



Lumbar & Pelvic Joint Mobilizations Featuring HVLA Techniques

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Course Outline

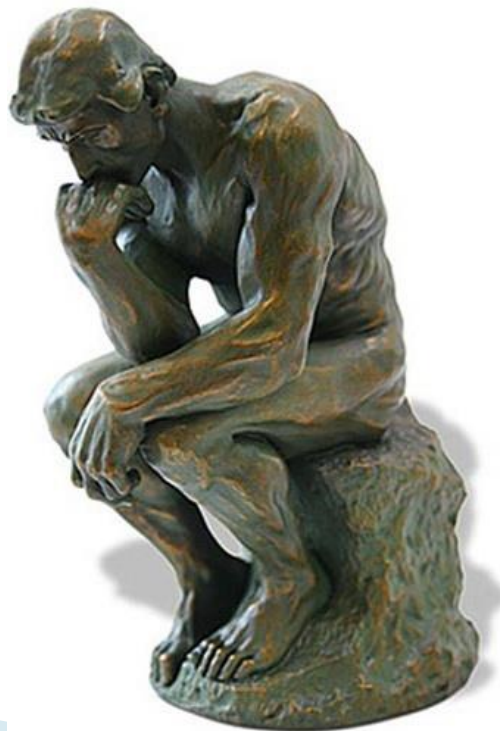
- ▶ Introduction and Course Objectives
- ▶ Overview of HVLA Mobilization
- ▶ Lumbar Facet Biomechanics & Joint Mobility Testing
- ▶ Indications & Contraindications; Patient Selection
- ▶ Lumbosacral and SIJ Screens
- ▶ Lab Component (techniques):
 - Prone Thoraco–Lumbar P–A Thrust
 - SIJ: Prone Upslip Distraction
 - SIJ: P–A Innominate Thrust
 - SIJ: A–P Innominate Thrust
 - Lumbar Facet Gapping
 - Lumbar Facet Closing
 - Lumbar Facet Opening
- ▶ Case Studies, Review, Problem Solving, Speed Mobs.

Course Objectives

- ▶ The participant will identify the history of thrust mobilization, current APTA policy, and the evidence available for techniques taught
- ▶ The participant will identify safety issues, indications, and contraindications for use of HVLA mobilizations
- ▶ The participant will identify clinical presentations, such as specific dysfunctions/pathologies, and when to apply the HVLA techniques
- ▶ The participant will demonstrate how to appropriately perform HVLA techniques on a lab partner, for multiple spinal joint regions

Why Manual Therapy?

- ▶ Before learning anything new, one needs to ask– why?



Manual Therapy Defined

“A clinical approach utilizing skilled, specific hands-on techniques, including but not limited to manipulation/mobilization; used by physical therapists to diagnose and treat soft tissue and joint structures for the purpose of modulating pain, increasing ROM, reducing or eliminating soft tissue inflammation, inducing relaxation, improving contractile and non-contractile tissue repair, extensibility and/or stability, facilitating movement, and improving function.”

–Stanley Paris

History of Manual Therapy

- ▶ Earliest Evidence: Hippocrates (460–385 BC)
 - “The Father of Medicine”
 - Described a combination of traction (using levers) and pressure (manipulation) performed in prone on a table
 - Noted that these treatments should be followed by exercise
- ▶ Also observed during Roman times, Renaissance Medicine
- ▶ By 18th Century, use of spinal manipulation was becoming less accepted among physicians
 - Bonesetters became the primary manipulators of 18th and 19th centuries in USA and Britain
 - This gave rise to two other professions...

History of Manual Therapy

▶ Osteopathy

- Founded by A.T. Still, 1874
- Still observed that when restricted joint motions were restored manually, certain disease conditions improved
- “Law of the Artery”: “I proclaimed then and there that all nerves depend wholly on the arterial system for their qualities such as sensation, nutrition and motion, even though by the law of reciprocity they furnish force, nutrition and motion to the artery itself.” –A.T. Still

▶ Chiropractic

- Founded by D.D. Palmer, 1895
- “Law of the Nerve”: a vertebra out of alignment caused pressure on nerves, changing nerve impulses, and affecting visceral function leading to disease
- Credited with the terms: “spinal subluxation” (diagnosis) and “spinal adjustment” (treatment)

History of Manual Therapy

▶ Physical Therapy

- Founded in Britain in 1899 as “Physiotherapy”
- PT established in USA in 1921
 - Originally known as the “American Women’s Physical Therapeutic Association”
 - Goal: “to make available efficiently trained women to the medical profession”

▶ Early PT Education

- Exercise
- Massage
- Manipulation
- Modalities

History of Manual Therapy

▶ Early PT Education

- James Cyriax
 - Popularized the term “end feel”
 - Trained PT’s and felt that they were the most apt professionals to learn manipulative techniques
- James Mennell
 - First to use the terms “manual therapy” and “joint play”

▶ 20th Century Manual Therapy

- 3 professions, each with its own history and philosophy

HVLA Mobilization: APTA Policy

- ▶ ***Guide to Physical Therapist Practice*** defines as:
 - “Mobilization/manipulation: a continuum of skilled passive movements to the joints and/or related soft tissue that are applied at varying speeds and amplitudes, including small amplitude/high velocity therapeutic movement.”
- ▶ ***Dorland’s Medical Dictionary*** defines manipulation as:
 - “In physical therapy, the forceful passive movement of a joint beyond its active limit or motion”

HVLA Mobilization: APTA Policy

▶ ***Guide to Physical Therapist Practice***

- “Mobilization and manipulation are an integral part of the direct interventions listed under the section entitled, “Manual Therapy Techniques.”
- ***Guide*** describes PT scope of practice
- Thrust joint manipulation/mobilization (HVLA) are **only** performed by PT’s and cannot be delegated to PTA’s

▶ **APTA Board of Directors**

- Minimum required skills of entry-level PT’s include thrust and non-thrust mobilization/manipulation

HVLA Mobilization: What is it?

- ▶ HVLA = High Velocity, Low Amplitude
 - Applied as a thrust/impulse at physiological barrier/limit to motion
 - Must be performed **very quickly** and **precisely**
 - Typically <1 / 8” of amplitude
 - Subsequent joint cavitation

- ▶ Grade 5 Mobilization (as per Maitland Scale)
 - AKA- “joint manipulation”
 - Terms are interchangeable as per APTA

HVLA Mobilization: Proposed Effects

- ▶ Mechanical
 - Restore proper joint mechanics/joint play
 - Stretch/rupture intra-articular adhesions
 - Release of intra-articular inclusions (i.e. meniscus)
 - Alter positional relationships (of bones)

- ▶ Hydraulic
 - Changes in synovial fluid viscosity

- ▶ Neurophysiological
 - Mechanoreceptor activation
 - Reflex muscular inhibition

- ▶ Psychological

HVLA Mobilization: Proposed Effects

▶ “The Pop”

- Nitrogen normally dissolved in synovial fluid
- With HVLA, the joint surfaces are separated so fast that capsule cannot fill voluminous void
- Nitrogen gas forms into a bubble in the joint cavity to accumulate increased joint volume
- Bubble explodes, resulting in an audible cavitation or “pop”
- Can take minutes to hours for the gas to redissolve back into fluid

A.M. Break

▶ 10 minutes
please!!!

Lumbar Facet Joint Biomechanics

- ▶ Motion of a segment is defined by motion of the upper level on the lower level
 - Ex: Up-and-forward at L3-4 describes the motion of the L3 vertebra moving on the L4 vertebra
- ▶ For a visual of this motion visit:
 - <http://www.csuchico.edu/~sbarker/spine/spinealt/page7.html>

Lumbar Facet Joint Biomechanics

- ▶ Lumbar Flexion:
 - Bilateral facets move up-and-forward
- ▶ Lumbar Extension:
 - Bilateral facets move down-and-back
- ▶ Lumbar Rotation:
 - Down-and-back on side of rotation
 - Up-and-forward on the side away from rotation
- ▶ Lumbar Sidebending:
 - Down-and-back on side of rotation
 - Up-and-forward on the side away from rotation

Testing Lumbar Joint Mobility

Examination Techniques

Testing Lumbar Joint Mobility

▶ P–A Spring Testing

- Tested in prone
- P–A pressure applied over the spinous process through the hypothenar eminence
- Amount and quality of motion is compared between segments



Testing Lumbar Joint Mobility

▶ Side Gliding

- Tested in prone
- “Frame” the TrPr’s of the cranial vertebra of motion segment with bilat thumbs and 2nd/3rd fingers
- Side gliding is applied until end feel is appreciated
- Amount and quality of motion is compared between segments



Testing Lumbar Joint Mobility

▶ Positional Fault Testing

- Initially test in prone
- Palpate the TrPr's on each side
- Feel for one side being more superficial or deeper than the other
 - I.E.: L TrPr is superficial, indicating a L rotation of that segment
- Can confirm by having the patient go POE/quadruped rock (demo.)



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Testing Lumbar Joint Mobility

▶ Closing Restriction

- Described as a facet that can not move down-and-back
- Positional fault testing reveals a (deeper) more anterior TrPr (the facet is stuck up-and-forward)
- Prone on elbows position would show the involved facet does not move
- Quadruped flexion would show the uninvolved facet becomes deeper
- AROM: expected- limited BB and ipsilateral SB

Testing Lumbar Joint Mobility

▶ Opening Restriction

- Described as a facet that can not move up-and-forward
- Positional fault testing reveals a more (superficial) posterior TrPr (the facet is stuck down-and-back)
- Prone on elbows position would show the uninvolved facet gets deeper
- Quadruped flexion would show the involved facet does not get more superficial
- AROM: expected- limited FB and contralateral SB

Contraindications (not exhaustive list)

- ▶ Fracture
- ▶ Anything that can weaken bone
 - Osteoporosis
 - Neoplasm
 - Osteomyelitis/infection
- ▶ Ligament tear/rupture → instability
- ▶ Acute rheumatoid arthritis exacerbation
- ▶ Post-surgical
 - i.e. THA/ORIF

Contraindications (not exhaustive list)

- ▶ Presence of other serious pathology
 - i.e. SCI/CVA
 - Active cancer
- ▶ Excessive pain/resistance (Fx?)
- ▶ Severe multi-directional spasm
- ▶ Joint ankylosis

Stoddard's Warning Signs

- ▶ 1. Malignancy within the last 2 years
- ▶ 2. Onset of back pain late in life with no history of symptoms
- ▶ 3. Serious loss of spinal function, shock, vomiting after trivial spinal injury
- ▶ 4. Intense pain requiring morphine for more than 48 hours
- ▶ 5. Deformity and muscle spasm in an area other than lower cervical or lumbar regions
- ▶ 6. Constitutional signs that accompany back pain, such as fever, weight loss, malaise, excess weakness.
- ▶ 7. Loss of power too widespread to be a single nerve root lesion.
- ▶ 8. Loss of sphincter control
- ▶ 9. Continuous pain unrelated to posture.
- ▶ 10. Normal erythrocyte sedimentation rate does not exclude disease entirely.

Signs/Symptoms of Cord Compression

- ▶ Bilateral or quadrilateral limb paresthesia
- ▶ Hyperreflexia (DTR's)
- ▶ Positive Clonus
- ▶ Positive Babinski or Hoffman's
- ▶ Loss of bowel/bladder control

Contraindications



- ▶ Would you perform HVLA mobilizations to this lumbar spine?
- ▶ (Burst fracture of L1)

Precautions (not exhaustive list)

- ▶ History of Cancer
- ▶ Pregnancy
- ▶ Chronic Pain disorders
- ▶ Psychological history
- ▶ Hunch/feel
- ▶ Emotionally dependent patients
- ▶ Age/general health
- ▶ Pt. inability to relax
- ▶ Hypermobility

Indications (not exhaustive list)

- ▶ Hypomobile joint
- ▶ Presence of joint dysfunction
- ▶ Pain → neurophysiological effects
- ▶ Psychological effect
 - Perception of efficacy
- ▶ Patient consent!

Proper Patient Selection

- ▶ **Absolutely crucial** to maximize likelihood of successful outcome
- ▶ Screen for Fear Avoidance Beliefs (FABQ)
- ▶ Screen for secondary gain issues
 - Hx of MVA, previous litigation
 - Worker's compensation
- ▶ Body part specific outcome measures can be helpful (Oswestry, DASH, NDI, etc.)
- ▶ When in doubt– **DON'T PERFORM HVLA!!!**

Clinical Prediction Rule for Lumbar Spine

- ▶ Developed by Flynn et al in 2002
- ▶ Validated by Childs et al in 2004
- ▶ Designed to identify patients most likely to show short term improvement from lumbar spine manipulation (Grade V mobilization)
- ▶ Considered applicable if 4/5 criteria are met
 - The probability of improvement in patients with 4/5 positive criteria went from 45% to 95%.

Clinical Prediction Rule for Lumbar Spine

- ▶ The criteria (5 components):
 - Duration of symptoms: < 16 days
 - Location of symptoms: no symptoms below the knee
 - FABQ: work subscale <19
 - Hypomobility: 1 or more hypomobile lumbar spine segment
 - Hip Internal Rotation: At least 1 hip with > 35 degrees of IR.

Fear Avoidance Behavior Questionnaire

- ▶ Developed by Waddell to identify patients with high pain avoidance behavior
- ▶ Only validated for patients with low back injuries
- ▶ Questions scored from 0–6
- ▶ The higher the total score, the more likely that pain avoidance behavior is present
- ▶ 2 subscales
 - Physical activity (PA) or FABQPA: Questions 1–5
 - Work (W) or FABQW: Questions 6–16
- ▶ Not all questions are counted when scoring
 - PA: 2, 3, 4, and 5
 - W: 6, 7, 9, 10, 11, 12, and 15
- ▶ Score of more than 19 on the work subsection is considered “positive”

Lumbosacral Screen

▶ Subjective

- Method of injury
- Specific location of pain
- Specific type of pain (sharp, dull, pinching, burning, etc.)
- Stoddard signs
- Exacerbating/Alleviating factors (positions, activities, hot/cold, meds, etc.)
- Yellow/Red Flags
- Prior medical/surgical history
- Social lifestyle (smoking, alcohol, activity level)

Lumbosacral Screen

▶ Objective

- Posture
- Lower quarter screen (DTRs, Myotomes, Dermatomes)
- Range of Motion – observe the spine during motion; look for patterns of limitation
- Neurodynamic Testing – Slump Test, SLR
- Lumbar joint mobility testing
- Sacro-Iliac Screen (aka “Cibulka Scan”)

- **This list is not exhaustive!**

Sacro-Iliac Screen

Standing

- Standing Flexion Test
- Iliac crest, PSIS, ASIS heights in standing

Prone

- Deerfield's (Prone Knee Flexion Test)
- Flick Test

Supine

- Supine to Long-Sit Test

****please refer to appendix for photos****

Expected Objective Findings

- ▶ **SI Joint Upslip**
 - PSIS, ASIS, iliac crest, pubic tubercle, and ischial tuberosity all higher on one side
 - Apparent leg length discrepancy with involved leg shorter
 - Positive standing flexion test

- ▶ **SI Joint Posterior Innominate**
 - PSIS low and ASIS high on same side
 - Supine to long sit and Deerfield tests show involved leg goes from short to long
 - Positive standing flexion and flick tests on involved side
 - Possible limited/painful trunk extension and ipsilateral sidebending

Expected Objective Findings

- ▶ **SI Joint Anterior Innominate**
 - PSIS high and ASIS low on same side
 - Supine to long sit and Deerfield tests show involved leg goes from long to short
 - Positive standing flexion and flick tests on involved side
 - Possible limited/painful trunk flexion or extension and ipsilateral sidebending
- ▶ **Lumbar Facet Opening Restriction**
 - Facet can not go up-and-forward
 - Pain/limitation with flexion, contralateral sidebending, and contralateral rotation
 - Hypomobility with spring testing and sidegliding
 - Positional fault would indicate the involved side TP feels more superficial than uninvolved side

Expected Objective Findings

- ▶ **Lumbar Facet Joint Closing Restriction**
 - Facet can not move down-and-back
 - Limited/painful trunk extension, ipsilateral sidebending, and ipsilateral rotation
 - Hypomobility with spring testing, sidegliding
 - Positional fault testing would indicate the involved side TP feels deeper than uninvolved side

- ▶ **Thoracolumbar P–A Glide Restriction**
 - Limited/painful trunk rotation and flexion/extension
 - Hypomobility with spring testing

Manipulation Techniques

Thoraco-Lumbar P-A in Prone

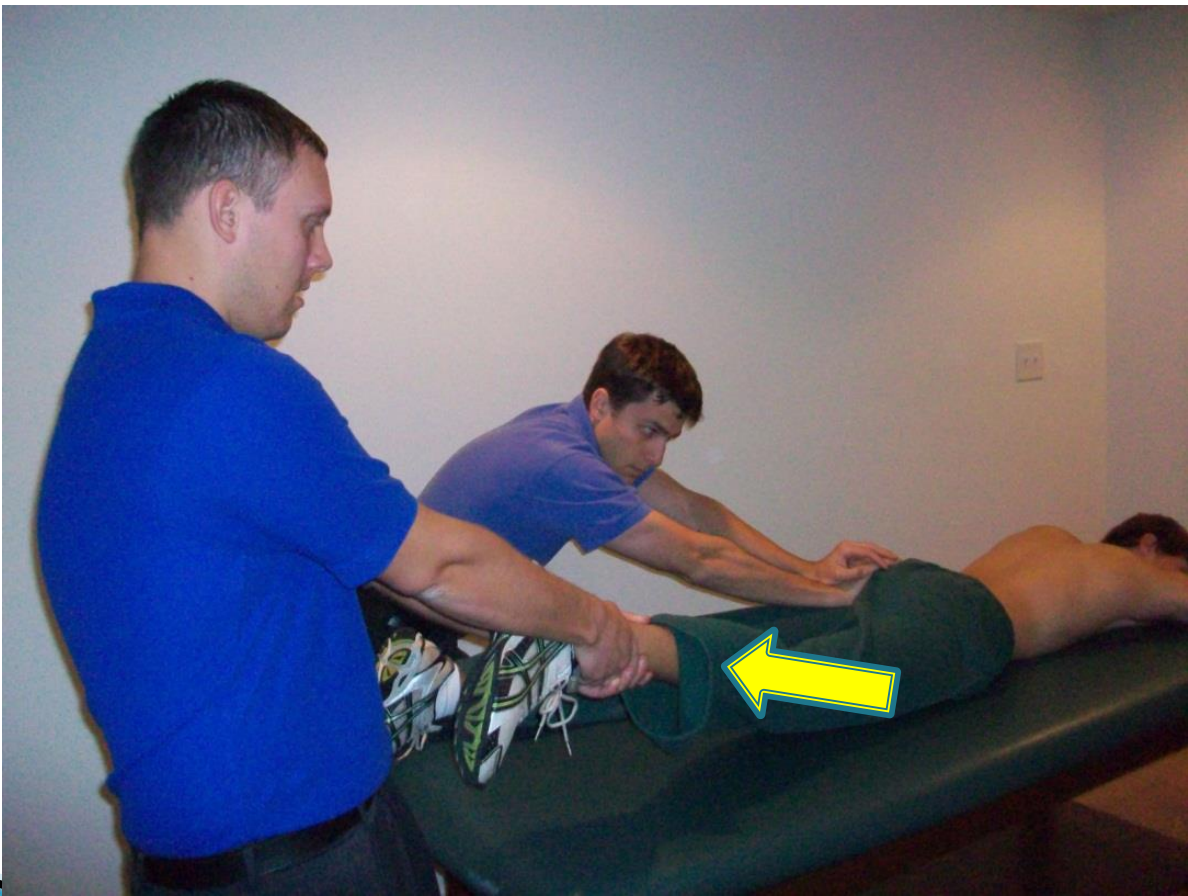


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Thoraco-Lumbar P-A in Prone

- ▶ Patient prone, PT on the side with prominent TrPr
- ▶ Caudal hand on TrPr closest to PT, finger pointing towards PT
- ▶ Cranial hand on TrPr furthest from PT, fingers pointing away from PT
- ▶ Screw home by rotating hands clockwise to take up slack
- ▶ Trust caudal hand in cranial/ant dir. and other hand in caudal/ant dir.

SI Joint Upslip Mobilization



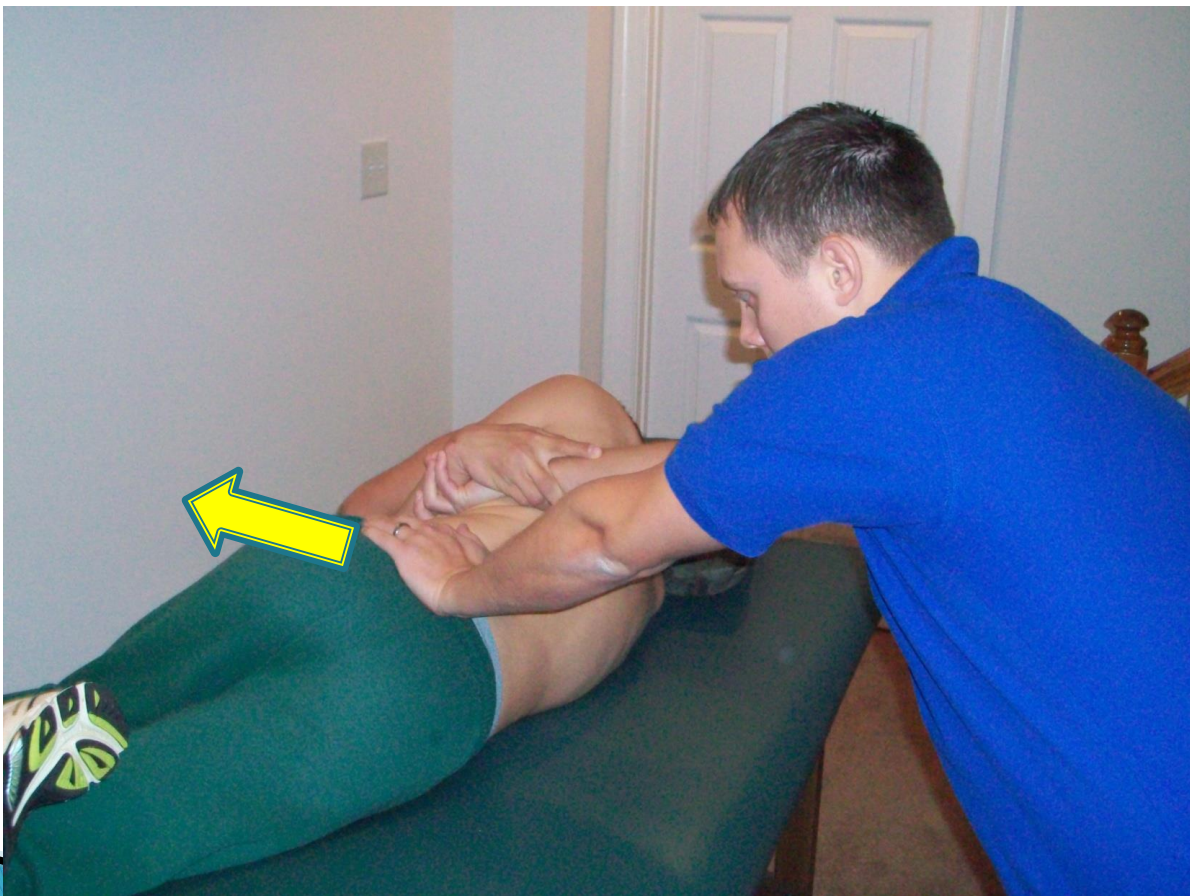
SI Joint Upslip Mobilization

- ▶ Patient laying prone
- ▶ Stabilize with a banana belt or an assistant holding the sacrum (anterior/cranial force)
- ▶ Grip around the involved lower leg, above the ankle
- ▶ Involved LE held in hip extension, IR, and abduction
- ▶ Thrust in caudal direction (quick pull of leg)

SI Joint Posterior Innominate



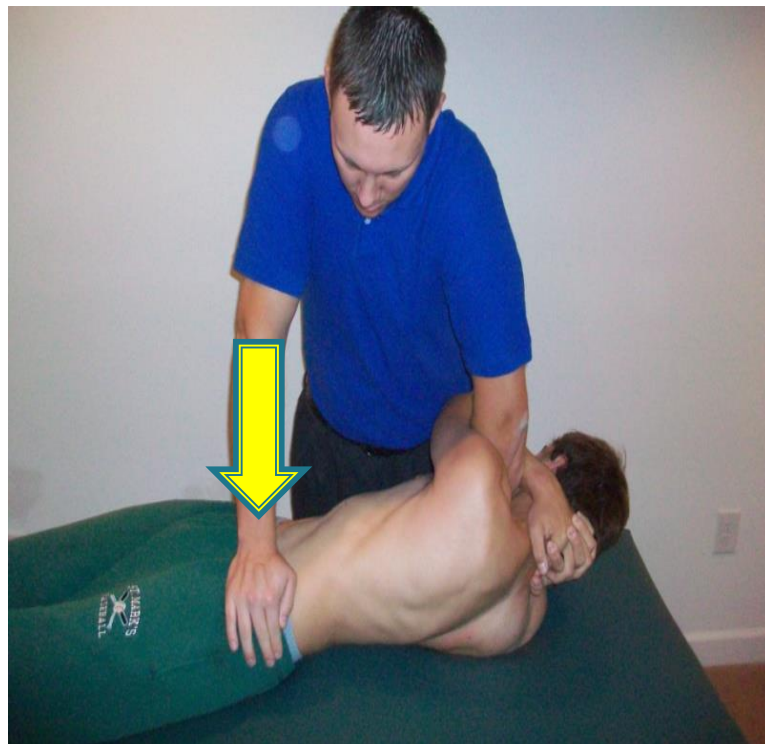
SI Joint Posterior Innominate



SI Joint Posterior Innominate

- ▶ Pt. sidelying with involved side up
- ▶ Bottom leg is extended, upper leg flexed
- ▶ Pt. holds the table with top hand and PT's hand with bottom hand
- ▶ Trunk stabilized by PT pulling pt's bottom hand and pt resisting
- ▶ PT takes up slack by pushing PSIS anterior and slightly superior then thrusting in that direction

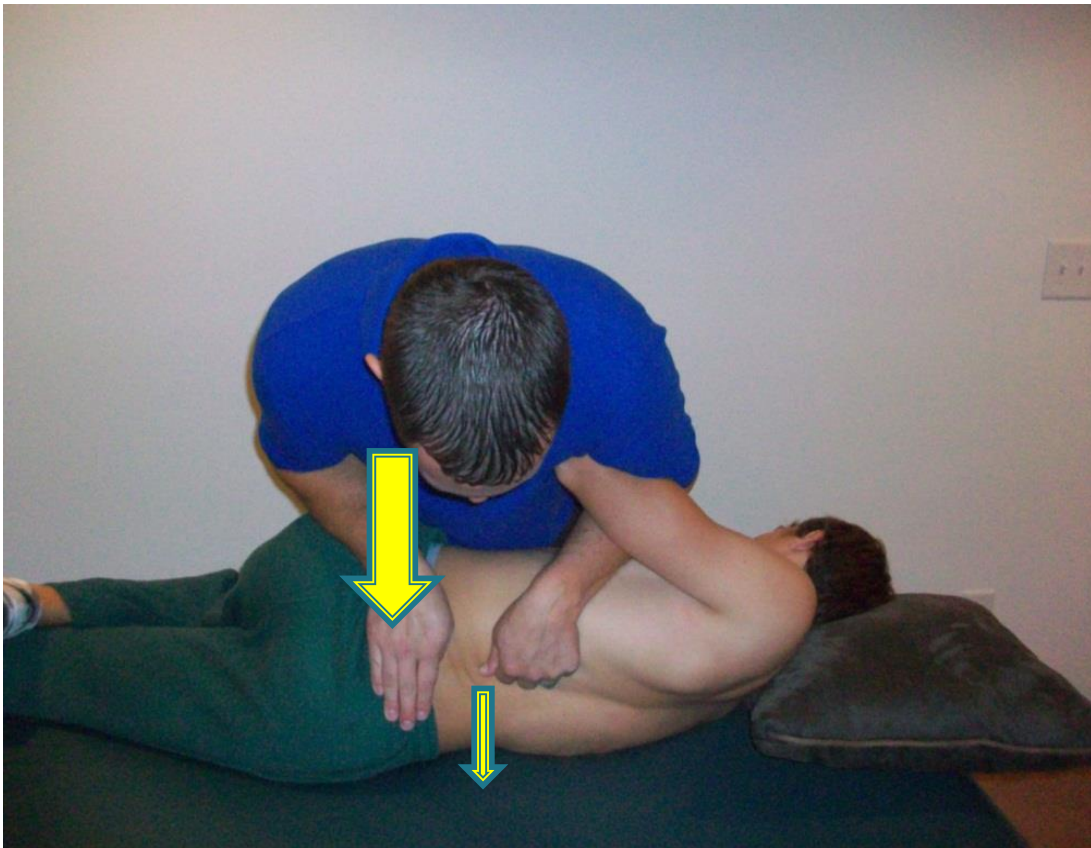
SI Joint Anterior Innominate



SI Joint Anterior Innominate

- ▶ Pt. supine, hands locked behind the head
- ▶ PT stands opposite the involved side
- ▶ PT moves pt's LE's away, and then trunk away to create SB'ing
- ▶ PT laces forearm through pt's arms and rotates the pt towards the PT (do not lose SB'ing)
- ▶ Once ilium begins to lift, thrust it posterior

Lumbar Gapping Mobilization



Lumbar Gapping Mobilization

- ▶ Pt. sidelying, treatment side up
- ▶ Lower leg extended, flex top leg up to the involved level
- ▶ Pull bottom arm away from pt and up to close down to the involved level
- ▶ Cranial thumb on lateral side of the SP, caudal forearm over glute
- ▶ Roll patient to get body weight on top and take up slack
- ▶ Thrust thumb to the table and pull the pelvis anterior with forearm

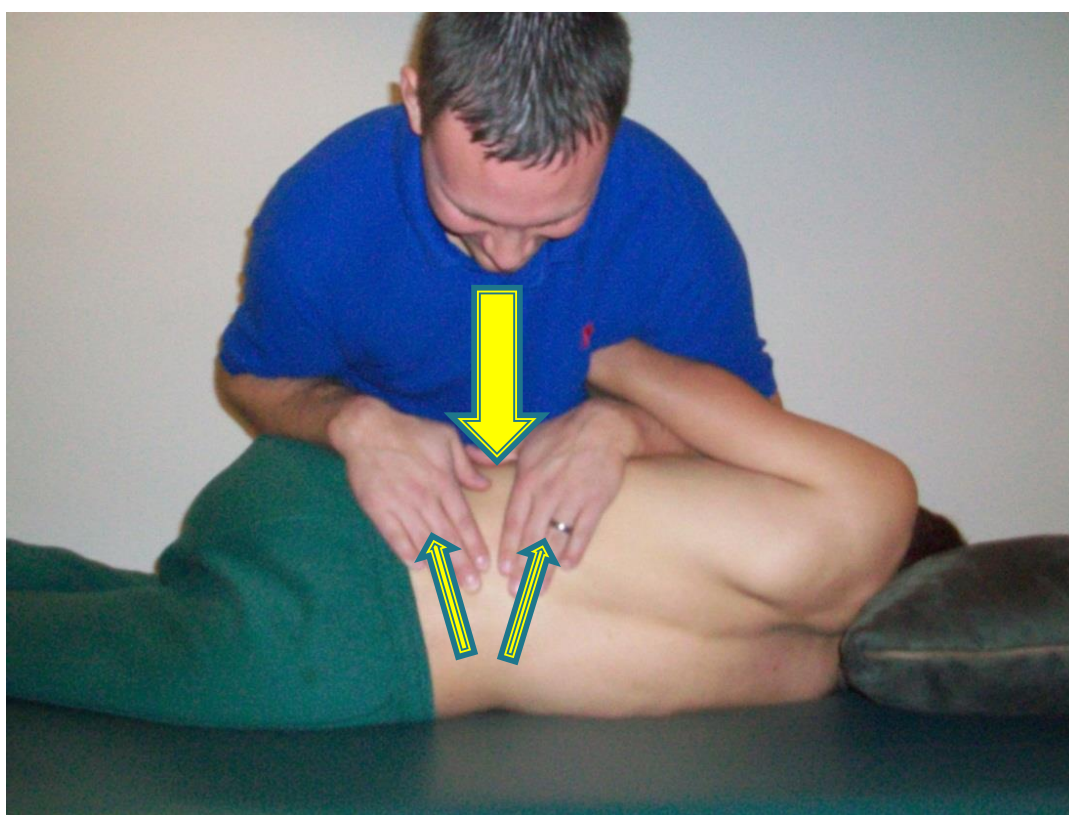
Lumbar Facet Closing



Lumbar Facet Closing

- ▶ Pt sidelying, involved side up
- ▶ Extend bottom leg to close up to the level
- ▶ Pull bottom arm towards ceiling to rotate to the level
- ▶ PT's cranial arm through pt's arms and thumb on SP
- ▶ Caudal forearm on gluteal mass
- ▶ Roll the pt over to get PT's body weight over the pt
- ▶ Thrust the SP towards opposite hip while forearm scoops into a sidebend

Lumbar Opening Mobilization



Lumbar Opening Mobilization

- ▶ Pt. sidelying, treatment side up
- ▶ Lower leg extended, flex top leg up to the involved level
- ▶ Pull bottom arm away from pt and up to close down to the involved level
- ▶ 3rd and 4th fingers lock on SP above and SP below
- ▶ Drop the elbows down and pull hands up to take up slack, then thrust

Case Study #1

- ▶ 27 y/o male; no significant PMHx
- ▶ No cardinal S/S or signs of cord compression
- ▶ Referred to PT with Dx: “low back sprain”
- ▶ MOI– yesterday at work, slipped off of 2nd rung of a ladder and landed on left leg, with the knee extended
- ▶ C.C.– sharp L LBP, which radiates down to L buttock and mid posterior thigh
- ▶ Denies any paresthesias, or pain with cough/sneeze
- ▶ Aggravating factors: prolonged standing, walking, BBending
- ▶ Easing factors: laying flat on back
- ▶ Oswestry: 50% FABQ (W): 28

- ▶ Does this pt appear to be a candidate for HVLA mobs.?
- ▶ What else do you need to know?
- ▶ What mob(s). would you choose?

Case Study #2

- ▶ 38 y/o female; no significant PMHx
- ▶ No cardinal S/S or signs of cord compression
- ▶ Referred to PT with Dx: “lumbar strain”
- ▶ MOI– 3 days ago while picking up son, felt immediate low back pain on return from FBending
- ▶ C.C.– R LBP and some R anterior thigh tingling
- ▶ No pain with cough/sneeze/valsalva; no distal symptoms below knee
- ▶ Aggravating factors: FBending/sitting
- ▶ Easing factors: prone lying
- ▶ Oswestry: 45% FABQ (W): 17

- ▶ Does this pt appear to be a candidate for HVLA mobs.?
- ▶ What else do you need to know?
- ▶ What mob(s). would you choose?

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Appendix– Sacro–Iliac Screen

- Standing Flexion Test



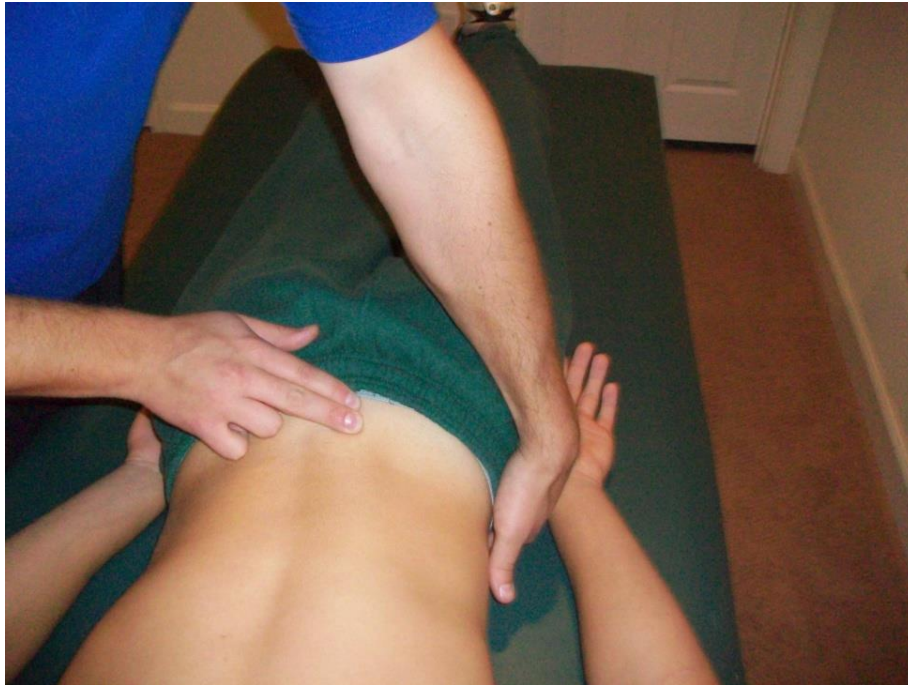
Appendix– Sacro–Iliac Screen

- Deerfield's (Prone Knee Flexion Test)



Appendix– Sacro–Iliac Screen

- ▶ Flick Test



Appendix– Sacro–Iliac Screen

- ▶ Supine to Long–Sit Test



Hypermobility

- ▶ Defined as an increase in a joint's neutral zone
- ▶ Characteristics (S & S) of spinal hypermobility
 - Increased segmental mobility
 - Full physiological motion
 - Pain and/or tightness with prolonged stretch
 - Stiffness helped by exercises
 - Tendency for joint locking
 - Aberrant motion
 - Frequent self-manipulators
 - Excellent but short term relief with HVLA
 - Difficulty with sustained postures

Hypermobility

- ▶ Beighton Scale (clinical Scale for generalized hypermobility)
 - 4/9 criteria is a + test
 - Hands flat on floor with knees straight
 - Both thumbs touch forearms (+1 per thumb)
 - Both little fingers past 90 degrees ext. (+1 per finger)
 - Both elbow and knees hyperextend (+1 each per elbow and knee)

Hypermobility

- ▶ CPR to help predict the likelihood of improvement with lumbar stabilization
- ▶ Developed by Hicks, Fritz, Delitto, McGill

- ▶ 4 variables identified
 - Less than 40 years old
 - SLR over 91 degrees
 - Aberrant motion with trunk AROM
 - Positive prone instability test
- ▶ If 3 of 4 variables are met the +LR is 4.0