Assessment and Treatment of the Lower Quadrant: A Functional Mobilization™ Approach

Alabama Chapter of the American Physical Therapy Association
Birmingham, AL

Presented by:
Michelle Nesin, PT, OCS, FAAOMPT
Janine Nesin, PT, DPT, OCS

Nesin Therapy Services, PC
(256) 461-9654
www.nesintherapy.com
Course Description

Functional Manual Therapy™ is an integrated and artistic intervention which couples *mechanical* treatment of the joints, soft tissues, visceral and neurovascular systems with manual *neuromuscular* facilitation to enhance optimum *motor control* and human function.

Develop your hands-on expertise utilizing Functional Mobilization™ principals and techniques. Emphasis will be on designing treatment programs for patients with lower quadrant dysfunction which are orthopedic or neurological in nature. Participants will be provided with manual skills to enhance their treatment and maximize the patient’s functional mobility. This is an interactive course requiring hands-on participation, allowing all participants to experience and assess functional movement patterns.

Objectives

Upon completion of the course, participants will be able to:

1. Define and state an understanding of the principles of Functional Mobilization™.
2. Identify appropriate Functional Mobilization™ principles to facilitate improved motor response.
3. Assess basic movement dysfunction for neurologic and orthopedic patient populations and design appropriate treatment programs.
4. Demonstrate understanding of home program development utilizing Functional Mobilization™ principles.

Target Audience: PT’s and PTA’s - Lab attire required

About the Speakers

Michelle Nesin, PT, OCS, FCFMT, FAAOMPT - Earned her bachelor’s degree in Physical Therapy for the University of South Alabama in 1989. Since graduation she has been working for Nesin Therapy Services, PC in Huntsville, AL where she is co-owner and Chief Operating Officer. She participated in a 6 month post professional residency in PNF at Kaiser Vallejo, CA in 1992. She became certified in Functional Manual Therapy™ in 1997 and completed her one year IPA Manual Therapy Fellowship studies with Gregg Johnson, PT, FFCFMT in 2001. She became a Board Certified Orthopedic Specialist in 2006, and completed her second AAOMPT Orthopedic manual therapy Fellowship in 2009. She has been teaching for the Institute of Physical Art since 1993 and is a primary instructor in PNF, FM1, Functional Gait and Visceral Functional Manipulation. Her experience has been in rehabilitation for neurologic and orthopedic patient populations of all ages.

Janine Nesin, PT, DPT, OCS- Graduated from Auburn University with a Bachelor of Science in Psychology in 1992 and from Creighton University Omaha, Nebraska with a Doctorate in Physical Therapy in 1996. Janine became a Board-Certified Orthopedic Specialist in 2005. She is a co-owner and CEO of Nesin Therapy Services.
ACKNOWLEDGEMENTS

Janet Nesin: Physical therapist, mother and mentor. She has an innate gift for analyzing human movement. She could literally watch some one walk down the hall and have their entire kinetic chain mapped out, list the problem areas to be addressed, and formulate a treatment plan for the day in under two minutes. She made every geriatric patient work on the floor.

Gregg Johnson, Cheryl Wardlaw and Vicky Johnson: Three fantastic mentors. I hope that you will be so fortunate to have fantastic mentors. They have helped form the PT that I am today. Their instruction, encouragement, and patience have been invaluable. When teaching, my goal is to instill excitement in the material, inspire others to advance and ignite enthusiasm in the possibilities as these three did for me.

Janine Nesin: My sister, Co-Worker and Boss. Janine has made understanding this material possible. She wrote the manual! The hours spent writing this manual was fun because we did it together. Each of us has our talents but together we make a great team! Thank you for being the leader and visionary of our company, Nesin Therapy Services, PC.

Gwen Murphy: For her work in editing this manual. Her passion, enthusiasm and devotion to her patients make her a fantastic coworker and therapist.

Nesin Therapy Services Team: Our Vision to “Set the standard of excellence for the nation as a model Physical Therapy practice” is performed every day. Each day I get to witness miracles happen in patients’ lives. I want to thank each and every one of my coworkers who make that happen.

Gwen Murphy and Lauren Roy: My faithful coworkers and fellow PT’s, you make this job worth it! I express my thanks for taking the time to lab assist and volunteer your time to inspire others.
INTRODUCTION

**Functional mobilization™** - Using assisted, active or resisted motions to assist with mobilization.

This is a dynamic approach which utilizes the primary principles of PNF for localizing the layer of the restriction, finding the specific direction of the restriction, using a dynamic functional movement that precisely focuses force into the restriction for mobilization, and following with neuromuscular re-education in new range.

Each movement segment is assessed for mechanical or neuromuscular dysfunction and treated accordingly. It is important to normalize any dysfunctions of the other segments utilized in treatment, prior to treating area of focus. For example: you must treat dysfunctions of the hip prior to using hip rotation to mobilize the innominate. “Never treat through a dirty lever arm”.

As with all functional movement, we progress from non-weight bearing to weight bearing activities.

Specificity is the key. The more detailed you are in discerning the direction of a restriction, the more success you will have with this approach.

Your hands are your most important tool and precise palpation takes time and practice. You will not be disappointed with the results of your treatment.

---

TABLE OF CONTENTS

**Functional Assessment and Tests**..................................................................................................pg. 05
**Coccyx**........................................................................................................................................pg. 11
**Sacrum**.........................................................................................................................................pg. 18
**Innominate**.....................................................................................................................................pg. 25
**Hip**................................................................................................................................................pg. 31
**Knee**..............................................................................................................................................pg. 41
**Ankle**............................................................................................................................................pg. 46
**Foot**................................................................................................................................................pg. 52
FUNCTIONAL TESTING OF LOWER QUADRANT

POSTURAL ASSESSMENT

- Foot/Ankle
- Knee
- Hip
- Pelvis
- Lumbar spine (posterior)/abdomen (anterior)
- Thoracic cage

<table>
<thead>
<tr>
<th>Posterior View:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot and Ankle Position:</td>
</tr>
<tr>
<td>□ Calcaneal inversion</td>
</tr>
<tr>
<td>□ Calcaneal Eversion</td>
</tr>
<tr>
<td>□ Pronation</td>
</tr>
<tr>
<td>□ Supination</td>
</tr>
<tr>
<td>Knee Position:</td>
</tr>
<tr>
<td>□ Varus</td>
</tr>
<tr>
<td>□ Valgus</td>
</tr>
<tr>
<td>□ Tibial ER</td>
</tr>
<tr>
<td>□ Tibial IR</td>
</tr>
<tr>
<td>Hip Position:</td>
</tr>
<tr>
<td>□ Hip IR</td>
</tr>
<tr>
<td>□ Hip ER</td>
</tr>
<tr>
<td>□ Hip Abducted</td>
</tr>
<tr>
<td>□ Hip adducted</td>
</tr>
<tr>
<td>Pelvis Position:</td>
</tr>
<tr>
<td>□ Iliac Crest:</td>
</tr>
<tr>
<td>□ L elevated</td>
</tr>
<tr>
<td>□ R elevated</td>
</tr>
<tr>
<td>□ level</td>
</tr>
<tr>
<td>□ Greater trochanter:</td>
</tr>
<tr>
<td>□ L high</td>
</tr>
<tr>
<td>□ R high</td>
</tr>
<tr>
<td>□ Level</td>
</tr>
<tr>
<td>□ PSIS</td>
</tr>
<tr>
<td>□ L superior</td>
</tr>
<tr>
<td>□ R superior</td>
</tr>
<tr>
<td>□ Level</td>
</tr>
<tr>
<td>□ Gluteal folds</td>
</tr>
<tr>
<td>□ L lower</td>
</tr>
<tr>
<td>□ R lower</td>
</tr>
<tr>
<td>□ Level</td>
</tr>
<tr>
<td>Lumbar Spine:</td>
</tr>
<tr>
<td>□ R sheer</td>
</tr>
<tr>
<td>□ L sheer</td>
</tr>
<tr>
<td>□ R rotation</td>
</tr>
<tr>
<td>□ L rotation</td>
</tr>
<tr>
<td>□ Flexed</td>
</tr>
<tr>
<td>□ Extended</td>
</tr>
<tr>
<td>Thoracic Cage:</td>
</tr>
<tr>
<td>□ R rotation</td>
</tr>
<tr>
<td>□ L rotation</td>
</tr>
<tr>
<td>□ Kyphotic</td>
</tr>
<tr>
<td>□ Scoliosis</td>
</tr>
</tbody>
</table>
### Anterior View:

<table>
<thead>
<tr>
<th>Foot and Ankle Position</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pronation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supination</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knee Position</th>
<th>Varus</th>
<th>Valgus</th>
<th>Tibial ER</th>
<th>Tibial IR</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Hip Position</th>
<th>Hip IR</th>
<th>Hip ER</th>
<th>Hip Adducted</th>
<th>Hip Adducted</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pelvis Position</th>
<th>ASIS</th>
<th>L superior</th>
<th>R superior</th>
<th>Level</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Abdominal Region</th>
<th>Linea alba:</th>
<th>Contour:</th>
<th>Symmetry:</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Lateral View:

<table>
<thead>
<tr>
<th>Foot and Ankle Position</th>
<th>Weight Bearing:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heel</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mid-foot</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Forefoot</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knee Position</th>
<th>Flexion</th>
<th>Extension</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Pelvis Position</th>
<th>Anterior tilt</th>
<th>Posterior tilt</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Thoracic/Lumbar Alignment</th>
<th>Flattened</th>
<th>Hyperlordosis</th>
<th>Normal</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Thoracic Cage</th>
<th>Sternum:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                         | Kyphotic |     |     |
|                         |          |     |     |
|                         |          |     |     |

|                         | Extended |     |     |
|                         |          |     |     |
GAIT ANALYSIS

- Reciprocal patterns:
  - Anterior elevation of pelvis combines with ipsilateral posterior depression of scapula (trunk shortening)
  - Posterior depression of pelvis combines with ipsilateral anterior elevation of scapula (trunk lengthening)

- Efficient Pelvis during gait:
  - Toe off – Anterior elevation
  - Swing phase – Anterior elevation
  - Heel strike – Anterior depression
  - Stance phase – Posterior depression
  - Double stance /terminal stance – Posterior elevation

ILIAC CREST and GREATER TROCHANTER HEIGHTS

**Purpose:** Tests for pelvic girdle dysfunction.

**Efficient:** Iliac crest (IC) height equal bilaterally, greater trochanters (GT) equal bilaterally.

**Inefficient:** A difference in IC height but not in GT height indicates pelvic girdle dysfunction. A difference in both indicates leg length discrepancy.

**Position:** Patient standing with Therapist behind. IC: Index fingers over top of iliac crests and thumbs on PSIS B and assess height. GT: Index fingers over top of GT’s and assess height. If difficulty locating GT, have patient internally and externally rotate hip.

LEG SWING

**Purpose:** Tests innominate mobility.

**Efficient:** End ranges are reached smoothly without abrupt stops. ASIS and PSIS are level.

**Inefficient:** Limited range, abrupt stop, poor coordination or unlevel ASIS and PSIS.

**Position:** Patient standing holding wall/rail with opposite hand of side being tested, with enough space to accommodate leg swinging freely. Therapist is at patient’s side palpating ASIS and PSIS to assess innominate mobility while patient swings leg from flexion to extension. Also observe hip end range of motion and quality of movement.
Alternatives: Assess with hip in internal rotation and external rotation to identify rotational dysfunctions.

**Gait Assessment:**

<table>
<thead>
<tr>
<th>Pelvic Motions</th>
<th>Anterior elevation (Swing Phase):</th>
<th>Posterior Depression (Mid-Stance, Wt Acceptance, Push Off):</th>
<th>Anterior Depression (Deceleration to heel contact):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rotation</td>
<td>Rotation</td>
<td>Rotation</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innominate Motions</th>
<th>Swing Phase:</th>
<th>Stance Phase:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Extension</td>
<td>IR</td>
</tr>
<tr>
<td>ER</td>
<td>Abduction</td>
<td>(minimal)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leg Swing Test (check if limited)</th>
<th>R Innominate:</th>
<th>L Innominate:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Neutral:</td>
<td>Hip Neutral:</td>
<td></td>
</tr>
<tr>
<td>Flexion</td>
<td>Flexion</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td>Extension</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hip IR:</th>
<th>Hip IR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Flexion</td>
</tr>
<tr>
<td>Extension</td>
<td>Extension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hip ER:</th>
<th>Hip ER:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td>Flexion</td>
</tr>
<tr>
<td>Extension</td>
<td>Extension</td>
</tr>
</tbody>
</table>
VERTICAL COMPRESSION TEST  (Gregory Johnson and Vicky Saliba Johnson)

**Purpose:** Tests translation of force through the frame with vertical load, efficiency of the structure in the absence of muscle contraction.

*Efficient:* Force translates evenly into base of support (BOS) (feet if standing)

*Inefficient:* Will see sidebending, rotation, pelvic shear, or hard end feel (guarding).

**Position:** Patient standing in their natural stance, avoiding bending knees. “Relax everything except your knees.” Therapist stands behind patient on chair or treatment table to allow them to apply vertical pressure without bias towards flexion or extension. Hand contact between 1st rib and acromion, forearms vertical. Slowly apply pressure until feel weight distributed into BOS or until patient’s frame gives way. If patient gives way, do not continue to apply additional force.

**Alternatives:** Assess in sitting.

---

ELBOW FLEXION TEST  (Gregory Johnson and Vicky Saliba Johnson)

**Purpose:** To assess alignment, stability and balance.

*Efficient:* Able to maintain elbow position, shoulder girdle/scapula and spine remain stable and no loss of balance.

*Inefficient:* Unable to maintain elbow, shoulder girdle/scapula position, instability of spine and/or loss of balance.

**Position:** Patient standing with elbow bent at 90 deg, forearms supinated, humerus perpendicular to floor, and any watches or jewelry removed from wrists. Therapist is facing patient, with hands placed on distal forearm of patient with hand flat and therapist’s forearms perpendicular to floor. Often requires therapist to rise up on toes or stand on stool to allow for perpendicular force to be applied from above. Therapist says “Don’t let me straighten your elbows.” Gradually increase vertical pressure.
Alternatives: Therapist squats in front of patient, with resistance applied from below with lumbrical grip.

LUMBAR PROTECTIVE MECHANISM  (Gregory Johnson and Vicky Saliba Johnson)

**Purpose:** Assess automatic trunk response to external force. **Efficient:** Immediate initiation, 5/5 strength and endurance.  
**Inefficient:** Unable to maintain stable trunk with external force. May see inefficiencies in initiation, strength or endurance.  
**Position:** Patient in staggered stance position, approximately same width and length as normal stride. Therapist stands facing patient, mirroring stance position, placing flat hands on anterior aspect of patient’s shoulders below coracoid process. Therapist says “Stand there, don’t let me move you.” Quickly apply with appropriate force, pushing backward in diagonal to test initiation. Avoid pushing with more force than necessary and causing patient to fall backwards. If initiation is poor, repeat with gradually increasing resistance to assess strength and/or endurance. Repeat with feet in opposite staggered stance position to test opposite diagonal.

Alternatives: Can test posterior trunk response by placing hands on scapula and pulling forward.
COCCYX

(Remember to educate and obtain consent due to positioning and hand placement for treatment.)

Indications

- Coccydynia
- History of trauma, fall on buttocks
- Coccyx injury or fracture
- Patient’s pain worsens with sitting
- Patient’s pain worsens with standing
- Neural tension
- Unresolved low back pain
- Unresolved hip pain
- Pelvic floor pain - male or female
- Long history of bowel problems or constipation
- Surgery, Pilonidal cyst

Anatomy and Considerations

- Dural attachment from foramen magnum to coccyx.
- Filum terminale, and actual piece of spinal cord attaching through middle of coccyx
- Tension of pelvic floor influence (show on mobile pelvis) ligaments and muscles
- Coccyx moves with sacrum
- Sections of coccyx, synovial joints and discs.
- Dysfunctions of coccyx- Compression/Rotation/Deviation/Flexion/Extension
- Can be in multiple pieces, or multi-segmental dysfunction
- What it does to the positioning of sacrum, spine and pelvic organs?
- Diaphragm, abdominal corset and pelvic floor work together for lumbar stability
- Glut max attaches to the coccyx, therefore dysfunction changes tension on glut max and the thoracodorsal fascia, a primary stabilizer of the lumbar spine/sacral spine region
- Normal moves from 5-22 degrees in flexion and 5-15 degrees extension
- Must treat in WB and NWB positions. 3 positions
Assessment and Treatment of the Lower Quadrant: A Functional Mobilization™ Approach

The Pelvic Diaphragm = the deepest muscle layer

Superior View of Female Pelvis
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Leg Swing
- LPM
- VCT
- Iliac Crest/Greater Trochanter Height
- Palpation Assessment

COCCYX ASSESSMENT AND TREATMENT IN PRONE

Purpose: Evaluate direction of restriction

Position: Patient in prone, therapist at side.

Technique:

Soft Tissue Mobilization™ (STM) - Sacral sulcus and lateral borders of coccyx.

Decompression – Assess ability to distract Coccyx from sacrum and end-feel, using caudad to caudle force. Manual pressure applied in direction of restriction (hard end-feel), using LE movements to assist such as ipsilateral (I) hip rotation with knee flexed or bilateral (B) knee flexion/extension. Rotation – Pressure in direction of restriction with (I) hip rotation with knee flexed, resistance to motion for further localization. Posterior shear- Direction of restriction with B knee flexion/extension or B hip rotation with knees flexed.
Neuromuscular re-education: Isometric or concentric/eccentric isotonic hip rotation in new range.

COCCYX FLEXION

Purpose: Correct coccyx which is locked in extension. Technique can also be used to correct for posterior shear
Position: Patient in prone
Technique: Pressure applied to body of coccyx in arching motion with B knee flexion/extension.

Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

COCCYX EXTENSION

Purpose: Correct coccyx which is locked in flexion
Position: Patient on hands and knees with feet off table. Therapist standing at side and behind.
Technique: Finger under tip of coccyx in direction of hardest end-feel. Caution with osteoporosis. Movements can include cat/camel lumbopelvic motion, or rocking forward and back.
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.
Alternatives: Sidelying position with upper leg forward to access coccyx.

COCCYX DEVIATION IN SIDELYING

Purpose: Correct coccyx which is deviated laterally (sidebent)
Position: Patient is sidelying with deviated side up, knee flexed.
Technique: Pressure on lateral border of coccyx at hardest restriction, directed toward midline. Localize with LE flexion/extansion or hip IR/ER.

Neuromuscular re-education: Basking seal (pelvis Anterior elevation /Posterior depression with B or 1 hip rotation in sidelying)

COCCYX WITH NEURAL TENSION

Purpose: Correct coccyx which is affected by neural tension stretch. Coccyx moves when patient performs SLR in sitting or sidelying.
Technique: Palpate coccyx during pressure on/pressure off of neural tension stretch. Determine direction of pull on coccyx with neural tension stretch; apply counter-pressure in the direction of greatest pull.
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.
Alternatives: Coccyx in sitting with neural tension stretch.
SACRUM

Indications

- SI joint pain
- Patient’s pain worsens with sitting
- Patient’s pain worsens with standing
- Neural tension
- Unresolved low back pain
- Unresolved hip pain
- Pelvic Floor pain - male or female
- Lower extremity radicular symptoms
- Pain difficulty with transfers, supine to sit, sit to stand, in/out car
- Pregnancy

Anatomy and Considerations

- Sacrum moves with lumbar spine
- Sacrum can be limited segmentally in mobility
- Sacral compression can occur with injury
- Pelvic organs sit just anterior to sacrum
- Torsion of sacrum affects both viscera and bony components
- Effects on thoracodorsal fascia
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Leg Swing
- LPM
- VCT
- H.I.S.L.
- Lateral Shear

SACRAL POSTERIOR to ANTERIOR ASSESSMENT AND TREATMENT: POSITION 1

**Purpose:** Bilateral assessment and treatment of sacrum.

**Position:** Patient in hooklying. Therapist palm placed under sacrum with fingertips at L5/S1. Identify area of hardest end-feel.

**Technique:** Localize with palpating/treating hand, with pressure at area of hardest end-feel and in direction of restriction, resist LE extension by placing patient’s foot against therapist’s anterior shoulder, with patient pushing gently (10% effort) against shoulder while maintaining pressure at sacrum with treating hand.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Therapist can resist with assisting hand further localizing with different LE movements. Patient can perform self-resistance by grasping legs and resisting extension.
SACRAL POSTERIOR to ANTERIOR ASSESSMENT AND TREATMENT: POSITION 2

**Purpose:** Unilateral assessment and treatment of sacrum.

**Position:** Patient in hooklying, therapist at side. Level the pelvis with support underneath opposite side with folded towel or pad. Place hands underneath sacrum with fingers cupped and overlapping for support, finger pads in contact with sacrum just medial to SI joint. Fingers spring upward to assess end-feel in superior, middle and inferior aspects of sacrum. Repeat on opposite side.

**Technique:** After identifying areas of hard end-feel, maintain pressure on restriction and have patient perform LE movements to further localize and mobilize. For example, slowly flex/extend leg, sliding foot on table until point of greatest restriction found. Plant foot and perform hip rotation at this point.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Can use half foam roller (Small superball) or Sacro-Wedgy® if too much pressure on fingers.

---

SACRAL POSTERIOR to ANTERIOR ASSESSMENT AND TREATMENT IN PRONE

**Purpose:** Unilateral assessment and treatment of sacrum.

**Position:** Patient prone, therapist at side. Therapist thumbs together for support, spring test superior, middle and inferior section of sacrum and identify restrictions. Repeat opposite side.

**Technique:** Maintain pressure on restricted section. Patient bends knees and performs B hip rotation or repeated knee flexion/extension. Therapist can assist or resist with one hand if additional localization is needed.

**Neuro re-ed:** Isometric or concentric/eccentric isotonic hip rotation in new range.
CAUDAL GLIDE OF SACRUM

**Purpose:** Assess and treat caudal glide of sacrum.

**Position:** Patient prone, therapist at patient’s head hands on proximal sacrum.

**Technique:** Apply caudal pressure to sacrum, one thumb on each side of base of sacrum, patient bends knees and perform B hip rotation. In efficient state, the sacrum remains springy and does not get pulled cranially. If dysfunctional, will be pulled cranially and have hard end-feel, either unilaterally or bilaterally. Localize dysfunction, treat by maintaining pressure caudally and continue with B hip rotation until end-feel improves and/or range is gained.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:**

SACRAL EXTENSION IN PRONE

**Purpose:** Technique to specifically address ability to assume form closure position of sacrum.

As patient bends their knees, in an efficient state you should feel the sacrum move anterior, towards the table. If inefficient, the sacrum will move up towards the treatment hand.

**Position:** Patient in prone with ½ foam roller under ASIS, knees bent. Therapist at side, applying pressure to superior aspect of sacrum.

**Technique:** Stabilize innominates with ½ foam roller under ASIS B. Assess PA mobility of upper, mid and lower sacrum. Isolate location, direction, and angle but flexing knees passively. Once restriction is isolated, then resist B knee extension.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.
INNOMINATE

Indications

- Lumbar pain
- Thoracic pain
- Hip pain
- Knee pain
- Abdominal pain
- Lower extremity radicular pain
- Altered gait pattern
- Trauma,
- History of fall onto buttock
- MVA
- Pregnancy

Anatomy and Considerations

- Innominate moves with hip
- Position of innominate drives lower extremity positions
- Position of innominate drives core activation of trunk
- Pelvic girdle contents
- Stress transfer through the system- efficient or inefficient
- Pelvis primary base of support in sitting and standing
- Insertion of powerful muscles in the hip
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Leg Swing
- LPM
- VCT
- H.I.S.L.
- Lateral Shear

H.I.S.L. TEST

Purpose: Test for mobility of Hip, Innominate, Sacrum, and L5/S1 (HISL). In the HISL 20 degree rule for efficient pelvic girdle mobility: hip motion is efficient when 110 degrees is achieved, innominate motion begins at 110 degrees, sacral motion at 130 degrees, S1/L5 flexion sequencing at 150 degrees.
**Position:** Patient in supine. Therapist places hand under innominate with fingers on upper sacrum and lower lumbar segments to assess movement. Begin test holding hip at 90 deg flexion with assisting hand.

**Technique:** While palpating for movement, slowly flex hip further. Innominate should begin to move at approximately 110 deg. If happens sooner, possible hip restrictions (joint or soft tissue). If happens later, possible hypermobility. Sacrum should begin to move at 130 deg, L5/S1 at 150 deg. Identify specific restrictions of hip, innominate, or sacrum for further assessment and treatment.

---

**INNOMINATE FLEXION**

**Purpose:** Treat restrictions in innominate flexion identified by HISL test.

**Position:** Patient in supine.

**Technique:** Fixate sacrum with fingers, Sacro-Wedgy®, or towel roll. Assisting hand on ASIS or posterior thigh. Localize innominate restriction and assist with pressure on ASIS or posterior thigh to enhance innominate flexion. Mobilize using resisted hip extension, either patient self-resists or therapist resists with hand on posterior thigh or foot on shoulder.
Alternatives: Innominate flexion performed in quadruped. One hand at ASIS and other at ischial tuberosity, enhancing innominate flexion while patient rocks towards heels and forward. 
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

INNOMINATE EXTENSION TEST AND TREATMENT IN PRONE

Purpose: Efficient extension occurs at approximately 20 deg increments from hip, innominate, sacrum, to lumbar spine.
Position: Patient in prone, therapist positioned adjacent affected side or patient in ½ prone with opposite leg off bed, therapist adjacent unaffected side. Patient’s knee flexed.
Technique: Extend hip to end range, using hip ABD or ADD to further localize restriction. Use half foam roll under patient’s distal thigh as shown below or therapist may prop knee on bed and place patient’s leg onto thigh, reducing strain on therapist.
Technique: Localize innominate restriction at PSIS. Use isometric hip flexion to mobilize innominate into extension. Avoid pelvis rising off bed.

Alternatives: Use strap at distal thigh to assist with supporting hip extension and resisting hip flexion.
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

INNOMINATE EXTENSION IN SIDELYING

Purpose: Improve innominate extension.
Position: Patient sidelying with affected side up, therapist behind patient. Lower leg positioned and held by patient in
full flexion.

**Technique:** Localize innominate restriction palpating at PSIS, therapist’s hand on dorsum of patient’s foot, extending hip with knee flexed to ~ 90 degrees. Apply posterior to anterior pressure at PSIS while resisting hip flexion.

**Neuro re-ed:** Resist hip extension in new range.

---

**ISCHIAL SPREAD BILATERAL**

**Purpose:** Assess and treat restrictions in innominate, hip abduction, or pelvic floor mobility. Remember to educate and obtain consent due to positioning and hand placement for treatment.

**Position:** Patient in supine holding hips in flexion and abduction with hands. Therapist below with hands in “butterfly” position, fingers on medial aspect bilateral ischium.

**Technique:** Assess position of ischium in relative ADD or ABD. Spring test to identify restrictions in mobility. Apply pressure to restricted side, stabilizing opposite side, while patient performs hip movement from flexion/abduction to extension/adduction or self-resists extension/adduction.

**Alternatives:** Perform in quadruped, localizing restriction with lumbar flexion and extension (anterior/posterior tilt pelvis), sidebending, and rocking back towards heels and forward. Unilateral Ischial Spread Assess end-feel, with force applied pulling laterally. Address restriction with sustained pull while resisting adduction/external rotation of hip.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.
INNOMINATE GAPPING FROM SACRUM

**Purpose:** The innominate should gap away from sacrum with Hip/innominate IR. If dysfunctional, innominate will not gap away and will have hard end-feel.

**Position:** Patient in prone. Therapist at side palpating opposite SI joint. Localize restriction by palpating along line of innominate where joins sacrum, while assisting hand moves hip into IR feeling for hard end-feel on spring test.

**Technique:** Gap or mobilize innominate from sacrum using passive hip IR or resisted hip ER while stabilizing sacrum with thumb or fingers.

![Image of innominate gapping from sacrum](image)

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Localize restriction of innominate; apply pressure in direction of hard end-feel. Patient performs “military crawl” LE movement pattern.

---

CAUDAL GLIDE OF INNOMINATE ON SACRUM

**Purpose:** To assess and treat caudal glide of innominate.

**Position:** Patient prone, therapist at head.

**Technique:** Palpate iliac crest just superolateral to sacrum working laterally. Check end-feel with inferior glide. If restricted, isolate direction of restriction and apply pressure combined with unilateral hip rotation on same side.

![Image of caudal glide of innominate on sacrum](image)
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

Alternatives: Percussive mobilization with Kong. ½ Foam roller under distal thigh for additional leverage.

---

**PUBIC RAMUS**

**Purpose:** Assess and treat restrictions in pubic ramus mobility.

**Position:** Patient supine, hooklying. Therapist standing on opposite side of affected ramus. Fingertips of treating hand on pubic ramus, opposite hand passively flexing /adducting patient’s hip (s).

**Technique:** If hard end-feel, apply pressure to the ramus in direction of restriction with treating hand and resist hip extension/abduction with assisting hand.

Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

Alternatives:
HIP

Indications

- Lumbar pain
- Hip/groin pain
- Knee pain
- Foot/ankle pain
- Pelvic girdle obliquity
- History of falls or fractures in LE

Anatomy and Considerations

- Can be a primary restrictor of pelvic girdle or lumbar spine mobility
- Most important joint to keep mobile as you age
- If lose IR of the hip and lose stability of lumbar spine
- IR must be present for efficient gait and stabilization of pelvis in stance
- Cannot get posterior depression and therefore core activation without efficient hip mobility
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Knee Tracking
- H.I.S.L.
- **Hip Flexion:** Remember HISL. Hip flexion restricted if innominate moves before 110 deg of flexion. Particularly if patient has symptoms of anterior impingement at hip, address all 4 of following structures/techniques that address hip flexion dysfunctions.

POSTERIOR SOFT TISSUE STRUCTURES

**Purpose:** Address restrictions in the posterior soft tissues of the hip that may be contributing to restrictions in hip flexion ROM.

**Position:** Patient in supine, therapist at side flexing patient’s hip.

**Technique:** Assess in flexion with ABD and ADD for most restricted position, trace and isolate soft tissue restrictions posterior proximal thigh. Treat restrictions while performing isometric resisted hip extension.
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

Alternatives: Assess SLR and treat associated restrictions. May also use hip ABD and ADD to localize most restricted tissues.

---

**INNOMINATE AND ILIACUS MOBILITY USING EXTERNAL ROTATION**

**Purpose:** Address restrictions in iliacus and innominate with hip ER.

**Position:** Patient in supine, hip flexed with foot on table (unilateral hooklying). Therapist at side.

**Technique:** Mobilize iliacus with patient performing repeated hip external rotation (knee rolling out to side and back into starting position). Mobilize innominate at ASIS in restricted direction using same movement pattern.

Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

Alternatives:
INGUINAL LIGAMENT AND PSOAS TENDON MOBILITY

**Purpose:** Address restrictions in inguinal ligament and psoas tendon.

**Position:** Patient in supine, hip flexed with foot on table (unilateral hooklying). Therapist at side.

**Technique:** Assess *psoas* mobility medially/laterally; treat restrictions found in psoas muscle and tendon particularly at insertion on lesser tubercle using isometric hip flexion or heel slides. Assess and treat *inguinal ligament* mobility/restrictions and *psoas tendon* mobility/restriction as it passes beneath inguinal ligament. Use hip external rotation or heel slides to assist with mobilization.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:**

INFERIOR GLIDE OF FEMORAL HEAD IN FLEXION

**Purpose:** Address hip capsule inferior glide restrictions

**Position:** Patient supine, effected hip close to edge of bed, hip flexed to barrier/restriction with therapist sitting below and patient’s leg propped on therapist’s shoulder. Utilize hip ABD/ADD and IR/ER to further localize restriction.

**Technique:** Therapist wraps hands around hip, pulling inferiorly. Patient place hand on knee and self-resists hip flexion, creating fulcrum.
Neuro re-ed: Isometric hold at “new” end range hip flexion
Alternatives: Use strap at proximal thigh to assist with inferior glide/distraction.

STRAP CLOCK FOR CAPSULAR ASSESSMENT AND TREATMENT

Purpose: Address multi-directional hip capsule restrictions, particularly those affecting hip flexion mobility.
Position: Patient supine with hip flexed to 90 deg affected hip close to edge of bed. Using towel to pad strap, place strap around patient’s proximal thigh and around therapist’s pelvis.
Technique: Assess and treat any restrictions in capsular mobility with inferior, lateral, and superior distraction of strap while resisting combination of hip flexion/extension, ABD/ADD, IR/ER.

Neuro re-ed: Isometric hold at “new” end range

POSTERIOR MOBILITY OF HIP USING INTERNAL ROTATION

Purpose: Assess and treat restrictions of hip internal rotation.
Position: Patient in supine, opposite leg flexed with foot on table. Therapist at side with treating hand over anterior hip capsule, greater trochanter.
Technique: Therapist applies anterior to posterior force to anterior hip/greater trochanter while patient performs hip IR “without lifting thigh off bed, straight rotation.”
Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

HIP EXTENSION IN PRONE

**Purpose:** Mobilization to improve hip extension mobility.

**Position:** Patient in prone, therapist at side. May place ½ foam roll under patient’s distal thigh. Bend knee and extend hip into barrier.

**Technique:** Apply posterior to anterior force to posterior hip, patient performs isometric hip flexion or knee extension.

Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

HIP EXTERNAL ROTATION USING PA FORCE

**Purpose:** Address restrictions in hip external rotation.

**Position:** Patient in prone, hip abducted and externally rotated, knee bent to 90 deg. Therapist at side with treated fist on posterior hip.
**Technique:** Apply PA force through hip using while patient performs active or assisted hip ER. Localize further with hip in ER, resisting IR or ER with assisting hand.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

---

**HIP EXTENSION/THOMAS TEST POSITION**

**Purpose:** Address soft tissue restrictions anteriorly which impede hip extension.

**Position:** Place patient in Thomas Test position on edge/end of table with opposite foot braced on therapist’s trunk/shoulder.

**Technique:** Trace and isolate soft tissue restrictions with treating hand while gradually increasing stretch into hip extension, enhance stretch by resisting hip flexion.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

---

**HIP EXTERNAL ROTATION IN PRONE USING FROG LEG MOVEMENT PATTERN**

**Purpose:** Assess and treat restrictions in hip flexion and ER mobility.

**Position:** Patient in prone, performs repeated frog-leg, hip abduction, ER with hip/knee flexion. Therapist and patient assess areas of greatest restriction during movement.
**Technique:** With treating hand therapist applies pressure in the direction of most restriction. Assist patient in performing repeated frog-leg movement pattern with repeated hip/knee flexion. Patient typically requires assistance with this movement pattern.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

---

**INFERIOR GLIDE OF HIP IN SIDELYING**

**Purpose:** Restore hip abduction mobility, critical for treating patients with lumbopelvic dysfunction and limited pelvic shear. Address soft tissue restrictions including ITB and hip capsule prior to this technique.

**Position:** Patient in sidelying, pelvis stabilized by patient using hand to maintain lower leg hip and knee in flexed position. Therapist at side, propping foot on bed, raising patient’s leg into abduction with therapist’s arm supporting patient’s thigh, with caution to avoid compensatory hip ER.

**Technique:** Therapist applies sustained caudal force against greater trochanter, resisting hip adduction.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Use strap at greater trochanter and therapists’ foot to assist with inferior glide in this position. Therapist can also prop patient’s leg on Swiss ball, allowing both hands to be free for treatment.
POSTERIOR DEPRESSION SERIES

**Purpose:** Improve weight bearing and weight acceptance into stance leg in gait. Improve efficiency of trunk stability and core activation onto stable limb in gait.

**Position:** Patient in sidelying, with posterior depression of pelvis will later work towards posterior depression through extended leg.

**Technique:** Develop hold into posterior depression of pelvis. Perform eccentric, concentric and stabilization holds all the while maintaining posterior depression. Next bring patients leg into an extended position (only as far as the lumbar spine does not go into extension!). Once you are approximating through the leg into the pelvic girdle have patient repeat pelvic posterior depression eccentric, concentric and isometric holds.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Progress to mobility at hip, knee and ankle as appropriate all the while maintaining a stable pelvis into posterior depression.
KNEE

Indications

- Knee pain
- Hip pain
- Foot/ankle pain
- Falls/fractures/twisting injuries
- Lumbar pain
- Previous surgery

Anatomy and Considerations

- Hinge joint
- Often weak link/“victim” in the chain
- Caught between dysfunctional hip/pelvis or foot/ankle
- Breaks down secondary to altered mechanics over time
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Knee Tracking
- VCT
- LPM

KNEE TRACKING

**Purpose:** Assess and treat knee tracking in standing, observe for dysfunctional motions and torsions. Knee should track approximately over second toe during efficient squatting.

**Position:** Patient in standing, therapist kneeling behind. Place hands on either side of structure assessing and follow direction of motion as patient performs repeated mini-squats. Observe direction of tracking of femur, patella, and tibia.

**Technique:** Palpate and treat any soft tissue dysfunctions during knee tracking.
MOBILIZATION OF TIBIA AND FEMUR

**Purpose:** Assess AP glide of tibia and femur relative to one another.

**Position:** Patient in supine, therapist at side. Support under heel and leg with ½ foam roll or towel roll as needed.

**Technique:** Assess femur on tibia, and vice versa, to localize dysfunction. Mobilize with active PF/DF or knee flexion.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Assess PA glide in prone; medial and lateral in sidelying. Mobilize as needed.

MENISCAL MOBILIZATION

**Purpose:** Evaluate and treat medial and lateral meniscus. This technique “flattens out” the meniscus. Also can be one indicator of whether additional intervention may be required. If patient’s sx are not alleviated by this technique in 4-6
visits, may require additional medical intervention (i.e. surgery).

**Position:** Patient in sidelying facing away, therapist behind at knee. LE supported by foam roll as needed to level LE.

**Technique:** Grasping distal femur and proximal tibia, approximate (compress) tibiofemoral joint while patient performs repeated knee flexion to extension.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

---

**PATELLAR GLIDES**

**Purpose:** Assess and treat restrictions in patellar mobility.

**Position:** Patient in supine with ½ foam roll or towel roll under knee.

**Technique:** Perform STM to bony contours around patella to clear first. Place thumbs on inferior pole of patella, apply force in superior direction while patient performs slight active knee flexion. Alternative grasp: therapist can also create cup or “V” out of thumb and index finger and grasp inferior pole. Repeat at superior pole, force applied in inferior direction. Patient performs slight active knee flexion. Alternative grasp applies as well.

**Neuro re-ed:** Patellar tracking exercises. In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives:** Can assess and treat in diagonals, or medial and lateral glide. As always, use appropriate force, particularly with medial and lateral glide. In addition, can address patellar tilt or gapping (plunger).

---

**FIBULAR HEAD INFERIOR GLIDE/LATERAL GAPPING**

**Purpose:** Address dysfunction at fibular head common with knee or ankle problems. Dysfunctions can be identified with
knee tracking test. An efficient fibular head remains mobile throughout the range in both AP and PA directions. **Position:** Address soft tissue restrictions in region first. Then place patient in sidelying with dysfunctional LE up, and ankle off end of bed. Inferior LE flexed up out of the way. On superior LE, use ½ foam roll or towel roll under proximal tibia to create fulcrum. Therapist at lower leg, facing patient with one thumb at fibular head and heel of other hand over lateral malleolus. **Technique:** Assess ability of fibular head to gap with inferior glide by applying pressure on lateral malleolus. If restricted, assist gapping and inferior gliding by applying force in the direction of the restriction while patient performs repeated DF/EVER.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range. **Alternatives:** Patient can hold strap place around ball of foot to assist with DF.

---

**FIBULAR HEAD AP AND PA MOBS**

**Purpose:** To assess and treat any AP or PA restrictions in fibular head mobility.  
**Position:** Patient in hooklying then in supine with ½ foam roll under knee. Therapist at side at level of fibular head.  
**Technique:** In hooklying, assess AP and PA mobility. Assess with foot planted on bed in lower leg IR then ER. Treat any restrictions with active or resisted ankle motions or knee flex/ext. Then assess AP and PA glide in supine with roll under knee. Assess with hip IR and ER as well. Treat any restrictions with active or resisted ankle motions, knee flex/ext or hip rotation.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.  
**Alternatives:** Assess and treat PA restrictions in prone or quadruped.
ANKLE

Indications

- Ankle pain
- Foot pain
- Altered mechanics of forefoot
- Poor squatting ability
- Altered gait
- History of sprains
- Difficulty descending stairs
- Knee pain

Anatomy and Considerations

- Talocrural joint/Subtalar joint/ Inferior tibiofibular joint
- Syndesmosis
- Ankle incurs 5 times the body weight when walking on level surfaces
- Mortise widens when goes from plantarflexion to dorsiflexion
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Knee Tracking
- Ankle Tracking
- Toe Raises
- Mini-Squats With Rotation
- VCT
POSTERIOR STRUCTURES SOFT TISSUE MOBILIZATION

**Purpose:** Assess and treat the posterior structures of the ankle. If efficient, the structures will remain pliable and not produce torsions during motion. Address Achilles, bony contours of calcaneus, malleoli, gastrocnemius and soleus, as well as musculature of deep posterior compartment including toe flexors and posterior tibialis.

**Position:** Patient in prone with feet off table. Therapist in sitting or standing at end of table.

**Technique:** Observe and palpate during foot circles and active and passive DF/PF. For Achilles, specifically assess and treat and restrictions in medial to lateral play, distraction, and elongation/shortening while performing foot circles or active PF/DF. For gastrocsoleus, bend knee and grasp gastroc, hold foot in DF and extend knee while mobilizing interface between gastrocnemius and soleus. Address deep musculature and bony contours with any of movements suggested above. Treatment: Using the above FM, mobilize the restricted soft tissue.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

TIB-FIB AND TALUS AP AND PA IN SUPINE

**Purpose:** Assess and treat any AP or PA restrictions in tibiofibular or talus mobility.

**Position:** Patient in supine or hooklying. Small foam roll under midfoot (hooklying). If needed, support under knee with pillow or ½ foam roll and ankle with ½ foam roll or towel roll. Therapist positioned at ankle.

**Technique:** *Tib-Fib:* Grasping tibia/medial malleolus in one hand and fibula/lateral malleolus with other hand, assess AP and PA glide of tibia relative to fibula. Treat any restrictions with pressure in restricted direction and active DF/PF, and can resist PF against therapist’s thigh. Repeat with fibula.
Talus: AP: *Indicated for limited ankle Dorsiflexion*, with ½ foam roll under ankle just proximal to talus, cradling ankle with B thumbs on talus, glide talus posteriorly and assess for any restrictions. Treat with active or resisted ankle motion as needed.  PA: *Indicated for limited ankle Plantarflexion*, talus PA is much easier to perform in standing, but can treat in prone, quadruped, or supine by grasping both malleolus with assisting hand and stabilizing with slight posterior force, and placing thumb and index finger of treating hand on posterior aspect of talus and applying pressure anteriorly. Treat with active or resisted ankle motion as needed.

**Neuro re-ed**: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

**Alternatives**: Can use strap at distal tib/fib to glide tib/fib anterior on talus or therapist’s body to assist or resist as needed.

---

**CALCANEUS MOBILIZATION IN SUPINE**

**Purpose**: Assess calcaneal mobility. In efficient state, calcaneus remains mobile in neutral standing position.

**Position**: Assess in standing, noting weight bearing position. Treatment: patient in supine with ½ foam roll under knee for support. Therapist at foot, either in sitting or standing.

**Technique**: Assess medial and lateral mobility. With patient’s ankle in dorsiflexion, grasp patient’s heel with distal hand, and with proximal hand grasp talus between thumb and index finger. Mobilizing force is a distraction between the two hands, thus mobilizing the talocalcaneal (subtalar) joint. Patient can perform short arc DF/PF to assist with mobilization.
Neuro re-ed: Perform stabilizing holds in desired position.

Alternatives: Dycem to assist with grasping calcaneus, and strap to assist with DF both work very well with this technique. With dycem use, always inquire about latex allergies.

CALCANEUS MOBILIZATION IN SIDELYING

Purpose: Assess for ability of calcaneus to translate medially, laterally and to tilt.

Position: Patient in sidelying, therapist at foot. Affected side down and heel slightly off edge of table, while ankle remains on table, assess calcaneus mobility medial to lateral, while stabilizing talus. Patient is sidelying with affected side down and heel slightly off edge of table, while ankle remains on table. Therapist positions foot in full DF by propping against thigh. To mobilize lateral to medial, patient can roll onto opposite side (affected leg up) and bend their other leg up underneath affected leg to support lower leg.

Technique: Therapist places heel of treating hand on patient’s calcaneus and assisting hand stabilizes talus just distal to malleoli. Pressure is then applied towards floor (either medial or lateral glide depending on patient position) while patient performs resisted PF, inversion or eversion against therapist’s thigh/hand, or other active ankle motion. Tilt or gap mobility can be improved by changing angle of force distally.

Neuro re-ed: In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

Alternatives: Use strap with assist with DF.
ANKLE MOBILIZATION IN STANDING OR ½ KNEELING

**Purpose:** AP and PA mobilization of tibia, fibula and talus in weight bearing.

**Position:** **AP:** Patient barefoot in standing holding onto parallel bar or rail for support, preferably on solid step to elevate patient and prevent therapist bending excessively. Therapist sitting in front facing patient, either on floor or short step stool. If patient excessively pronates, place towel roll under medial longitudinal arch for support. **PA:** Patient turns around facing away from therapist.

**Technique:** With one thumb on the anterior aspect of the medial malleolus and other on the anterior aspect of the lateral malleolus, assess tibia and fibula AP glide and end-feel while patient performs repeated squatting. To treat medial malleolus, place both thumbs on medial malleolus, applying AP pressure while patient performs repeated squats. Repeat on lateral malleolus as needed. For talus, place both thumbs on talus, and assess and treat any restrictions in AP glide during repeated squatting. Have patient turn facing away, reposition support under arch as needed. Assess and treat PA glide of tibia, fibula and talus in same manner as above.

**Neuro re-ed:** Against wall for support, perform single leg mini squat, then rising up to straight leg heel raise. Repeat 5-10 times.

**Alternatives:** Perform in ½ kneeling to reduce pressure of weight bearing. Can use strap, placed securely around ankles, to assist with mobilization.
FOOT

Indications

- Foot pain
- Limited mobility with squatting
- Altered gait mechanics
- Hallux valgus
- Morton’s neuromas
- Plantar fasciitis
- Numbness with activity
- Excessive pronation or supination

Anatomy and Considerations

- 26 bones
- 33 joints
- >100 muscles/tendons/ligaments in the foot
- Influence of footwear
Assessment/Palpation/Treatment

ASSESSMENT

- Standing Assessment
- Knee Tracking
- Ankle Tracking
- Toe Raises
- Mini-Squats With Rotation
- VCT

PLANTAR FASCIA MOBILIZATION

**Purpose:** To mobilize the plantar fascia.

**Position:** Patient in prone with feet off edge of bed, therapist sitting at patient’s feet.

**Technique:** Therapist grasps the 1st metatarsal head and 5th metatarsal head. Assess spring in tissue of plantar fascia during passive dorsiflexion with slight pressure towards floor to elongate plantar fascia. Identify areas of restriction, then use thumbs, knuckle, fingers or soft tissue mobilization tools to apply pressure to restriction while patient performs repeated ankle DF/PF, foot circles or combination movements.

**Neuro re-ed:** In new range, perform stabilizing holds. Follow with resisted eccentric and concentric motions in and out of new range.

MOBILITY OF MIDFOOT AND FOREFOOT IN HOOKLYING
Purpose: Assess and treat restrictions in midfoot and forefoot mobility.
Position: Patient in hooklying with ½ foam roll beneath forefoot or lengthwise under foot, adjusting position of roll as needed based on bone being treated.
Technique: Grasping each bone between thumb and index finger, or using thenar eminence, assess end-feel in navicular and cuboid, cuneiforms, metatarsals, and phalanges using dorsal to plantar force or plantar to dorsal force. Treat any restrictions while patient performs plantar flexion against roll, INV/EVER, toe flexion or extension, or combination movements. Place foot in DF, PF, INV or EVER, assess and treat any restrictions.

Neuro re-ed: Resisted ankle PNF patterns.
Alternatives: Perform in standing as per next two techniques.

MIDFOOT MOBILIZATION IN STANDING

Purpose: Assess and treat and restrictions in midfoot mobility.
Position: Patient barefoot in standing holding onto parallel bar or rail for support, preferably on solid step to elevate patient and prevent therapist from bending excessively. Therapist sitting in front facing patient, either on floor or short step stool. If patient excessively pronates, place towel roll under medial longitudinal arch for support.
Technique: With both thumbs, index and middle fingertips of one hand, or thenar eminence, assess end-feel of navicular, cuboid, medial, lateral and intermediate cuneiforms during squatting, using dorsal to plantar force.

Neuro re-ed: Patient practices efficient knee tracking over foot during squatting. Patient works specifically on heel and toe raises focused on appropriate mechanics including stability and neutral positioning, avoiding excessive inversion or eversion.
Alternatives: Hooklying mobilization (refer above).
FOREFOOT MOBILIZATION IN STANDING

**Purpose:** Assess and treat restrictions in forefoot mobility.

**Position:** Patient barefoot in standing holding onto parallel bar or rail for support, preferably on solid step to elevate patient and prevent therapist from bending excessively. Therapist sitting in front facing patient, either on floor or short step stool. If patient excessively pronates, place towel roll under medial longitudinal arch for support.

**Technique:** Assess spring in tarsometatarsal joints with treating thumb, or index and middle fingertips of one hand, while assisting hand may apply gentle traction through corresponding phalanx. In addition, therapist can use heel of hand or thenar eminence to apply pressure directly on metatarsal for further mobilization. Patient performs repeated squatting during mobilization. For metatarsophalangeal and interphalangeal joint mobs, therapist’s assisting hand, using thenar eminence or thumb and index finger, stabilizes proximal bone. Treating hand, with thumb and index finger, grasps distal bone and assesses and treats any restrictions in AP/PA or medial/lateral glide. Patient gently rocks or shifts weight forward and back between forefoot and heel.

**Neuro re-ed:** Patient practices efficient knee tracking over foot during squatting. Patient works specifically on heel and toe raises focused on appropriate mechanics including stability and neutral positioning, avoiding excessive inversion or eversion.

**Alternatives:** Hooklying mobilization (refer above).
REFERENCES

7. Cleland, J, DPT, OCS. Orthopedic Clinical Examination. Icon Learning Systems, Corlstadt, NJ, 2005

IMAGES

Coccyx

1. Weaver, Rufus. Harriet Cole- Nerve cadaver dissection 1888
5. Retrieved March 12, 2015, from: https://www.google.com/search?q=anatomy+of+the+sacrum+and+pelvis&espv=2&biw=1366&bih=643&tbm=isch&imgil=aTRWxUgsjVv7hm%253a%253b30Nfr5jy3T
Sacrum

Innominate

Hip

Knee

Ankle
Foot
### Posterior View:

<table>
<thead>
<tr>
<th>Area</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot and Ankle Position</td>
<td>Calcaneal Inversion</td>
<td>Pronation</td>
</tr>
<tr>
<td></td>
<td>Calcaneal Eversion</td>
<td>Supination</td>
</tr>
<tr>
<td>Knee Position</td>
<td>Varus</td>
<td>Tibial ER</td>
</tr>
<tr>
<td></td>
<td>Valgus</td>
<td>Tibial IR</td>
</tr>
<tr>
<td>Hip Position</td>
<td>Hip IR</td>
<td>Hip Abducted</td>
</tr>
<tr>
<td></td>
<td>Hip ER</td>
<td>Hip adducted</td>
</tr>
<tr>
<td>Pelvis Position</td>
<td>Iliac Crest:</td>
<td>Greater trochanter:</td>
</tr>
<tr>
<td></td>
<td>L elevated</td>
<td>L high</td>
</tr>
<tr>
<td></td>
<td>R elevated</td>
<td>R high</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td></td>
<td>PSIS</td>
<td>Gluteal folds</td>
</tr>
<tr>
<td></td>
<td>L superior</td>
<td>L lower</td>
</tr>
<tr>
<td></td>
<td>R superior</td>
<td>R lower</td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td>Level</td>
</tr>
<tr>
<td>Lumbar Spine</td>
<td>R shear</td>
<td>R rotation</td>
</tr>
<tr>
<td></td>
<td>L shear</td>
<td>L rotation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flexed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extended</td>
</tr>
<tr>
<td>Thoracic Cage</td>
<td>R rotation</td>
<td>Kyphotic</td>
</tr>
<tr>
<td></td>
<td>L rotation</td>
<td>Extended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scoliosis</td>
</tr>
</tbody>
</table>

### Anterior View:

<table>
<thead>
<tr>
<th>Area</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot and Ankle Position</td>
<td>Pronation</td>
<td>Supination</td>
</tr>
<tr>
<td>Knee Position</td>
<td>Varus</td>
<td>Tibial ER</td>
</tr>
<tr>
<td></td>
<td>Valgus</td>
<td>Tibial IR</td>
</tr>
<tr>
<td>Hip Position</td>
<td>Hip IR</td>
<td>Hip Abducted</td>
</tr>
<tr>
<td></td>
<td>Hip ER</td>
<td>Hip adducted</td>
</tr>
<tr>
<td>Pelvis Position</td>
<td>ASIS</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L superior</td>
<td></td>
</tr>
<tr>
<td></td>
<td>R superior</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Level</td>
<td></td>
</tr>
<tr>
<td>Abdominal Region</td>
<td>Linea alba:</td>
<td>Contour:</td>
</tr>
<tr>
<td></td>
<td>L</td>
<td>Symmetry:</td>
</tr>
<tr>
<td></td>
<td>R</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Center</td>
<td></td>
</tr>
</tbody>
</table>
### Lateral View:

<table>
<thead>
<tr>
<th>Foot and Ankle Position</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight Bearing:</td>
<td></td>
</tr>
<tr>
<td>Heel</td>
<td></td>
</tr>
<tr>
<td>Mid-foot</td>
<td></td>
</tr>
<tr>
<td>Forefoot</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knee Position</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexion</td>
<td></td>
</tr>
<tr>
<td>Extension</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pelvis Position</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior tilt</td>
<td></td>
</tr>
<tr>
<td>Posterior tilt</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thoracic/Lumbar Alignment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Flattened</td>
<td></td>
</tr>
<tr>
<td>Hyperlordosis</td>
<td></td>
</tr>
<tr>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thoracic Cage</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sternum:</td>
<td></td>
</tr>
<tr>
<td>Elevated</td>
<td></td>
</tr>
<tr>
<td>Depressed</td>
<td></td>
</tr>
<tr>
<td>Neutral</td>
<td></td>
</tr>
<tr>
<td>Kyphotic</td>
<td></td>
</tr>
<tr>
<td>Extended</td>
<td></td>
</tr>
</tbody>
</table>

### Gait Assessment:

<table>
<thead>
<tr>
<th>Pelvic Motions</th>
<th>Anterior elevation (Swing Phase):</th>
<th>Posterior Depression (Mid-Stance, Wt Acceptance, Push Off):</th>
<th>Anterior Depression (Deceleration to heel contact):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rotation</td>
<td>Rotation</td>
<td>Rotation</td>
</tr>
<tr>
<td></td>
<td>Limited</td>
<td>Limited</td>
<td>Limited</td>
</tr>
<tr>
<td></td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Innominate Motions</th>
<th>Swing Phase:</th>
<th>Stance Phase:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Flexion</td>
<td>Extension</td>
</tr>
<tr>
<td></td>
<td>ER</td>
<td>IR</td>
</tr>
<tr>
<td></td>
<td>Adduction (minimal)</td>
<td>Abduction (minimal)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Leg Swing Test (check if limited)</th>
<th>R Innominate:</th>
<th>L Innominate:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hip Neutral:</td>
<td>Hip Neutral:</td>
</tr>
<tr>
<td></td>
<td>Flexion</td>
<td>Flexion</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>Extension</td>
</tr>
<tr>
<td></td>
<td>Hip IR:</td>
<td>Hip IR:</td>
</tr>
<tr>
<td></td>
<td>Flexion</td>
<td>Flexion</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>Extension</td>
</tr>
<tr>
<td></td>
<td>Hip ER:</td>
<td>Hip ER:</td>
</tr>
<tr>
<td></td>
<td>Flexion</td>
<td>Flexion</td>
</tr>
<tr>
<td></td>
<td>Extension</td>
<td>Extension</td>
</tr>
</tbody>
</table>