Hinge Theory!

University of Chicago Sports Medicine Course 2016

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Disclosure:

- I have no financial relationships to currently disclose that would bias my presentation
- I will not discuss off label use and or invenstigantional use of any product in this presentation.

Let's Talk Gymnastics!

- How many gymnasts do you see?
- Do you know your local gyms?
- Have you talked to the coaches?
- Can you talk the talk?
- Top 5 injuries of gymnast that all sports have?
- Top 5 that gymnasts get more than others?

Hinge Theory

- Shoulder flexibility
- Hip flexibility
- Assessment
- Significance to other sports??

So… what is it?

- Knowledge of the etiology of injury combined with treatment (what works and what doesn't) including
  - passive stabilization
  - manual therapy
  - Strength
  - biomechanics
- Combines the last 8 years of my research and presentations into a medically and biomechanically based theory

State of Mind

- 3 parts to an arch
  - 1) Shoulder opening (anatomical flexion)
  - 2) Back bending, or lordosing
  - 3) hip opening (or anatomical extension
- Most people stretch the arch positioning by increasing the low back flexibility
  - You are stretching 50% muscles and 50% trying to change the kinematics of the spine
  - Shoulders and hips- muscular flexibility – MUCH more of a chance to actually make a change without pain!

History

- Came about from treating 236 Spondy-category injuries – probably more than most PT's in a lifetime
- Seeing trends – always poor posture, but not from family, or studying, from a lack of available ROM!
- Started to treat 50% spine, and 25% shoulder, 25% hips, and got BETTER results (informal personal patient research)

Relevance

- Think of a slinky- where each piece takes a piece of the pie, and the result is a curve
- If one piece is stuck, or is not working, the others have to chip in
- Look- what is the shoulder angle – is it even 180?

Pictures of hinging, external

Natural resting arch/lordosis

Flat above, flat below

Arch to flat?

Excessive hinge, can you find it?

Lack of Ability to reverse curvature

Study

- Athletes all level 9-10
  - 9's have to have scored at least 35.0
  - Girls
  - No matter the age (we will cross-stat this is SPSS to see if there is a correlation)
- 3 categories of injury:
  - Pre-stress reaction (bone scan only not plain film)
  - Fracture current with or without slip (listhesis)
  - Fracture diagnosed with unsuccessful rehab
- 50% traditional therapy to low back, including ART to spine
- 50% having the 50/25/25 treatment, marked by time, mobilization, and ART pass count

Break down of anatomy

- 1. hips
- 2. low back
- 3. shoulder

Hip Flexibility – Rotation of the pelvis

- Anterior Rotation
  - Place hands on hips, fingers in front (ASIS) thumbs in back around hips
  - Dump the bucket forward
  - Fingers drop below thumbs
  - Arch in back (lordosis)
- Posterior Rotation
  - Dump bucket backwards
  - Do not “Frump” with upper body, wrong part
  - Fingers rise above thumbs, or thumbs relatively drop
  - Pubic bone comes closer to breast bone
  - Rounded back (kyphosis)

Example - HIPS

- Hips:

The more flexibility in the capsule and anterior musculature, the more the hip can work without the lower back arching, or jamming, and without the hips turning out, or externally rotating

Look familiar? NO hip flexibility- flat as a board!

Example- Hips/Splitz

Example- Hips - leaps

- Look at turn out of back leg and "hinge" in back (evident in leo crease, too) – prominent vastus too

EXAMPLE- Low Back

- Imagine a back bend, low and long
- Less angle at each level, hands further from feet
- NOTICE – HINGE in her spine?

Tighter Arch

- Imagine back bend where the feet and hands are closer together – most of this increase in angle comes from spine – hips do not change (most likely they actually open, the knees come apart, allowing external rotation of the hips to compensate, and the arms bend)
- Notice- very little flexibility from the hips, knees bend and separate!
- Even though hands and feet are close, all from spine!

Compensations

- If the low back is not flexible, joint above and joint below can help
  - Thoracic spine
  - Hips
- If the upper back is not flexible, joints can help as well
  - Lower back
  - shoulders

Side bending flat as well, all locked up

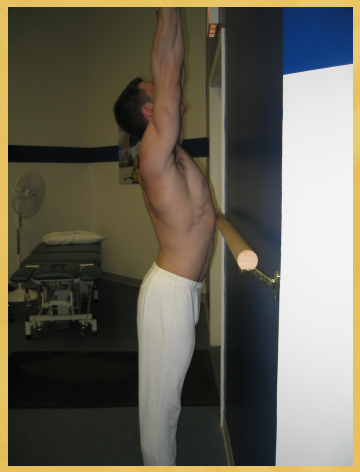
Example: Shoulders

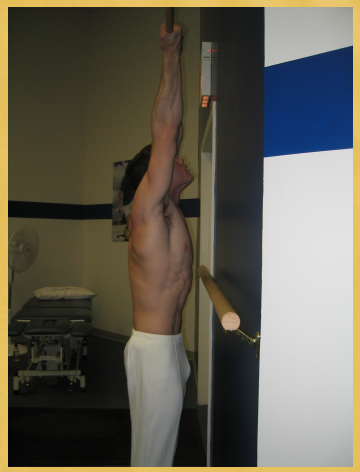
- The shoulders should be able to move above the head, with the spine at least in neutral, to 180 degrees
- Lets try –
  - 1) floor
  - 2) wall
  - 3) handstand example
  - SLIDES…

Wall

- Stand against the wall, lift arms overhead
- Try to keep all of the following:
  - Feet 6 inches from wall
  - Butt on wall
  - Low back pressed against hand, or towel, or better yet –wall!
  - Shoulder blades start on wall
  - Head on wall in neutral
- Lift arms overhead, keeping all on the wall
- How far are you away?

Wall testing





- Arms overhead, humerus bone straight in line with femurs
- Look at arch in low back
- THIS is what the handstand looks like – familiar?
- 2nd pic- straight spine
- Flexed shoulders! But, better…

Floor

- Lay on floor
- Keep low back as flat as possible, or smash something – neutralizes spine
- Lift arms overhead, STOP when back comes off of floor
- How far did you go?

Practical Testing

- First pic- flat back, about 150 degrees
- 2nd pic- arched back

- FAKE 180 degrees, look at the ribs tilt backwards- the spine is already in lordosis

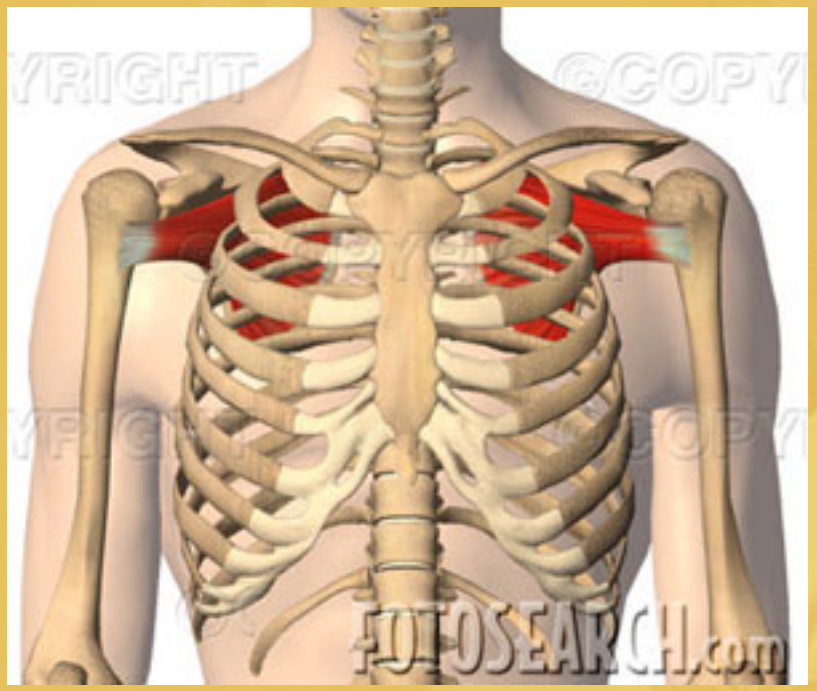
Shoulder Anatomy and Explanation

- When raising your arms overhead, many things are stretched:
  - Abs
  - Lats
  - Pecs (some fibers)
  - Triceps
  - Intercostal muscles
  - Shoulder capsule

Shoulder Anatomy

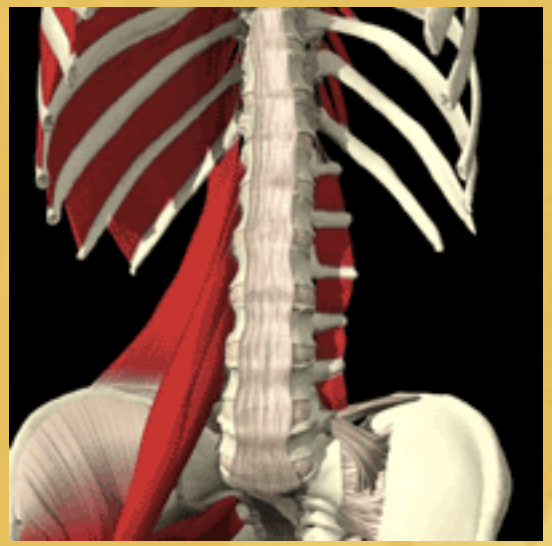
Subscapularis

Pecs



Hip Anatomy

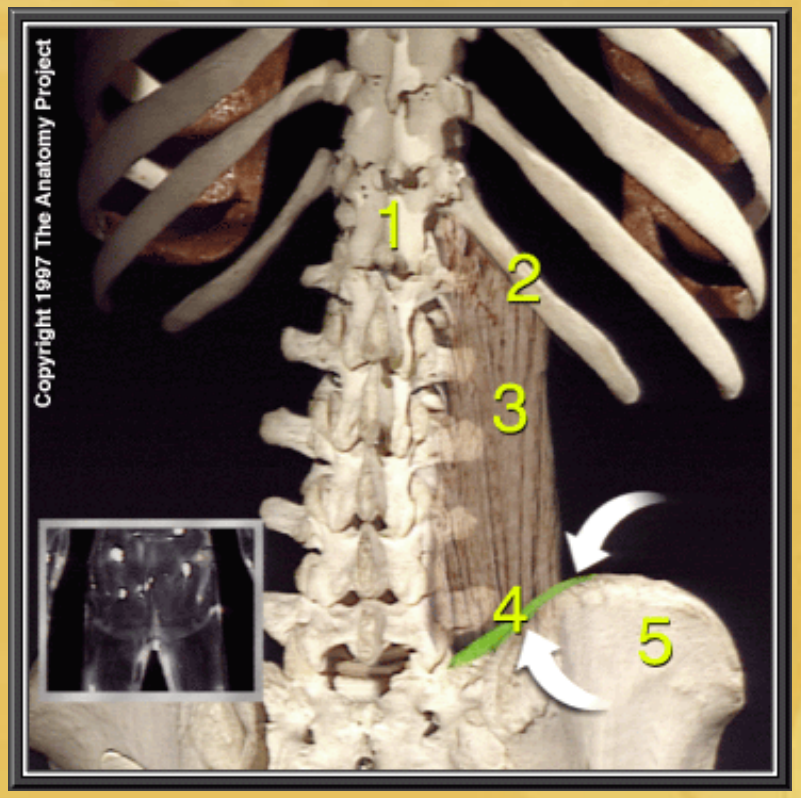
- When extending the hip, many things are stretched:
  - Abs
  - Psoas
  - Iliacus
  - Rectus femoris
  - Sartorius
  - Other fascia and hip flexors



Spine Functional Anatomy

- When the spine is lordosed, the following happens:
  - Facet joints close down
  - Abs are stretched
  - Hip flexors are stretched (lumber and sacral)
  - Muscles can work to get the spine there
  - If too much of an angle, you can have approximation, touching, or jamming (never good!) of the spinous processes

Arch of back and shoulder flexibility



Ex: Terin H.

- Pretty good example of open shoulders, closed hips, and hinged spine!

How do we FIX it?

- Make sure that time is spent stretching the hips and shoulders properly
- Make sure that this is done EARLY
- Ensure that your athletes understand the concept (even just standing them against a wall helps!)
- Test and measure the flexibility and chart it – in public, so they can keep track
  - Measure with a goniometer, or have your PT do it for you to ensure accuracy and repeatability

Proper and Improper Evaluation and Strength Technique

Measure the rib angle to the humerus bone – NOT the spine

Evaluation - Hips

- Need to make sure that the spine is in neutral, for reliability of measurement
- Need to make sure the athletes understand this position
- Need to make sure the back leg is never in external rotation, or compensation patter, will skew results

Splitz example

Measure- and look

- Notice that she actually has a GREAT hip open angle
- She is still hinging (you can see the spine)
- NO shoulder angle!

Square with the use of mats to raise body, un-”arch” the back, and square the hips to as high as the athlete needs- MEASURE angle between two femurs (thighs)

Evaluation - Spine

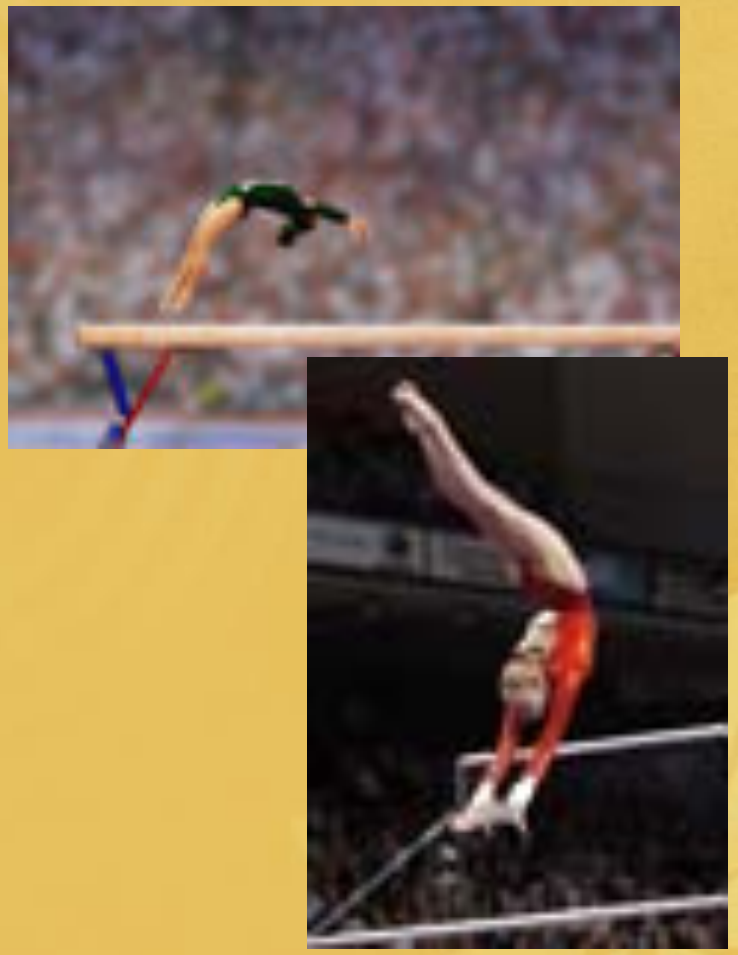
- Measure the distance between heel of hand and heel of foot
- Measure height from belly (highest point) to floor
- Just for knowledge
- Pictures are best
  - Measure the shoulder angle and hip angle there, too

Pictures & Measurement

- Take picture of athlete doing a back bend
- Measure the shoulder and hip angles, and record
- Feet must be flat
- Knees must be straight
- Elbows must be locked out

Functional assessment

- Try to take pics in action, and still frame, or video so that you can still frame the exact moment!



MD Evaluation

- Make a form for anticipated measurements

Tplain the importance of tackling this early to the athlete and the parent

- Differentiation between SP and TP pain
- FB vs BB
- Twisting skills, rebounding
- Brace vs no brace

Skill assessment: Developmental

- Let's discuss:
  - Back roll
  - Back bend – next?
  - Walkover – next?
  - Step down skills?

Skill Assessment: Optional to Elite

- Free hip opens, transition
- Vault reaches for yerchenko – take side still pictures

Summary

- Take the pressure off of the spine- release the muscles from tension, and increase surrounding flexibility
- Watch skills, and watch for compensation patterns
- Treat with a combination of rest, functional strengthening, and joint mobilization/reeducation early!

Thank you!

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