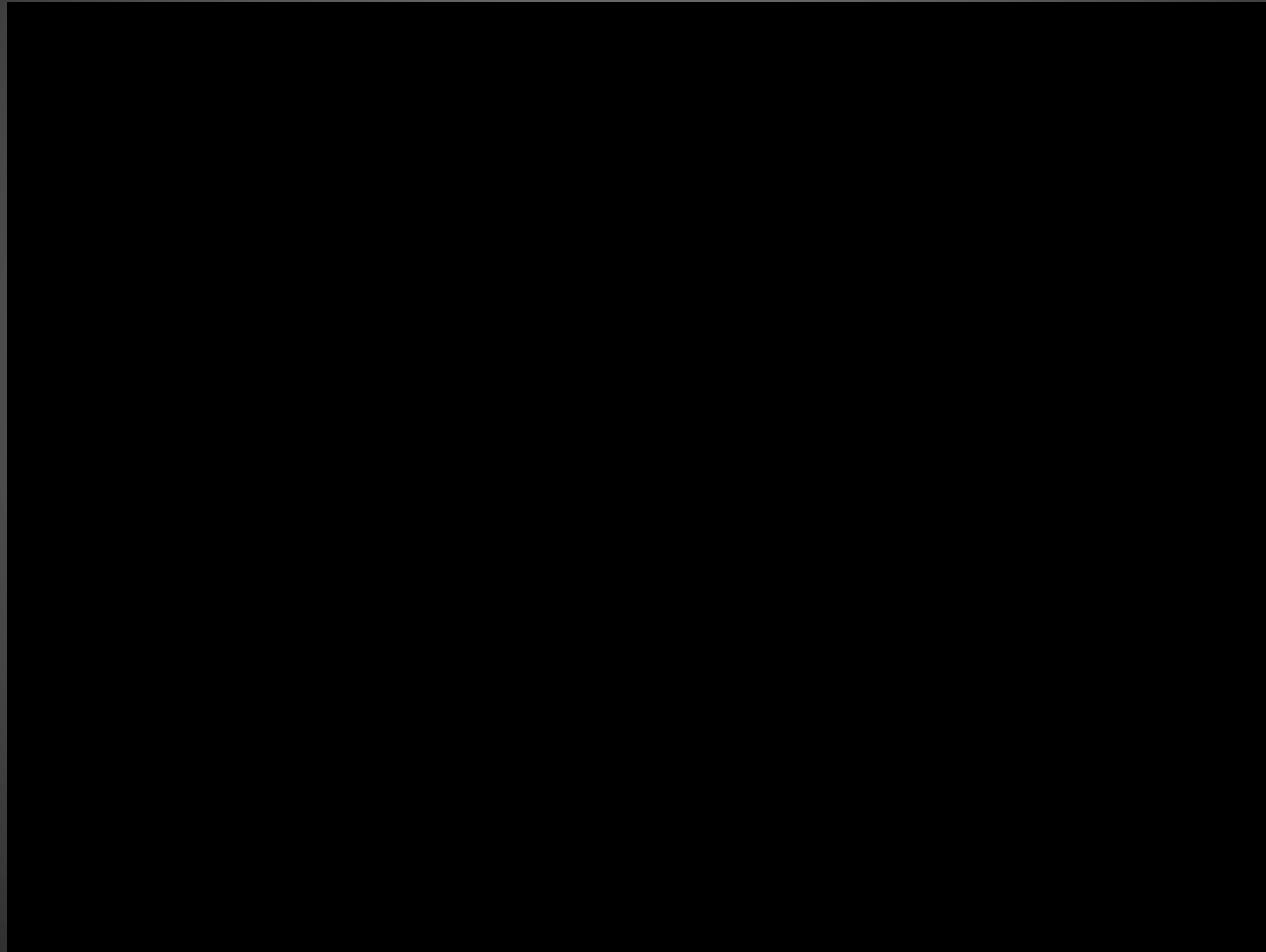
3) Wall Squat w/ R Arm Reach & Balloon



PRI 90-90 Hip Lift w/ R Arm Overhead



PRI Wall Squat w/ R Arm Reach



PRI Corrective Progressions

Left AIC/PEC Correctives

Perform all exercises for 2-3 sets of 5 breathing cycles

Phase 1 Left AIC

1) 90-90 Hip Lift w/ Hip Shift



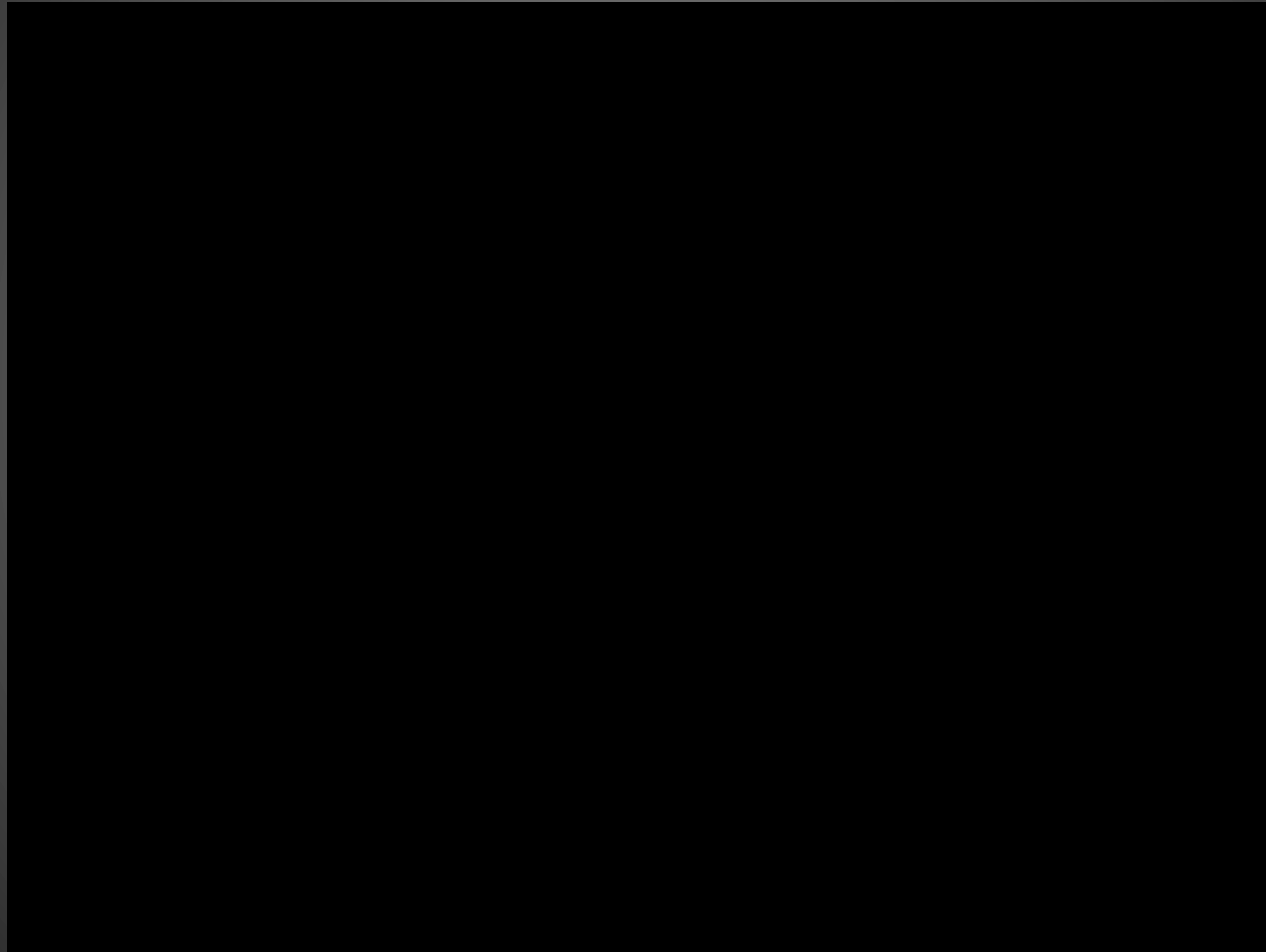
2) R Side Lying Adductor Pullback



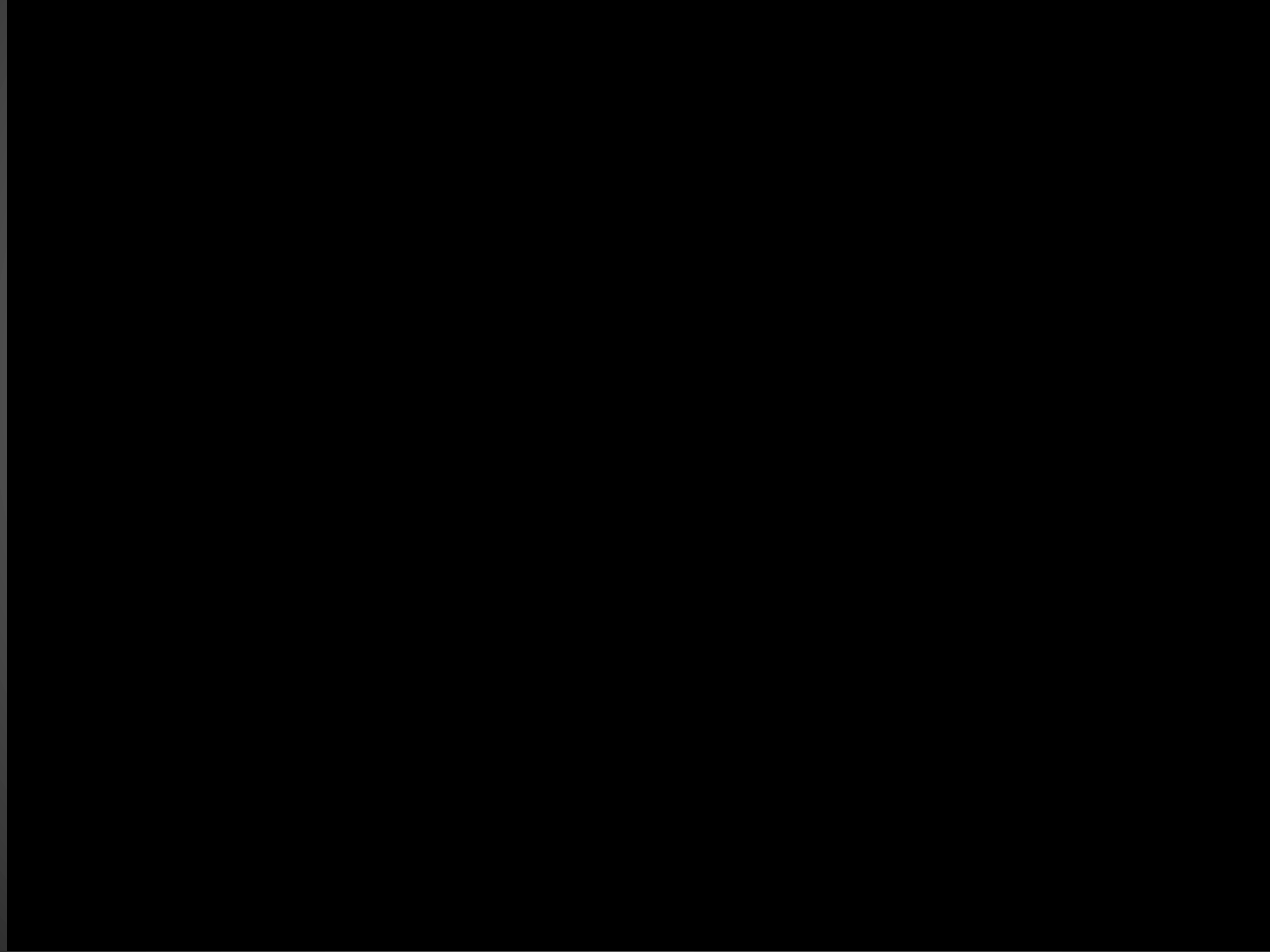
3) L Side Lying R Glute Max



PRI R Side Lying L Adductor Pullback



PRI L Sidelying R Glute Max

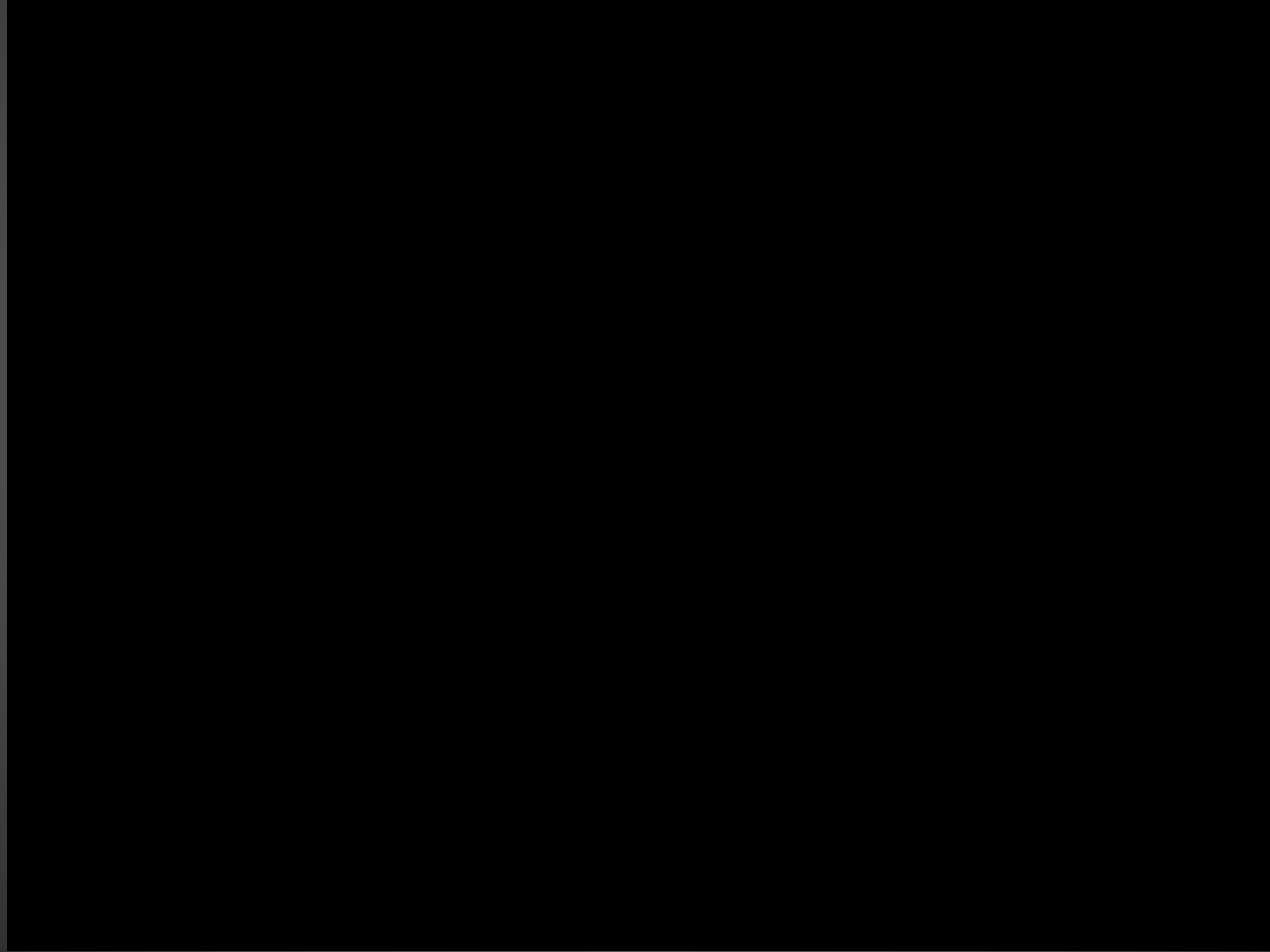


Program Adaptations

- OWN the movement!
 - Full -> Partial ROM
 - Deadlift -> Rack Pulls
 - Single-Leg Variations
 - More degrees of freedom
 - Greater emphasis on LB pulling
 - Back knee elevated position
 - Pair with restriction-specific mobility/stability exercise



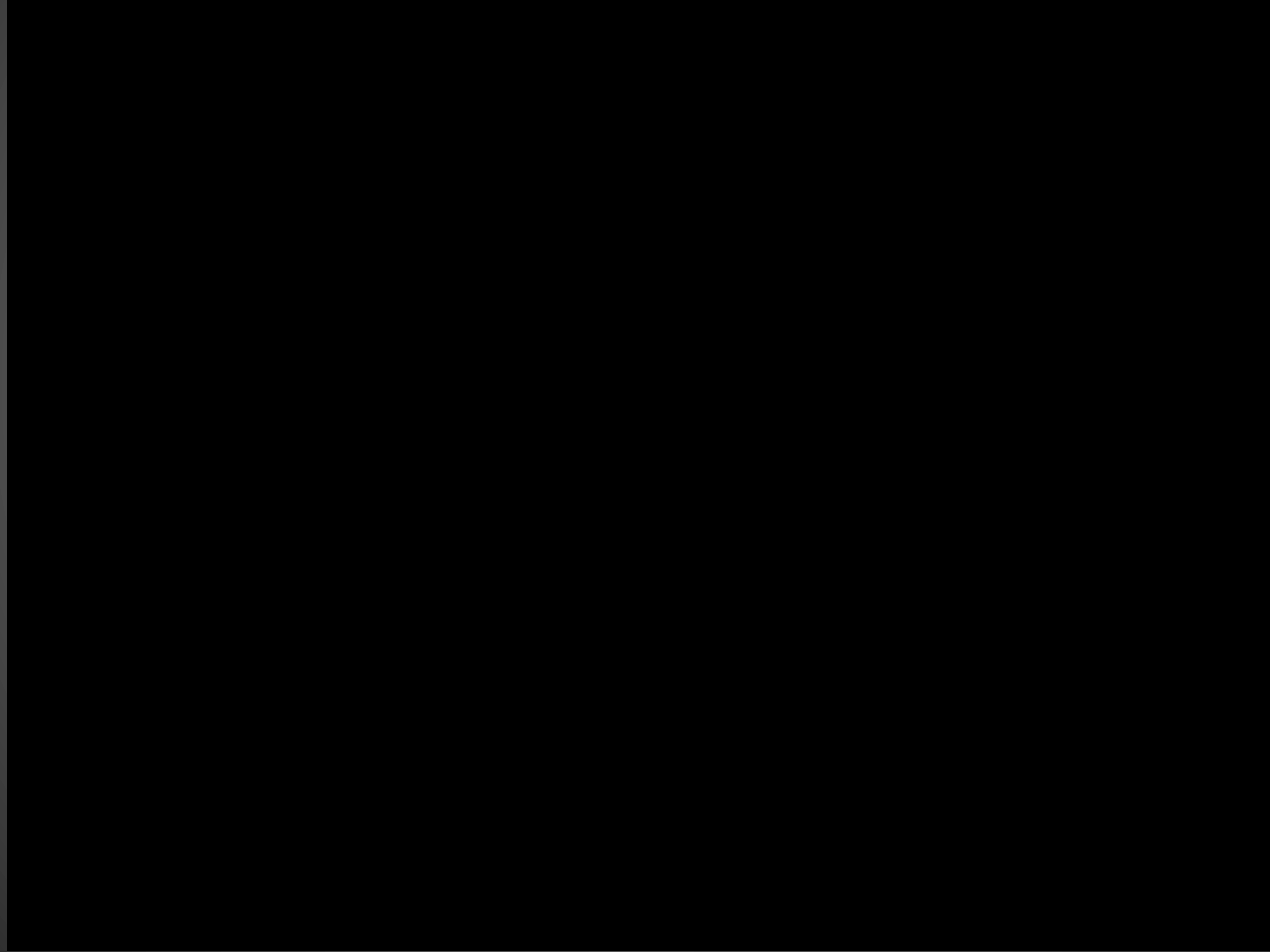
Back Knee Elevated Position



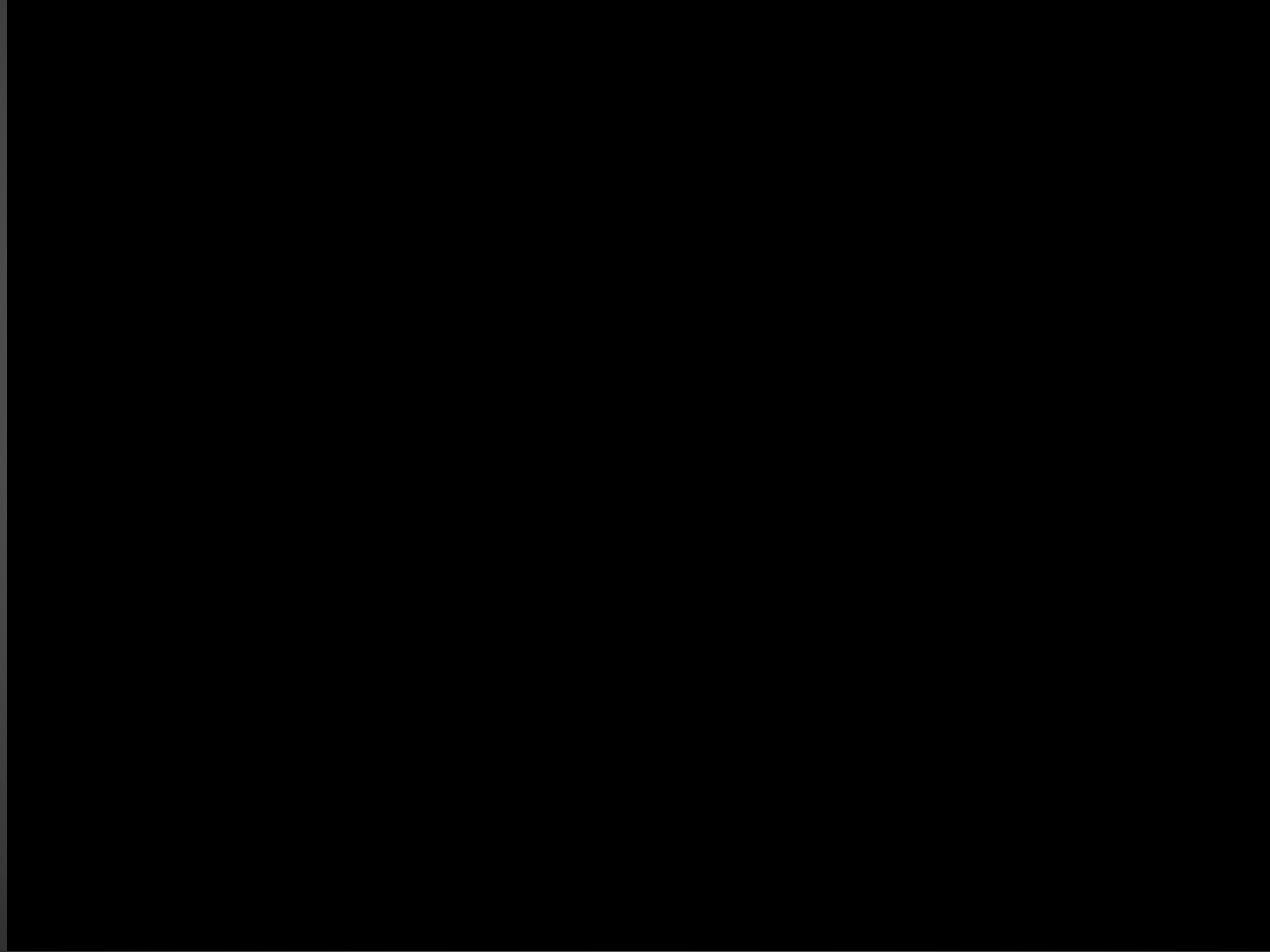
Corrective Cuing: Rib Position

- Breathe in through your nose, out through your mouth
- Feel your ribs come down
- Lock that in
 - Inhale through this brace for loaded work
- Implications for:
 - Glute bridge/Slideboard Hamstring curls
 - Overhead pressing/pulling
 - ½ and tall kneeling variations
 - Squat/deadlift variations

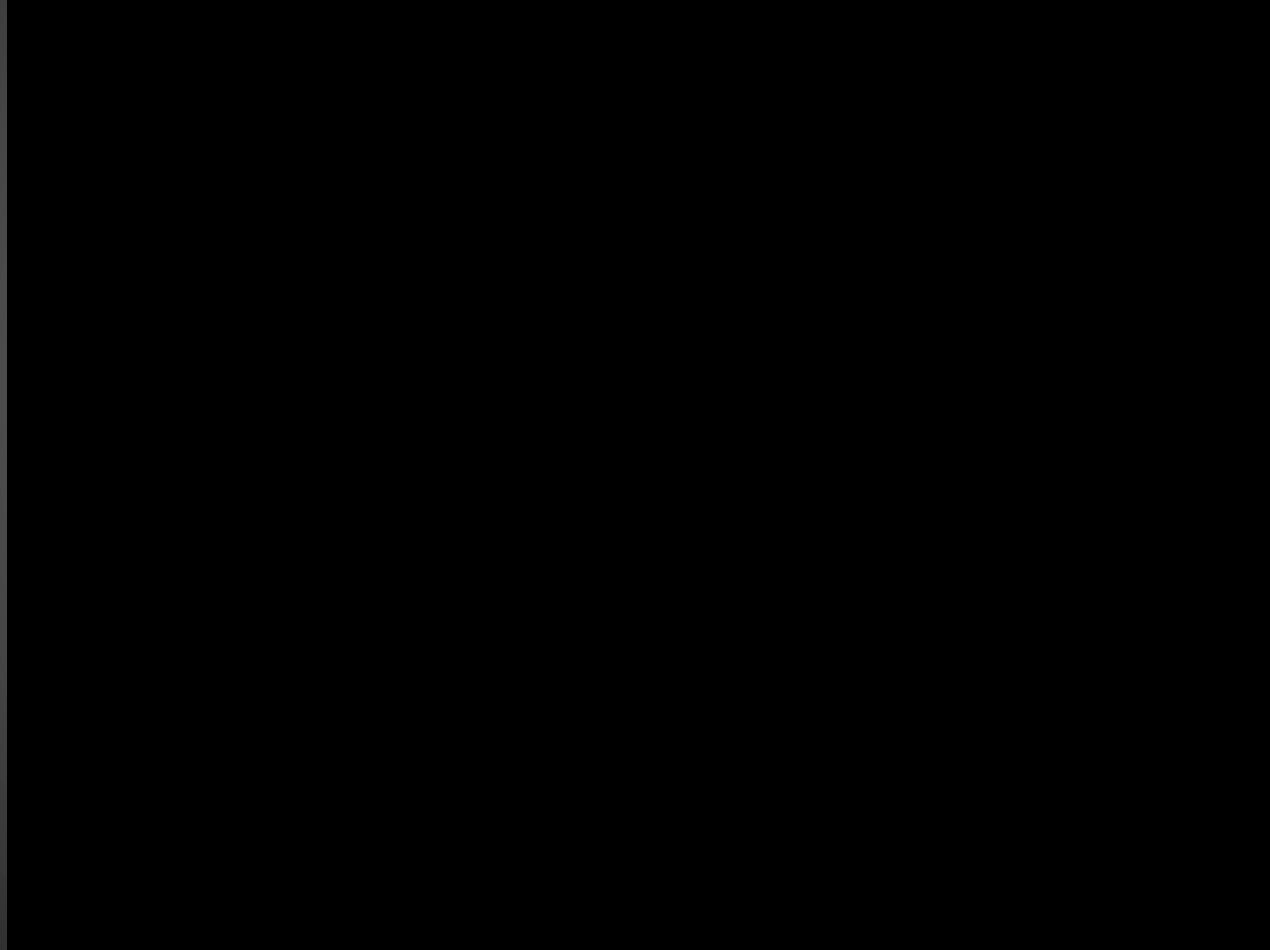
Belly Press Technique Comparison



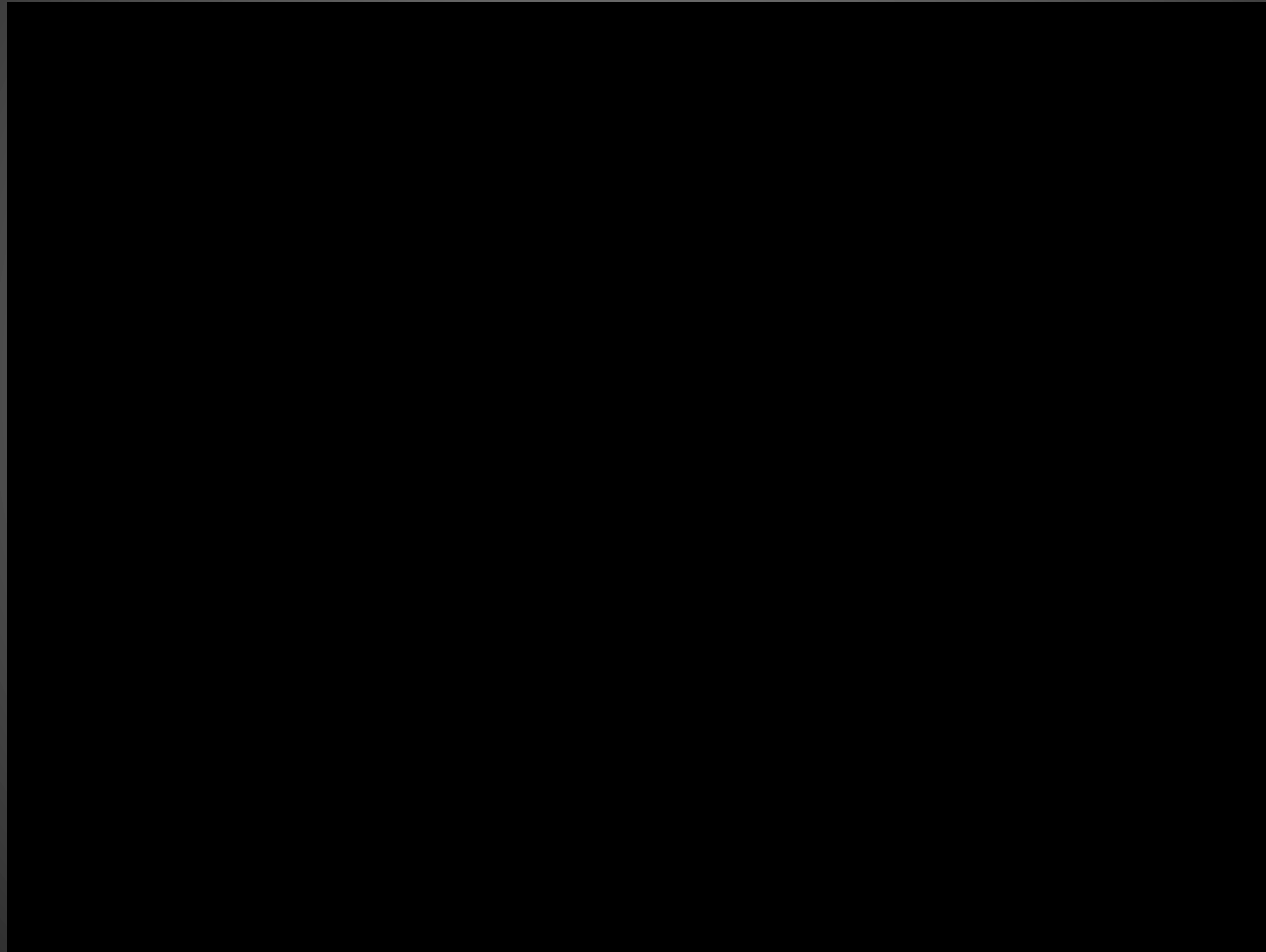
Hamstring Curl Technique Comparison



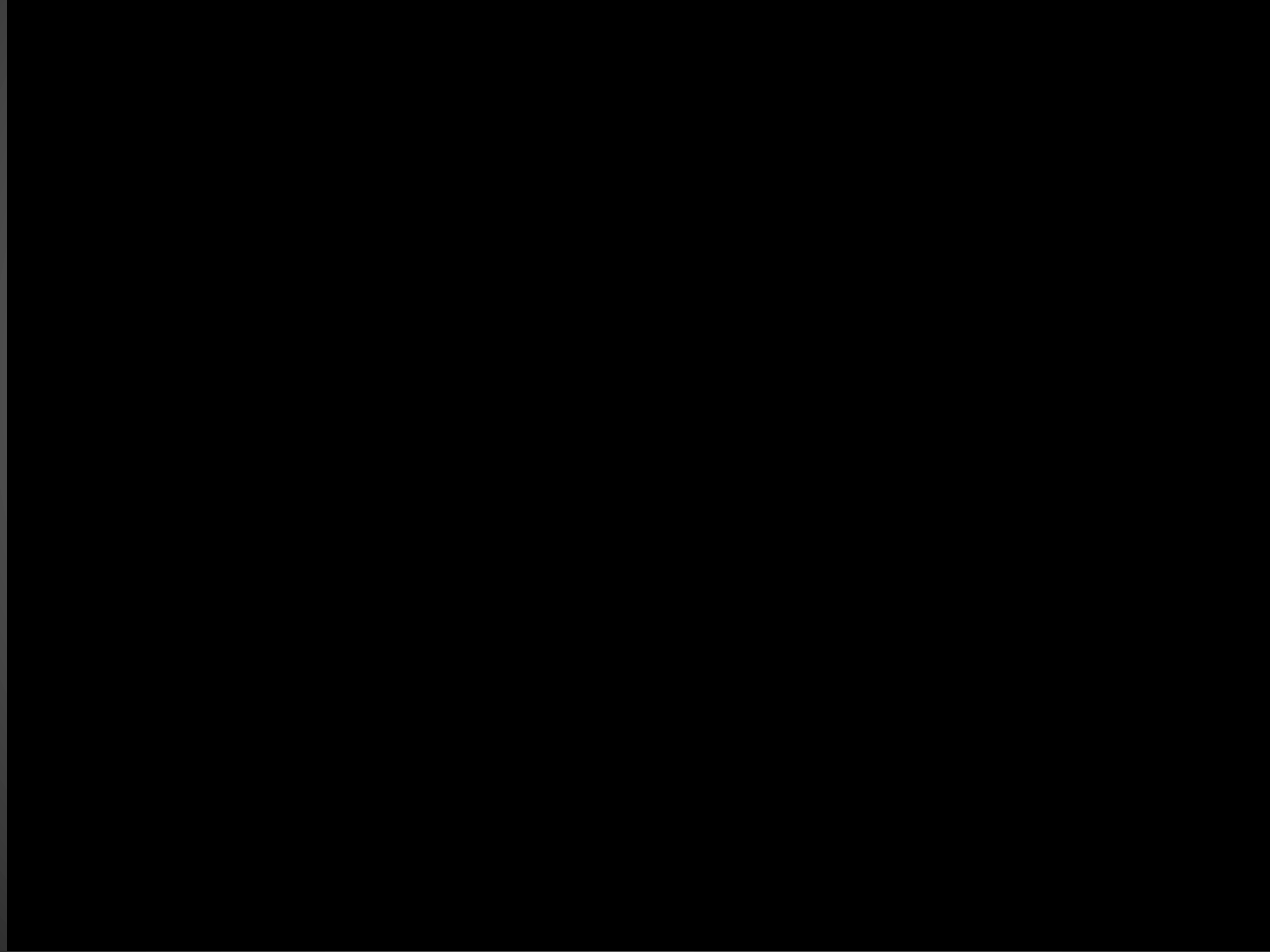
MiniBand Walk Comparison



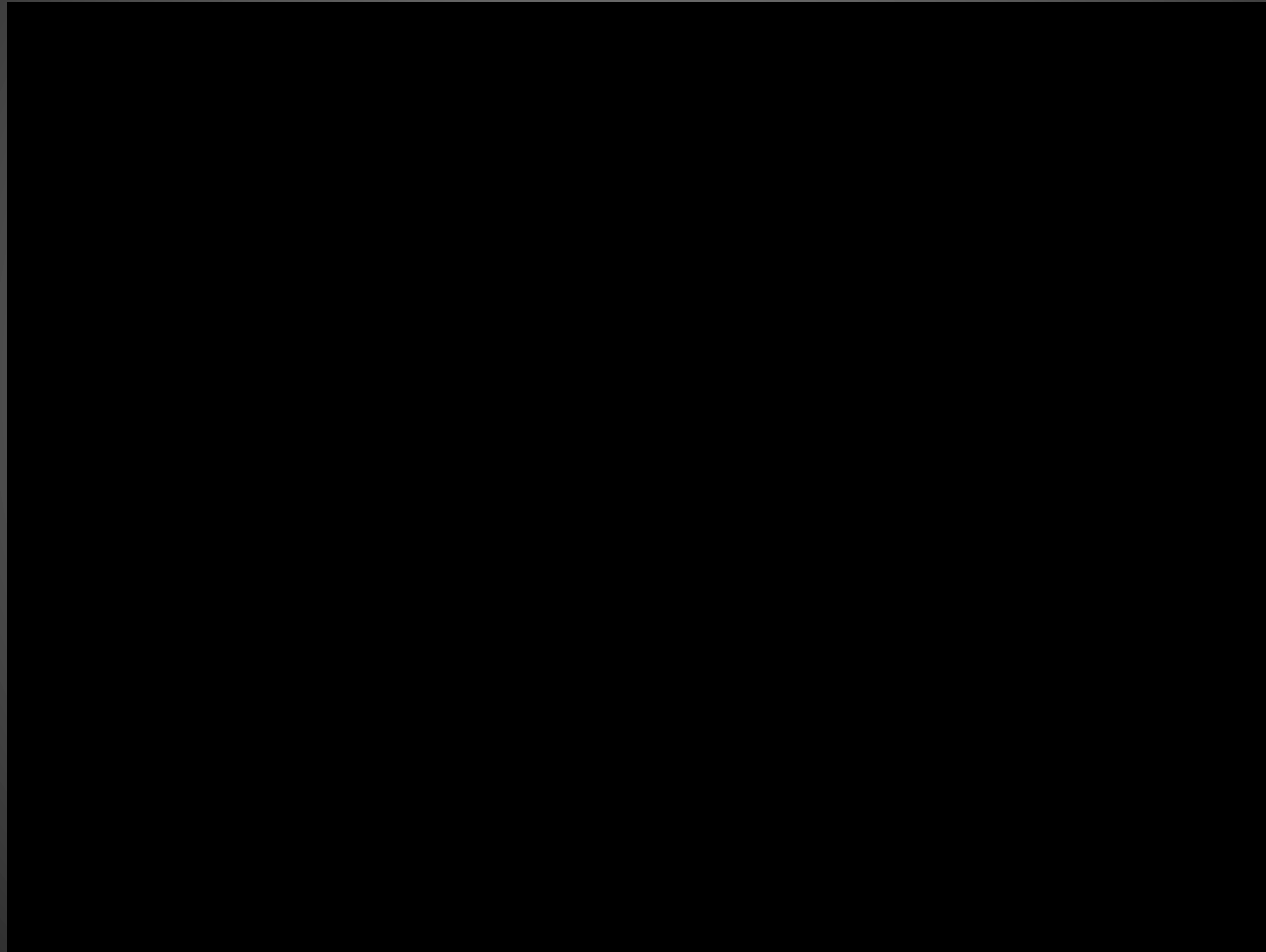
MiniBand Psoas w/ Hands vs. Wall



Ipsilateral Deadbug w/ MiniBand



2-Way Med Ball Crush



Additional Approaches

- Manual Therapy
 - Psoas/Iliacus
 - Piriformis/Hip Ext. Rotators
 - Adductors/Post Adductor Magnus/Medial Hamstring
- Mobilization
 - Posterior Capsule
- Distraction

Take Home Points

- Hockey requires extremes in ROM at high volumes
 - Damage to hip structures from playing is inevitable
- Need to re-establish egg alignment and core control to minimize *excessive* damage
- Need to consistently manage soft-tissue adaptations
- Reposition core musculature and reinforce through all exercises

23/1 Rule

- What else may be driving their dysfunction?
 - Common culprits
 - Default standing and sitting postures
 - Lots of time at desk or in car (or playing Call of Duty)
 - Seat position, arm rest presence/height, weight shift, computer/keyboard placement
 - Sleeping
 - Facesleepers are in constant pain
 - Side lying is most realistic optimal position (pillows between knees and between arms)



More Information

- KN@KevinNeeld.com
- www.KevinNeeld.com
- HockeySC.com
- Ultimate Hockey Training
(UltimateHockeyTraining.com)
- www.EndeavorFit.com

