



SPINE INJURY PREVENTION AND HINGE THEORY IN GYMNASTICS

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Spine Injury, shoulders, hips, the back, and why it's all tied together...

“Hinge Theory!”

Gina Pongetti, MPT, MA, CSCS, ART-Cert.

OUTLINE

- ① Experience
- ② Tricks
- ③ Hinge Theory
- ④ Spine
- ⑤ Shoulders
- ⑥ Hips

① EXPERIENCE...

- Highest etiology of gymnastics injuries
 - Chronic
 - Life-changing
 - Psychologically altering
 - Serious
 - Sport longevity
 - Lingering
 - Compensations
 - Skill bucket cut

TRICKS- BREAK OUT 1!

- Tricks that kids arch on, that they should not that are the most harmful
- Tricks that kids should arch on, excessively, that are the most potentially harmful
- Spine flexibility exercises
- If you have spine pain, or return from fracture, what should you avoid?

② TRICKS- EXPLAINED

Shouldn't arch, but do...

- Shoulder flexion skill category
 - Back extension roll
 - Cast handstand
 - Shoulder flexion strength ex
 - Prone vault shoulder ext
 - Free hip
- Other
 - Setting
 - Blocking
 - Conditioning- handstand walk, hold pushups

Examples-

- See pics-

SHOULD ARCH, EXCESSIVE, HIGH POT INJ RATE (PIR ©)

- Potential Injury Rate is predictability, using facts on anatomy, group dynamics of sport and environment, retrospective look at injury etiology, as well as prevention ex and treatment to determine the skills that have the highest percentage of possible injury

$$\begin{aligned} &\text{Total ROM required} + \text{Skill Difficulty} + \text{joints involved} + \text{repetitions} \\ &\quad \text{needed} + \text{Velocity} \\ &= \\ &\text{PIR} \end{aligned}$$

PIR © CONTINUED

- Handstand push ups
 - Low PIR
 - But high potential that high reps of this poorly lead to poor basic form for Domino Skills (skills that build on base)
- Switch leaps
 - Total Available ROM (AvROM) Depends on flexibility to splits
 - Multiple Joint Systems- shoulders/pecs, spine, hips (knee if switch ring)
 - Velocity- High
- Tkatchev
 - Same as switch leap
 - Add closed chain (hands attached to bar to encourage shoulder and spine arch)
 - Velocity- extremely high
- More- Yerchenko preflight, whips, layouts on beam, walkovers, and so many more...

Arch within Pak

- Open in the air
- This means need a combination of AvROM as well as strength to keep the arms and lower spine/hips there



Arch within Preflight

- Notice the need for available ROM to get arms to table first



Arch within switch ring

- Notice the spine flexibility
- Shoulder combo joint add
- Turn out of the back leg, to get leg higher



WHERE DOES IT START?

Developmental coaches

- Teaching body positioning
 - Standing against a wall
 - Hollow hold
 - Handstand hold
 - Handstand push up
 - Press with proper sequencing
 - Corrections
 - Moving up too quickly...

Time and Multitasking

- Have coaches specifically who do conditioning, if the others have moved on
 - Stretching
 - Strength
 - Overlap time

③ HINGE THEORY, EXPLAINED

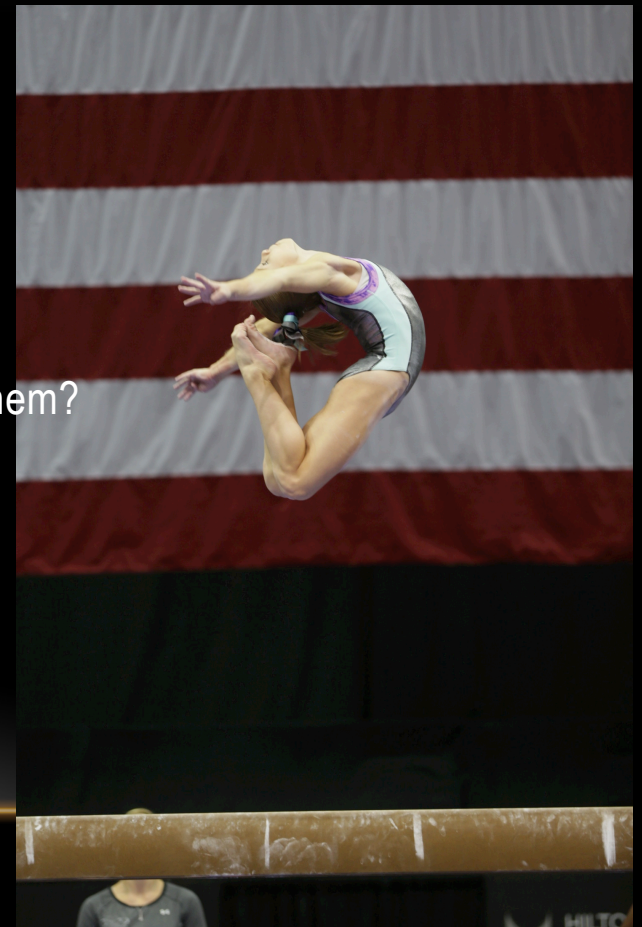
- Spine is a slinky
- Shoulders need to be flexible
- Hips need to be flexible
- After you have the Available Range of Motion (AvROM) you need to know how to use it
 - Order
 - Intensity
- Compensations happens first to move to another body part, then to more centrally focus on less levels of the spine
- Seems easy, right?

④ SPINE

- Cervical- lordosis
- Thoracic- Kyphosis
 - ** with need to *reverse* this kyphosis
- Lumbar- Lordosis
 - ** with need to evenly dissipate stress
 - Where too much could be bad if forced
- Sacrum – kyphosis
 - Important concept in hip extension combined with lower spine lordosis

5 SHOULDERS

- One of the most important joint to understand the *kinematics* of, or the science behind the joint motion
 - a) Scapula, what does it do?
 - b) Humerus, what does it do?
 - c) How is the clavicle (collar bone) involved?
 - d) Pecs-
 - e) Lats and subscap- we use these, but do we stretch them?
 - f) Rib articulations to spine
 - g) Intercostal (muscles between the ribs themselves
 - h) Abs- attachment to breast bone
 - i) Thoracic spine

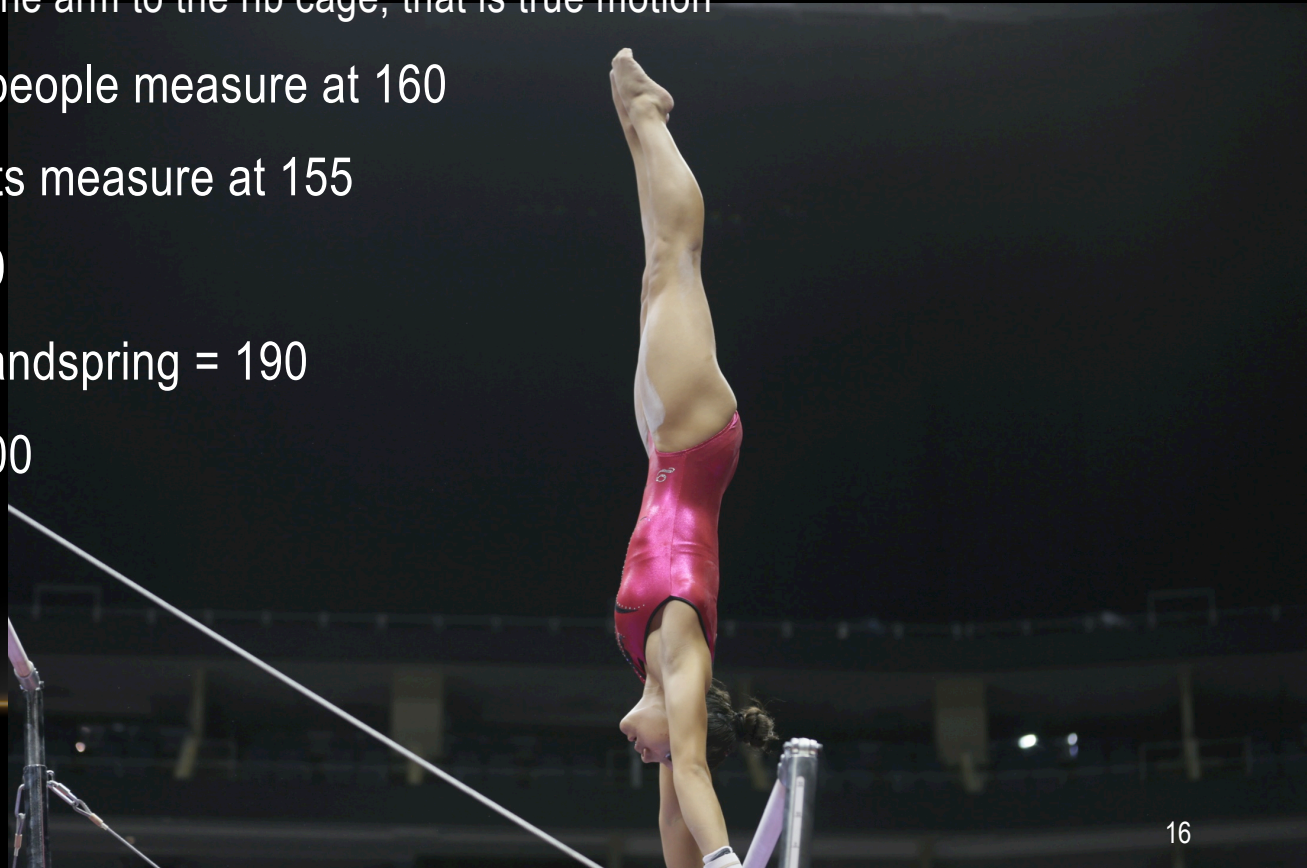


a) SCAP

- Glides “out” with rounded forward shoulders and poor posture
- Glide together with use of lower trap, rhomboids (Scap adduction)
- Cannot “flex” shoulders with scap outward position

b) HUMERUS

- Shoulder “flexion “ is overhead motion
- Shoulder “extension” back, tricep dips, jam throughs, etc
- “Actual” measure of the arm to the rib cage, that is true motion
 - Most normal people measure at 160
 - Most gymnasts measure at 155
 - Straight = 180
 - Vault, back handspring = 190
 - Tkatchev = 200
 - MORE!



c) CLAVICLE

- Motion up and down
- Rotation forward and backwards
- Front and back
- IF hiked (when not using lower trap, etc.) then encourages injuries such as impingement, labral issues, and rotator cuff *stress*

d) PECS

- To stretch, open the arms overhead, and out to the side
- Often get adaptively shortened
- Partner stretching is the best
 - Overhead stick up
 - Beam pit drop or stall bar drop
 - Hand on ankle partner back bridging
- The importance of posture
 - One of the MOST important posters or signs that you can have in your lobby...!

e) LAT/SUBSCAP

- Pull down
 - Kips, rope climb, dips, pull ups, etc.
- To stretch, open the arm *without* arching the back



f) RIB ARTICULATIONS TO SPINE

- Open and close, like bucket handle
- Up and down like jumping jack puppets, bilaterally
- Need to be mobilized at times manually, Physical Therapy or Chiropractic, to encourage proper motion of the joint itself
- Can sublux..

g) INTERCOSTAL

- Between the ribs
- Used mostly in forceful exhalation or ab exercises, isometrics as well as motion (such as V-ups)
- Stretch- need to bend sideways, as well as backwards- arms and spine

h) ABS

- Attach breast bone to public bone, essentially
- Opened when arched
- Can fight the posterior rib tilt

i) THORACIC SPINE

- Goes forward (kyphose)
- Needs to reverse
- Gets adaptively shortened with posture, especially in men



⑥ HIPS- ACTIVE BREAKOUT!

- 10 ways to stretch the back leg of splits....go!

10 WAYS TO STRETCH BACK LEG OF SPLITS

- 1) Crotch to carpet splits
- 2) Square split position
- 3) True, traditional lunge forward
- 4) ½ kneeling hip roll under
- 5) Prone quad stretch with pelvic rotation focus
- 6) Hurdler with back knee bent
- 7) Thomas stretch off of a mat
- 8) Standing “russian split squat” with torso flex and then stand to vertical (dynamic)
- 9) Dynamic- Leg swings to the back
- 10) Use of opposite- theory of Reciprocal Inhibition (arabesque high pulses, use the glut, shut off the hip flexor, allow the end range of motion
 - 1) 10A- band split jumps, on trampoline, Biggs, etc.

HIPS, EXPLAINED...

- Hip motion- pelvis
 - ACTIVE- up and down bucket tilt, both ways
 - Stretch flexors- need posterior tilt, bucket dump water out backwards
- Hip flexor muscles- cross 1 joint for some, 2 for some
- Ilium
 - You have two
 - They can move together
 - Arching
 - Sheep jump
 - Or not... individually
 - Walking, splits, etc.

SUMMARY

- From the beginning, at your gym, developmental coaches HAVE to understand the concepts of
 - Verticality
 - Hinge Theory
- Focus on NOT moving kids up, no matter WHAT their score, without base level achievements of understanding of positions and muscle activation

CONTACT INFORMATION

- Gina Pongetti, MPT, MA, CSCS, ART-Cert.
- E: gina.pongetti@gmail.com or medgyminfo@gmail.com
- W: www.medgym.net and www.achieveorthosports.com
- C: 630-607-8907
- F: MedGym and Achieve Orthopedic Rehabilitation Institute Sports Medicine
- T: ginapongetti
- Contact: for private gym programs, analysis and creation. Prices vary, custom schedules.