Mobilization Notes
A Rehabilitation Specialist's Pocket Guide

Christopher H. Wise
Dawn T. Gulick

Includes...
- Write-on, Wipe-off
- Evidence-based guidelines to enhance mobilization performance
- Regional review of functional anatomy and kinematics
- Essential skill set for joint mobilization techniques with detailed descriptions and photographs
- Innovative accessory and combined physiologic with accessory mobilization techniques
Mobilization Notes

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Operational Definitions

- **Mobilization/Manipulation:** A manual therapy procedure that comprises a continuum of skilled passive movements to joints &/or related soft tissues applied at varying speeds & amplitudes. The terms mobilization and manipulation are considered to be synonymous & include the entire continuum of techniques ranging from non-thrust to thrust procedures.

  - **Note:** The terms mobilization & manipulation are often used interchangeably within the field of Physical Therapy. In order to provide clarity, throughout this text the term mobilization will be used to define techniques that are performed at Grades I–IV. Grade V techniques will be described through the use of the term high-velocity thrust.

- **Osteokinematics/Physiologic Motion:** Gross movements of limbs or other body parts relative to the body or environmental references & typically measured in degrees by a goniometer.

- **Arthrokinematics/Accessory Motion:** Relative motions that occur between articular surfaces & related structures within a joint. These motions include:
  - **Component Motions:** Motions taking place in a joint or related joints to facilitate a particular active or passive motion (i.e., roll, spin, glide, roll-glide).
  - **Joint Play Motions:** Motions not under voluntary control that occur only in response to outside forces (i.e., ligament stress testing).

- **Accessory Roll:** One type of accessory motion that occurs between 2 articular surfaces where new points on 1 surface contact new points on the opposing surface. This motion is always in the same direction as the physiologic motion primarily when friction is high & the joint surfaces are incongruent. In order for rolling to occur, the concave aspect of the joint must be at least as large as the convex surface.

- **Accessory Glide:** One type of accessory motion that occurs between 2 articular surfaces where the same point on 1 surface contacts new points on the opposing surface. The direction of glide is dependent upon whether the convex surface or the concave surface is moving & primarily occurs when the joint surfaces are congruent.
- **Accessory Roll-Glide**: The term used to define the combination of rolling & gliding, as previously defined, that occurs between 2 opposing joint surfaces during movement.

- **Accessory Spin**: One type of accessory motion described as rotatory motion in the transverse plane of 1 joint surface relative to the other. This type of accessory motion often occurs when the concave aspect of the joint is significantly larger than the convex (i.e., the hip joint).

- **End Feel**: The quality of the resistance at the end range of joint motion that is perceived when overpressure is applied to either physiologic or accessory joint motion.

- **Open-Packed Position (OPP)**: A position of 2 articular surfaces relative to one another in which there is less than maximal joint congruency; any position other than the closed-packed position in which a joint is less stable & better able to be moved.

- **Close-Packed Position (CPP)**: A unique position of a joint in which 2 articular surfaces are maximally congruent relative to one another; the specific position in which a joint is most stable & least able to be moved.

- **Treatment Plane**: Determined by the concave aspect of the joint & is at a right angle to a line drawn from the axis of rotation to the center of the concave articulating surface. Appreciating the location of the treatment plane requires knowledge of the concave aspect of the joint in any given position & is useful for understanding the direction in which mobilizing forces may be provided.

- **Distraction Mobilization**: The passive movement of 1 articular surface relative to the other in a direction that is perpendicular to the treatment plane of the joint that produces separation of the joint.

- **Glide Mobilization**: The passive movement of 1 articular surface relative to the other in a direction that is parallel to the treatment plane of the joint.
Joint Mobilization of the (1) convex aspect of a typical synovial joint upon its (2) concave counterpart. The direction of mobilizing forces remains the same when the joint is moved out of the neutral position.
Joint mobilization of the (1) concave aspect of a typical synovial joint upon its (2) convex counterpart. The direction of mobilizing forces changes when the joint is moved out of the neutral position.

X = stabilized segment
Dotted line = Treatment plane (TP) determined by the concave aspect of the joint & is at a right angle to a line drawn from the axis of rotation to the center of the concave articulating surface
Red arrow = Direction of joint glide that is parallel to the TP
Green arrow = Direction of joint distraction that is perpendicular & away from the TP
Purple arrow = Direction of joint compression that is perpendicular & toward the TP
Blue arrow = Direction of physiologic (osteo)kinematic motion
Yellow arrow = Direction of accessory (arthro)kinematic motion

Adapted with permission from Paris & Loubert, 1990
Continuum of Joint Motion

Dislocation  Sprain/Strain  Joint Play  Active Movement  Open Packed  Active Movement  Joint Play  Sprain/Strain  Dislocation

Active Range of Motion

Physiologic Range of Motion

Anatomical Range of Motion

Adapted with permission from Paris & Loubert, 1990
Indications for Joint Mobilization

- To improve a loss of accessory or physiologic movement
- To reduce a closing or opening dysfunction of the spine
- To restore normal articular relationships
- To provide symptom relief & pain control
- To enhance motor function
- To improve nutrition to intra-articular structures by promoting mobility
- To reduce muscle guarding
- To curtail a progressive loss of mobility associated with disease or injury
- To increase & maintain mobility if unable to do so independently
- To safely encourage early mobility following injury
- To develop patient confidence in the prospect of a favorable outcome
- To provide preparation or support for other manual & nonmanual interventions

Effects of Joint Mobilization

**Neurophysiologic Effects (Grades I, II):**

- Fire articular mechanoreceptors, proprioceptors
- Fire cutaneous & muscular receptors
- Alter nociception

**Mechanical Effects (Grades III–V):**

- Stretch joint restrictions
- Break adhesions
- Alter positional relationships
- Diminish/eliminate barriers to normal motion
Psychological Effects (Grades I–V):

- Instill confidence gained through improvement
- Encourage positive response effects from manual contact
- Ensure favorable response to audible joint sounds

Paris & Loubert, 1990

Contraindications for Joint Mobilization

Absolute Contraindications

- Medically unstable
- Suspected joint hypermobility or instability
- Malignancy in treatment region
- Cauda equina lesions
- Bowel & bladder dysfunction
- Fracture in treatment region
- Vertebral basilar insufficiency (VBI)
- Joint ankylosis
- Ligamentous laxity
- Vascular disorders in the treatment region
- Acute inflammation
- Joint effusion
- Bone disease detectable on radiograph
- Acute radiculopathy
- Immediately post partum
- Blood clotting disorder
- Presence of hard end feel
- Spinal arthropathy (i.e., ankylosing spondylitis, diffuse idiopathic skeletal hyperostosis, spondyloarthopathy)
- Status post joint fusion
- Deteriorating CNS pathology
- Condition made worse by treatment
Relative Precautions

- Confirmed or suspected malignancy (patient >50 y.o., failure to respond, unexplained weight loss, previous CA hx)
- Joint replacements
- Pregnancy or immediately post partum, oral contraceptives, anticoagulant therapy
- Recent trauma, radiculopathy (distal to knee/elbow), cauda equina syndrome (+B/B signs)
- Early healing phase of newly developing connective tissue
- Long-term use of corticosteroids
- Bone disease not detectable on radiograph (osteoporosis, osteopenia, osteomalacia, chronic renal failure, osteopetrosis)
- Systemic connective tissue disorders (RA, Down’s, Ehlers-Danlos, Marfan’s, lupus erythematosus)
- Unfused growth plates
- Skin rashes or open wounds in region treated
- Individuals unable to communicate reliably or respond to intervention (elderly, young children, cognitively impaired, language barriers)
- Psychogenic patients exhibiting dependent behaviors, suspected symptom magnification, or irritability
- Elevated pain levels that make palpation &/or stabilization unreasonable
### Potential Complications of Inappropriate Use of Joint Mobilization of the Lumbar Spine

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Characteristics</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disc herniation</td>
<td>Severe back &amp; leg pain, all movements &amp; positions painful, pain on walking &amp; sitting, neuropathic pain &amp; radiculopathy</td>
<td>Exacerbation of condition &amp; possible progression to cauda equina syndrome</td>
</tr>
<tr>
<td>Neoplastic disease</td>
<td>Progressive symptoms, multisegmental symptoms &amp;/or signs may be worse than the symptoms</td>
<td>Pathologic fracture</td>
</tr>
<tr>
<td>Cauda equina syndrome</td>
<td>Bilateral multisegmental lower motor neuron signs &amp; symptoms including bladder dysfunction, sensory &amp; motor paresis</td>
<td>Compression damage &amp; permanent palsy</td>
</tr>
<tr>
<td>Spinal compression</td>
<td>Multisegmental upper motor neuron signs &amp; symptoms</td>
<td>Compression damage &amp; permanent deficit</td>
</tr>
<tr>
<td>Nonmechanical causes</td>
<td>Minimal musculoskeletal signs &amp; symptoms or symptoms related to visceral function</td>
<td>Waste of effort &amp; delay in getting appropriate care</td>
</tr>
<tr>
<td>1st &amp; 2nd lumbar nerve root palsies</td>
<td>Hip flexor weakness; these levels more frequently affected by neoplastic disease</td>
<td>Delay in getting appropriate care &amp; possibility of fracture</td>
</tr>
<tr>
<td>Tri-level segmental signs</td>
<td>Disc compression can impact a maximum of 2 levels of nerve root</td>
<td>Neoplastic disease, spondylolisthesis, or cauda equina compression</td>
</tr>
</tbody>
</table>

*Continued*
<table>
<thead>
<tr>
<th>Conditions</th>
<th>Characteristics</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign of the buttocks</td>
<td>Empty end feel on hip flex painful weakness of hip ext limited SLR, trunk flex &amp; hip flex; non-capsular pattern of restriction of the hip; swollen buttock</td>
<td>Serious disease such as sacral fracture, neoplasm, infection, etc.</td>
</tr>
<tr>
<td>Various serious pathologies</td>
<td>Empty end feel &amp; severe multidirectional spasm</td>
<td>Worsening of condition</td>
</tr>
<tr>
<td>Adverse joint environment</td>
<td>Spasm, acute inflammation, fracture</td>
<td>Worsening of condition</td>
</tr>
<tr>
<td>Acute fracture or dislocation</td>
<td>Immediate onset of post-traumatic pain &amp; function loss</td>
<td>Worsening of condition</td>
</tr>
<tr>
<td>Bone disease</td>
<td>Deep pain &amp; relatively minimal musculoskeletal signs</td>
<td>Wasted effort &amp; the possibility of fracture &amp; delay in getting appropriate medical treatment</td>
</tr>
<tr>
<td>Systemic arthritis</td>
<td>Bilateral pain, high level of irritability, previous episodes of type</td>
<td>↑ Tissue damage &amp; severe exacerbation</td>
</tr>
</tbody>
</table>

Developed by: James Meadows, 2009
PATIENT WITH A MOVEMENT IMPAIRMENT SYNDROME

Patient requires consultation
Patient requires PT (R/O red flags)
Patient requires referral

PT exam to identify 3 R’s

Reproducible sign
What causes symptoms?

Region of origin
Where are symptoms?

Reactivity
How symptomatic?

Hypomobility syndrome
Instability syndrome

MOBILIZATION
STABILIZATION
Stiffness-Dominant Movement Diagram

R1 = First resistance
R2 = Final resistance
L = Limit of available motion

Adapted with permission from Maitland et al, 2001
Symptom-Dominant Movement Diagram

- **R1** = First resistance
- **R2** = Final resistance
- **P1** = First pain
- **P2** = Final pain
- **L** = Limit of available motion

Intensity of applied force vs Percent range of motion

Adapted with permission from Maitland et al, 2001
Use this movement diagram to document the quantity & quality of any joint motion using the following symbols. Write directly on the diagram & reuse as needed.

- **R1** = First resistance
- **R2** = Final resistance
- **P1** = First pain
- **P2** = Final pain
- **L** = Limit of available motion

Adapted with permission from Maitland et al, 2001
Grades of Mobilization

**Grade I** = Small amplitude, before R1
**Grade II** = Large amplitude, before R1
**Grade III--** = Large amplitude taken to R1
**Grade III-** = Large amplitude taken to 25% R1-R2
**Grade III** = Large amplitude taken to 50% R1-R2
**Grade III+** = Large amplitude taken to 75% R1-R2
**Grade III++** = Large amplitude taken to R2

**Grade IV--** = Small amplitude taken to R1
**Grade IV-** = Small amplitude taken to 25% R1-R2
**Grade IV** = Small amplitude taken to 50% R1-R2
**Grade IV+** = Small amplitude taken to 75% R1-R2
**Grade IV++** = Small amplitude taken to R2

**Grade V** = Small amplitude, high velocity at R2 and beyond

R1 = First resistance
R2 = Final resistance
L = Limit of available motion

Adapted with permission from Maitland et al, 2001
Steps to Mobilization Specificity

Variables (boxes) to consider when improving the specificity of joint mobilization, including criteria (circles) for determining the manner in which each variable is performed

- **FREQUENCY/DURATION:**
  1–2 sets, 1–5 repetitions, daily

- **AMPLITUDE:**
  Small, medium, large

- **SPEED/RHYTHM:**
  Smooth oscillation, progressive oscillation, staccato oscillation, prolonged hold, thrust

- **LOCATION:**
  Relationship to R1 & R2

- **Patient age, health**

- **Stage of intervention**

- **Stage of healing**

- **Desired effect**

- **Prior experience**

- **Reactivity level**

- **Nature of restriction**

- **Other interventions**

- **Patient age, health**
Types of Oscillators

Manner in which oscillations may be performed during the application of joint mobilization techniques

Adapted with permission from Paris & Loubert, 1990
Application of Joint Mobilization Techniques

A clinical decision-making algorithm that utilizes the patient’s response for determining the next appropriate strategy when applying joint mobilization techniques

TRIAL INTERVENTION 1–5 repetitions

- Worse
  - Decrease 1 variable
  - Hold & monitor
  - Repeat 1–5 repetitions
- Better
  - Slightly better
  - Dramatically better
  - Repeat 1–5 repetitions
- No change
  - Increase 1 variable
  - Re-examine
Clinical Prediction Rule (CPR) for Lumbar Spine Stabilization

When 3 or more criteria are positive, the probability of experiencing improvement from stabilization procedures increases from 33% to 67%

- Age <40 yr (pt >40 yr may require >8 weeks of training to gain the same benefits)
- Straight leg raise >91°
- Positive prone instability test
- Presence of aberrant motions
- Positive lumbar hypermobility with lumbar spring testing

Hicks et al, 2005

Clinical Prediction Rule (CPR) for Lumbopelvic High-Velocity Thrust Mobilization in Patients With Low Back Pain (LBP)

When 4 or 5 criteria have been met, successful outcome increases from 44%–45% (pretest probability) to 92%–95% (post-test probability)

- Fear-Avoidance Beliefs Questionnaire : Work section score <19
- Duration of LBP <16 days
- No symptoms distal to knee
- ≥1 lumbar hypomobile segment upon intervertebral mobility testing
- At least 1 hip with >35° of IR

Flynn et al, 2002; Childs et al, 2004; Cleland et al, 2006
Clinical Prediction Rule (CPR) for Thoracic Spine High-Velocity Thrust Mobilization in Patients With Neck Pain

When 3 of the 6 criteria have been met, successful outcome increases from 54% to 86%. When 4 of the 6 criteria have been met, successful outcome increases from 54% to 93%.

- Symptoms <30 days
- No symptoms distal to shoulder
- No increase with cervical extension
- FABQ: Physical assessment section score <12
- Decreased upper thoracic (T3–5) kyphosis
- Cervical extension <30°

Cleland et al, 2007; Cleland et al, 2005

Clinical Prediction Rule (CPR) for Cervical Spine High-Velocity Thrust Mobilization in Patients With Neck Pain

When 4 of the 6 criteria have been met, there is an 89% chance of an immediate positive response.

- Neck Disability Index score <11.5
- Bilateral involvement pattern
- Not performing sedentary work >5 h/day
- Feeling better while moving the neck
- Not feeling worse while extending the neck
- Diagnosis of spondylosis without radiculopathy

Tseng et al, 2006
# Fear-Avoidance Beliefs Questionnaire (FABQ) for Patients With Low Back Pain

**Instructions:** Please select the number from 0 to 6 to say how much physical activities affect your back pain

<table>
<thead>
<tr>
<th>Statements</th>
<th>Completely disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Completely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My pain is caused by physical activity</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Physical activity makes my pain worse</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. Physical activity might harm my back</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. I should not do physical activities which might make my pain worse</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. I cannot do physical activities which might make my pain worse</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

**Instructions:** Please select the number from 0 to 6 about how your normal work affects your back pain

<table>
<thead>
<tr>
<th>Statements</th>
<th>Completely disagree</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Completely agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. My pain was caused by my work or by an accident at work</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. My work aggravated my pain</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. I have a claim for compensation for my pain</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

*Continued*
9. My work is too heavy for me & 0 & 1 & 2 & 3 & 4 & 5 & 6
10. My work makes or would make my pain worse & 0 & 1 & 2 & 3 & 4 & 5 & 6
11. My work might harm my back & 0 & 1 & 2 & 3 & 4 & 5 & 6
12. I should not do my normal work with my present pain & 0 & 1 & 2 & 3 & 4 & 5 & 6
13. I cannot do my normal work with my present pain & 0 & 1 & 2 & 3 & 4 & 5 & 6
14. I cannot do my normal work until my pain is treated & 0 & 1 & 2 & 3 & 4 & 5 & 6
15. I do not think that I will be back to my normal work within 3 months & 0 & 1 & 2 & 3 & 4 & 5 & 6
16. I do not think that I will ever be able to go back to that work & 0 & 1 & 2 & 3 & 4 & 5 & 6

**Scale #1** = Fear-avoidance beliefs about work = sum of questions #6,7,9,10,11,12,& 15

**Scale #2** = Fear-avoidance beliefs about physical activity = sum of questions #2,3,4,5

**Total score** = sum of all items

The higher the score, the greater the degree of fear & avoidance beliefs shown by the patient.

Waddell, Newton et al, 1993
# Neck Disability Index

<table>
<thead>
<tr>
<th>Pain Intensity</th>
<th>Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no pain at the moment</td>
<td>I can do as much as I want</td>
</tr>
<tr>
<td>The pain is very mild at the moment</td>
<td>I can only do my usual work but not more</td>
</tr>
<tr>
<td>The pain is moderate at the moment</td>
<td>I can do most of my usual work, but not more</td>
</tr>
<tr>
<td>The pain is fairly severe at the moment</td>
<td>I can’t do my usual work</td>
</tr>
<tr>
<td>The pain is very severe at the moment</td>
<td>I can hardly do any usual work at all</td>
</tr>
<tr>
<td>The pain is the worst imaginable at the moment</td>
<td>I can’t do any work at all</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal Care (washing, dressing, etc.)</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can look after myself normally w/o causing extra pain</td>
<td>I can concentrate fully when I want to with no difficulty</td>
</tr>
<tr>
<td>I can look after myself normally but it causes extra pain</td>
<td>I can concentrate fully when I want to with slight difficulty</td>
</tr>
<tr>
<td>It is painful to look after myself &amp; I am slow &amp; careful</td>
<td>I have a fair degree of difficulty concentrating when I want</td>
</tr>
<tr>
<td>I need some help but manage most of my personal care</td>
<td>I have a lot of difficulty concentrating when I want</td>
</tr>
<tr>
<td>I need help every day in most aspect of self-care</td>
<td>I have a great deal of difficulty concentrating when I want</td>
</tr>
<tr>
<td>I can’t get dressed, wash with difficulty &amp; stay in bed</td>
<td>I can’t concentrate at all</td>
</tr>
</tbody>
</table>


## Neck Disability Index

### Lifting
- I can lift heavy weights without extra pain
- I can lift heavy weights but it gives extra pain
- Pain prevents me from lifting heavy weights off the floor but I can manage if they are on a table
- Pain prevents me from lifting heavy weights but I can manage if they are conveniently placed
- I can lift only very light weights
- I cannot lift or carry anything at all

### Driving
- I can drive my car without neck pain
- I can drive my car as long as I want with slight neck pain
- I can drive my car as long as I want with moderate neck pain
- I can’t drive my car as long as I want because of moderate neck pain
- I can hardly drive at all because of severe neck pain
- I can’t drive my car at all

### Reading
- I can read as much as I want with no pain in my neck
- I can read as much as I want with slight pain in my neck
- I can read as much as I want with moderate pain in my neck
- I can’t read as much as I want because of moderate pain in my neck
- I can hardly read at all because of severe pain in my neck
- I cannot read at all

### Recreation
- I am able to engage in all my recreational activities with no neck pain
- I am able to engage in all my recreational activities with some neck pain
- I am able to engage in most but not all of my usual recreational activities because of neck pain
- I am able to engage in a few of my usual recreational activities with some neck pain
- I can hardly do any recreational activities because of neck pain
- I can’t do any recreational activities at all
## Neck Disability Index

<table>
<thead>
<tr>
<th><strong>Headache</strong></th>
<th><strong>Sleeping</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>I have no headaches at all</td>
<td>I have no trouble sleeping</td>
</tr>
<tr>
<td>I have slight headaches which come infrequently</td>
<td>My sleep is slightly disturbed (&lt;1 hr sleep loss)</td>
</tr>
<tr>
<td>I have moderate headaches which come infrequently</td>
<td>My sleep is mildly disturbed (1–2 hr sleep loss)</td>
</tr>
<tr>
<td>I have moderate headaches which come frequently</td>
<td>My sleep is moderately disturbed (2–3 hr sleep loss)</td>
</tr>
<tr>
<td>I have severe headaches which come infrequently</td>
<td>My sleep is greatly disturbed (3–5 hr sleep loss)</td>
</tr>
<tr>
<td>I have headaches almost all the time</td>
<td>My sleep is completely disturbed (5–7 hr sleep loss)</td>
</tr>
</tbody>
</table>

**Score:**
The items are scored in descending order with the top statement = 0 & the bottom statement = 5.
All subsections are added together for a cumulative score. The higher the score, the greater the disability.

Vernon & Minor, 1991
The 4-Tier Premobilization Screening Process for the Spine

Tier 1: Historical Interview

- Review contraindications
  - Rheumatoid arthritis, Down’s syndrome, Ehlers-Danlos syndrome, Marfan’s syndrome, lupus erythematosus, ankylosing spondylitis, diffuse idiopathic skeletal hyperostosis (DISH), spondyloarthropathy, cancer (patient >50 yr, failure to respond, unexplained weight loss, previous history), bone density concerns (osteoporosis, steroid use, chronic renal failure, postmenopausal females)
  - Pregnancy or immediately postpartum, oral contraceptives, anticoagulant therapy
  - Recent trauma, radiculopathy (*distal to knee*), cauda equina syndrome (+ *B/B signs*)
  - Intolerance for static postures
  - Acute pain with movement, improved with external support
  - Extension brings on vertigo, nausea, diplopia, tinnitus, dysarthria, & nystagmus

Tier 2: Medical Testing & Diagnostic Imaging

- Lab values suggesting systemic disease (*see Tier 1*)
- Plain film radiography including:
  - *Open-mouth view*: Visualize odontoid & C1–C2
  - *Lateral views & lateral stress views*: Visualize parallel line relationship & atlantodental interface (>3 mm)
  - *Oblique views*: Visualize defect in pars interarticularis
- MRI, CT scans, scintigraphy for identification of subtle pathology
- Doppler ultrasound for detection of vertebrobasilar ischemia (VBI)
Tier 3: Clinical Screening Procedures for Segmental Stability

- Sharp-Purser test
- Aspinall’s test
- Transverse ligament stress test
- Alar ligament stress test
- Prone lumbar segmental stability test
- Anterior lumbar segmental stability test
- Posterior lumbar segmental stability test
- Torsional lumbar segmental stability test
- Prone knee flex test
- Axial compression test
- Passive intervertebral mobility testing (>Grade 5)
- Mobilization prepositioning
- AROM assessment revealing poor movement quality
- Palpation revealing step when unsupported & band of hypertrophy

Tier 4: Clinical Screening Procedures for Vertebrobasilar Ischemia (VBI) (Cervical Only)

- Vertebral artery test
- Neck torsion test (sitting trunk rotation with head stabilized)

Clinical Screening Procedures

Vertebral Artery Test

- **Patient:** Supine without head support
- **Clinician:** Sitting at head of table supporting occiput
- **Procedure:** Neck sequentially brought into ext, SB, & ipsilateral rotation; held for 15 seconds while clinician monitors pt & engages pt in conversation; rest for 15 seconds, then test other side
- **Interpretation:** Test (+) if following are present: dizziness, nausea, tinnitus, diplopia, slurred speech, slow response, nystagmus, altered pupil dilation
- **Statistics:** Sensitivity = 0%; Specificity = 67%-90%
Sharp-Purser Test

- **Patient**: Sitting with flex of the head on neck
- **Clinician**: One hand on pt's forehead & other thumb over spinous process of C2 to stabilize
- **Procedure**: As pt flexes, clinician imparts force posteriorly through forehead contact
- **Interpretation**: Test (+) if head slides posteriorly indicating a reduction of the subluxed atlas on axis or if end feel not firm

Aspinall’s Test

- **Patient**: Supine
- **Clinician**: Stabilizes flexed occiput on atlas
- **Procedure**: An anteriorly directed force is applied to atlas
- **Interpretation**: Test (+) if end feel soft or pt reports symptoms including esophageal pressure & other neurologically related cord compression signs or symptoms

Transverse Ligament Stress Test

- **Patient**: Supine
- **Clinician**: Supports the occiput with fingers over the atlas
- **Procedure**: Occiput & atlas together are brought anteriorly without flex or ext & held for 15 seconds
- **Interpretation**: Test (+) if end feel soft; muscle spasm, nausea, vertigo, paresthesia, nystagmus, esophageal pressure suggesting transverse ligament compromise

Alar Ligament Stress Test

- **Patient**: Supine
- **Clinician**: Supports occiput with hands while index fingers palpate spinous process of axis
- **Procedure**: Occiput passively moved slightly to each side
- **Interpretation**: Test (+) if there is delay in mov’t of spinous process of axis suggesting alar ligament compromise
Prone Lumbar Segmental Stability Test

- **Patient:** Prone with trunk on table & feet on floor
- **Clinician:** Standing with hand contact on segment in question
- **Procedure:** A gentle posterior-to-anterior force applied with pt’s feet resting & force then reapplied with the feet actively lifted off floor
- **Interpretation:** Test (+) if soft end feel & symptoms noted in the resting position that reduce when the feet are unsupported

Anterior Lumbar Segmental Stability Test

- **Patient:** Side-lying with hips & knees flexed to 90°
- **Clinician:** Standing with pt’s flexed knees fixed & hand at segment to be tested
- **Procedure:** A gentle posterior force applied through femurs while the hand stabilizes
- **Interpretation:** Test (+) if relative mov’t of superior vertebra felt to move anteriorly on inferior vertebra

Posterior Lumbar Segmental Stability Test

- **Patient:** Sitting with arms folded
- **Clinician:** Standing with pt’s flexed elbows in contact with clinician’s chest & clinician’s hands resting on lumbar segment to be tested
- **Procedure:** Pt pushes into clinician through the forearms as clinician stabilizes the segment with hands
- **Interpretation:** Test (+) if relative mov’t of superior vertebra felt to move posteriorly on inferior vertebra

Torsional Lumbar Segmental Stability Test

- **Patient:** Prone
- **Clinician:** Standing with contact on contralateral anterior ilium while other hand stabilizes above segment to be tested
- **Procedure:** Clinician pulls ilium upward producing rotation of pelvis on stabilized lumbar segment
**Interpretation:** Test (+) if symptoms reproduced & ↑segmental mobility noted

---

**Prone Knee Flexion Test**

- **Patient:** Prone
- **Clinician:** Contact made at segment to be tested while other hand grasps pt’s leg
- **Procedure:** Posterior-to-anterior pressure applied over spinal segment while knee passively flexed
- **Interpretation:** Test (+) if symptoms reproduced & ↑segmental mobility noted
- **Statistics:** Sensitivity = 84%

---

**Axial Compression Test**

- **Patient:** Standing
- **Clinician:** Both hands placed on pt’s shoulders
- **Procedure:** Downward axial compressive forces applied equally through both hand contacts
- **Interpretation:** Test (+) if reproduction of symptoms along with ↑segmental mobility, soft end feel, & ↑paravertebral muscle activity noted
- **Statistics:** Sensitivity = 30%–92%; Specificity = 74%–100%

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**Lumbar Passive Intervertebral Mobility (PIVM) Test**

- **Patient:** Side-lying or prone
- **Clinician:** Standing with one hand producing motion at lumbar spine & other palpating for segmental mobility
- **Procedure:** Mov’t introduced through the LE as palpating finger identifies the degree of intervertebral mobility for:
  a. Forward bending
  b. Side bending
  c. Rotation
- **Interpretation:** Resistance, pain, limitation of mov’t, & reproduction of symptoms documented on mov’t diagram
Lumbar Passive Accessory Intervertebral Mobility (PAIVM) Test

■ **Patient:** Prone
■ **Clinician:** Standing with thumb-over-thumb contact over spinous process or transverse process
■ **Procedure:** Posterior-to-anterior force applied through thumb contacts creating central P-A pressure & unilateral P-A pressure
■ **Interpretation:** Resistance, pain, limitation of mov’t, & reproduction of symptoms documented on mov’t diagram

Cervical Passive Intervertebral Mobility (PIVM) Test

■ **Patient:** Supine
■ **Clinician:** Sitting with one hand supporting occiput and producing motion at cervical spine & other palpating for segmental mobility
■ **Procedure:** Mov’t introduced as palpating finger identifies the degree of intervertebral mobility for:
   a. Forward bending
   b. Side bending
   c. Rotation
■ **Interpretation:** Resistance, pain, limitation of mov’t, & reproduction of symptoms documented on mov’t diagram

Cervical Passive Accessory Intervertebral Mobility (PAIVM) Test

■ **Patient:** Prone
■ **Clinician:** Standing with thumb-over-thumb contact over spinous process or transverse process
■ **Procedure:** Posterior-to-anterior force applied through the thumb contacts creating central P-A pressure & unilateral P-A pressure
■ **Interpretation:** Resistance, pain, limitation of mov’t, & reproduction of symptoms documented on mov’t diagram

Cote et al, 1996
Porchet, Fankhauser, deTribolet, 1994
Tong, 2002; Viikari-Juntura, 1989; Wainner et al, 2003; Shah, Rajshekhar, 2004
General Recommendations for Performance of Joint Mobilization

- Selecting pts most likely to benefit from a particular technique is more important than the technique itself.
- Begin in area & direction of greatest restriction.
- Monitor symptoms over 24-hour period immediately following intervention & base next intervention on tolerance.
- If substantial improvement in mobility is noted in response to an intervention, do not be greedy. Wait until the next visit to do more.
- Add a second technique or intervention only after effects of the first technique have been determined.
- Use as little force as possible to produce the desired effect.
- Use the relationship between pain & resistance to determine aggressiveness.
- Allow individuals to take responsibility for their own care; initiate active interventions ASAP.
- Avoid creation of manual therapy addicts; do not overuse manual interventions.
- The best way to assess the effect of each technique is to continually re-examine throughout each session by following the process of examination/intervention/re-examination.
- Do not enter into examination with bias; let the pt’s presentation guide your evaluation & plan of care.
- Perform each technique at least twice before abandoning it.
- Do not feel the need to complete the entire exam & initiate intervention on first day; you need only enough information to educate & advise. The pt’s response to intervention on the first day may be confounded by effects from examination.
- Use specificity when mobilizing to reduce the effects on adjacent structures; use locking techniques when possible.
- Use the pt’s symptomatic response to mov’t to confirm clinical relevance of examination findings, as a guide for intervention, & as a dependent variable upon which to confirm efficacy of chosen interventions.

Maitland Australian Physiotherapy Seminars, 1985–2005
Anatomy of the Shoulder

- Acromioclavicular joint
- Glenohumeral joint
- Superior angle
- Spine of scapula
- Inferior angle
- Vertebral border
- Sternoclavicular joint
- Scapulothoracic joint
### Physiologic (Osteokinematic) Motions of the Shoulder

<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Abnormal End Feel(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scapulothoracic</td>
<td>Elevation = 4–6 cm Depression = 1–2 cm Abd (protraction) = 7–10 cm Add (retraction) = 4–5 cm Upward rotation = 60° Downward rotation = 20°</td>
<td>30°–60° flex &amp; 30°–60° horiz. abd</td>
<td>Maximal abd &amp; ER</td>
<td>Flex = elastic, firm–bony contact Abd = elastic Scaption = elastic IR/ER = elastic/firm Horizontal add = soft tissue Ext = firm</td>
<td>Empty = subacromial bursitis Hard capsular = frozen shoulder Capsular = ER &gt; abd &gt; IR</td>
</tr>
<tr>
<td>Sternoclavicular</td>
<td>Elevation = 45° Depression = 5° Protraction = 15°–20° Retraction = 15°–20° Upward rotation = 25°–55° Downward rotation = &lt;10°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acromioclavicular</td>
<td>Total IR/ER = 30° Total A/P tilting = 30°–40° Upward rotation = 30° Downward rotation = 17°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glenohumeral</td>
<td>Elevation (flex, abd) = 180° Ext = 60° Total IR/ER = 180° Scapulohumeral rhythm 2:1 = 120°:60°</td>
<td></td>
<td></td>
<td></td>
<td>Empty = subacromial bursitis Hard capsular = frozen shoulder Capsular = ER &gt; abd &gt; IR</td>
</tr>
</tbody>
</table>
## Accessory (Arthrokinematic) Motions of the Shoulder

<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scapulothoracic Joint</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Convex surface:</strong> Thorax</td>
<td>To facilitate elevation: Scapula glides superior on thorax</td>
</tr>
<tr>
<td><strong>Concave surface:</strong> Scapula</td>
<td>To facilitate protraction: Scapula glides lateral around thorax</td>
</tr>
<tr>
<td><strong>To facilitate upward rotation:</strong></td>
<td>To facilitate upward rotation: Inferior angle of scapula glides superior &amp; lateral around thorax</td>
</tr>
<tr>
<td><strong>Scapulothoracic Joint</strong></td>
<td>To facilitate depression: Scapula glides inferior on thorax</td>
</tr>
<tr>
<td><strong>Convex surface:</strong> Clavicular head</td>
<td>To facilitate depression: Lateral clavicle rolls downward &amp; medial clavicle glides inferior on disc &amp; manubrium</td>
</tr>
<tr>
<td><strong>Concave surface:</strong> Disc &amp; manubrium</td>
<td>To facilitate retraction: Medial clavicle &amp; disc roll &amp; glide posterior on manubrium</td>
</tr>
<tr>
<td><strong>Concave surface:</strong> Medial clavicle</td>
<td>To facilitate protration: Medial clavicle &amp; disc roll &amp; glide anterior on manubrium</td>
</tr>
<tr>
<td><strong>Convex surface:</strong> Manubrium</td>
<td></td>
</tr>
<tr>
<td><strong>Concave surface:</strong> Clavicle &amp; disc</td>
<td>To facilitate downward rotation: Medial clavicle glides inferior on clavicle</td>
</tr>
<tr>
<td><strong>Convex surface:</strong> Clavicle</td>
<td>To facilitate downward rotation: Scapula (acromion) glides inferior &amp; medial on clavicle</td>
</tr>
<tr>
<td><strong>Concave surface:</strong> Acromion</td>
<td></td>
</tr>
</tbody>
</table>

Continued
Arthrology

<table>
<thead>
<tr>
<th>Glenohumeral Joint</th>
<th>Concave surface: Glenoid Fossa</th>
<th>Convex surface: Humeral head</th>
</tr>
</thead>
</table>

Arthrokinematics

|                  | To facilitate flex: Humeral head rolls superior & glides inferior, anterior |
|                  | To facilitate IR: Humeral head rolls posterior & glides anterior |
|                  | To facilitate abd: Humeral head rolls superior & glides inferior, posterior |
|                  | To facilitate ER: Humeral head rolls anterior & glides posterior |

Scapulothoracic Mobilization Techniques

Scapulothoracic (S/T) Distraction & Glides

Indications:

- Any condition in which mobility of scapula relative to thoracic wall is reduced &/or painful
- Lateral glide for protraction, elevation, horizontal abd
- Medial glide for retraction, horizontal add
- Upward rotation glide for elevation
- Downward rotation glide for return to neutral
- Superior glide for elevation
- Inferior glide for depression
- An alternate technique may involve compression

Patient:

- Sidelying with arm at side & scapula in neutral or may pre-position with arm at point of restriction
Clinician:
- Face pt
- Caudal hand beneath pt’s arm capturing inferior angle of scapula in web space of hand
- Cephalad hand capturing superior angle of scapula in web space of hand
- Pt shoulder in contact with clinician’s chest/abdomen to assist with mobilization

Accessory Motion Technique:
- Maintain all contacts
- Distraction produced through hand contacts at anterior aspect of scapula to lift scapula away from thoracic wall
- Move hands in unison to mobilize scapula in lateral/medial, up/downward rotation, or superior/inferior directions

Accessory With Physiologic Motion Technique:
- Pt sitting
- Clinician standing on ipsilateral or contralateral side
- Pt actively moves into direction of greatest restriction
- During active mov’t, clinician mobilizes scapula on thorax in direction of restriction t/o entire ROM
- ST compression with contacts at midclavicle & medial-inferior scapula may also be considered
S/T Medial & Lateral Glide

S/T Superior/Inferior Glides

S/T Upward & Downward Rotation

S/T Compression
With Physiologic Motion
Sternoclavicular Mobilization Techniques

Sternoclavicular (S/C) Glides

Indications:
- Any condition in which mobility of clavicle or scapula relative to thoracic wall is reduced &/or painful
- Posterior glide for horizontal abd
- Inferior glide for elevation
- Superior glide for return to neutral
- An alternate technique may involve compression

Patient:
- Supine with arm in neutral & supported by pillows with hand placed over abdomen; may pre-position with arm in elevation to point of restriction during inferior glides or horizontal abd for posterior glides

Clinician:
- Stand to side of pt
- Position forearms in direction of mobilization
- Mobilizing contact: Thumb-over-thumb or hypothenar-eminence-over-thumb contact made as follows:
  - Posterior glide: Contact is on anterior surface of proximal clavicle
  - Inferior glide: Contact is on superior surface of proximal clavicle
  - Superior glide: Contact is on inferior surface of proximal clavicle
Accessory Motion Technique:
■ With thumb in direct contact with clavicular head, mobilizing thumb or hypothenar eminence elicits force in posterior, inferior, or superior directions

Accessory With Physiologic Motion Technique:
■ Pt sitting & clinician standing on contralateral side
■ Pt actively moves into the direction of greatest restriction
■ During active mov’t, clinician mobilizes SC joint in direction of restriction t/o entire ROM
■ Alternate technique involves compression with contacts over clavicle & scapula t/o entire ROM
S/C Posterior Glide

S/C Inferior Glide

S/C Superior Glide

S/C Inferior Glide With Physiologic Motion
Glenohumeral Mobilization Techniques

Glenohumeral (G/H) Distraction

**Indications:**
- To improve motion in all directions

**Patient:**
- Supine with arm in neutral or may pre-position with arm at point of restriction

**Clinician:**
- Sitting or standing on ipsilateral side facing cephalad
- *Stabilizing contact:* Grasps lateral aspect of distal humerus
- *Mobilizing contact:* Drape hand with a towel & place in pt's axilla
- Mobilization strap may be applied to proximal humerus & around clinician's gluteals

**Accessory Motion Technique:**
- Laterally-directed force applied through mobilizing hand or strap as stabilizing contact provides counterforce at distal humerus, thus producing a short-arm lever

**Accessory With Physiologic Motion Technique:**
- Pt supine & clinician standing on ipsilateral side
- Pt actively moves into direction of greatest restriction
- During active movement, clinician applies distraction force through mobilizing hand t/o entire ROM
- Clinician must be prepared to follow the extremity through its excursion of motion
G/H Inferior Glide

Indications:
- To improve elevation of G/H joint
- Combined ext, add, IR position indicated when there are restrictions &/or pain with this combined movement pattern

Patient:
- Supine or sitting with arm in neutral or may pre-position with arm at point of restriction

Clinician:
- Sitting or standing on ipsilateral side facing cephalad
- Stabilizing contact: Drape hand with a towel & place in pt’s axilla
- Mobilizing contact: Grasps distal humerus with pt’s forearm held between clinician’s arm & body
**Accessory Motion Technique:**
- While maintaining all contacts, clinician rotates trunk away from pt, producing inferior glide against pressure from stabilizing contact in pt's axilla.
- When mobilizing out of neutral, an inferiorly directed force is applied over lateral aspect of proximal humerus while stabilization is provided at elbow with pt in supine or sitting.
- Alternate technique: Clinician can stand alongside pt's head, with mobilizing hand on superior aspect of humerus to impart an inferior glide.

**Accessory With Physiologic Motion Technique:**
- Pt sitting or standing with shoulder in ext, add, IR elbow flexed & forearm held by uninvolved hand.
- Clinician on ipsilateral side with mobilizing hand contact or mobilization strap at pt's forearm just distal to flexed elbow t/o entire ROM.
- Stabilizing hand contact within pt's axilla.
- Inferior glide performed while pt moves with assistance of clinician & uninvolved hand into greater degrees of motion.

---

**G/H Inferior Glide**

![Image of G/H Inferior Glide](image1)

**G/H Inferior Glide With Physiologic Motion**

![Image of G/H Inferior Glide With Physiologic Motion](image2)
G/H Posterior Glide

Indication:
- To improve ER & abd

Patient:
- Supine with wedge to stabilize scapula posteriorly & bolster supporting elbow in flexed position, hand on abdomen; may pre-position with arm at point of restriction

Clinician:
- Technique 1: Standing on ipsilateral side facing cephalad
  - Stabilizing contact: Holds arm in neutral or placed under scapula in lieu of wedge
  - Mobilizing contact: Palm contacts humeral head
- Technique 2: Standing on ipsilateral side facing caudally
  - Stabilizing contact: Pt’s arm brought into elevation to point of restriction & held between clinician’s arm & body
  - Mobilizing contact: Both hands wrapped around proximal humerus with thumbs contacting the anterior humerus within the axilla

Accessory Motion Technique:
- Technique 1: With contacts in place, a posterolateral glide is performed
- Technique 2: With contacts in place, a posterior glide (followed by anterior glide) may be applied at the end range of available motion in single or combined planes of elevation
Accessory With Physiologic Motion Technique:

- Pt sitting or standing
- Clinician standing on contralateral side with mobilizing hand, or mobilization strap, over anterior humeral head & stabilizing contact over scapula
- Pt actively moves into elevation in the direction of greatest restriction
- During active mov’t, clinician applies a posterolaterally directed force over humerus while stabilizing scapula t/o entire ROM

G/H Posterior Glide
Technique #1

G/H Posterior Glide
With Physiologic Motion
**G/H Anterior Glide**

**Indications:**
- To improve IR, flex, & ext

**Patient:**
- Prone (technique 1 & 2) with wedge to stabilize scapula anteriorly or sitting with arm in neutral
- Supine (technique 3)
- May pre-position with arm at point of restriction

**Clinician:**
- Technique 1: Standing on ipsilateral side facing cephalad
  - *Stabilizing contact:* Holds arm in neutral
  - *Mobilizing contact:* Hypothenar eminence of mobilizing hand contacts posterior aspect of humeral head
- Technique 2: Standing on ipsilateral side
  - *Stabilizing contact:* Contacts anterior aspect of distal clavicle & scapula just proximal to glenoid fossa.
  - *Mobilizing contact:* Contacts posterior aspect of humerus
- Technique 3: Standing on ipsilateral side
  - *Stabilizing contact:* Contacts distal clavicle & scapula just proximal to glenoid fossa
  - *Mobilizing contact:* Hand cups humerus with fingers contacting posterior aspect of proximal humerus
Accessory Motion Technique:
- With contacts in place, an anteromedial glide performed with arm in neutral or at point of greatest restriction

Accessory With Physiologic Motion Technique:
- Pt sitting or standing
- Clinician standing on ipsilateral side with mobilizing hand contacting posterior humerus while stabilizing hand contacts distal clavicle
- Pt actively moves into direction of greatest restriction primarily into IR, functional IR (IR, ext, add), or ext
- During active mov’t, clinician maintains all contacts during application of mobilizing force t/o entire ROM

G/H Anterior Glide Technique #1

G/H Anterior Glide With Physiologic Motion
Anatomy of the Elbow

Anterior View

- Humerus
- Lateral epicondyle
- Capitulum
- Radial head
- Radial tuberosity
- Radius
- Ulna

Medial supracondylar crest
Coronoid fossa
Medial epicondyle
Trochlea
Coronoid process

Posterior View

- Humerus
- Olecranon
- Medial epicondyle
- Radial head
- Coronoid process
- Radius
- Ulna
### Physiologic (Osteokinematic) Motions of the Elbow

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<th>Normal ROM</th>
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<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Abnormal End Feel(s)</th>
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<tbody>
<tr>
<td>Humeroulnar</td>
<td>Flex &gt;135°, Ext = 5°</td>
<td>70° flex</td>
<td>Full ext</td>
<td>Flex = soft tissue or bony approximation</td>
<td>Boggy = joint effusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10° sup</td>
<td>Full sup</td>
<td></td>
<td>Capsular = flex &gt; ext</td>
</tr>
<tr>
<td>Humeroradial</td>
<td></td>
<td>Full ext</td>
<td>90° flex</td>
<td>Ext = bony approximation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full sup</td>
<td>5° sup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superior radioulnar</td>
<td>Pronation = 80°–90°, Supination = 80°–90°</td>
<td>70° flex</td>
<td>5° sup</td>
<td>Supination = ligamentous Pronation = bony approximation or ligamentous</td>
<td>Capsular = pronation &amp; supination equally limited</td>
</tr>
<tr>
<td></td>
<td></td>
<td>35° sup</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Accessory (Arthrokinematic) Motions of the Elbow

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<tr>
<td><strong>Humeroulnar</strong></td>
<td></td>
</tr>
<tr>
<td>Concave surface:</td>
<td>To facilitate flex:</td>
</tr>
<tr>
<td>Trochlear notch of ulna</td>
<td>OKC = radius &amp; ulna roll &amp; glide</td>
</tr>
<tr>
<td>Convex surface:</td>
<td>anterior &amp; medial on humerus</td>
</tr>
<tr>
<td>Trochlea of humerus</td>
<td></td>
</tr>
<tr>
<td><strong>Humeroradial</strong></td>
<td>To facilitate ext:</td>
</tr>
<tr>
<td>Concave surface:</td>
<td>OKC = radius &amp; ulna roll &amp; glide</td>
</tr>
<tr>
<td>Radial head</td>
<td>posterior &amp; lateral on humerus</td>
</tr>
<tr>
<td>Convex surface:</td>
<td></td>
</tr>
<tr>
<td>Capitulum of humerus</td>
<td></td>
</tr>
<tr>
<td><strong>Proximal radioulnar</strong></td>
<td>To facilitate pronation:</td>
</tr>
<tr>
<td>Concave surface:</td>
<td>Radius spins medially &amp; glides</td>
</tr>
<tr>
<td>Radial notch of ulna</td>
<td>anteriorly on ulna</td>
</tr>
<tr>
<td>Convex surface:</td>
<td>To facilitate supination:</td>
</tr>
<tr>
<td>Radial head</td>
<td>Radius spins laterally &amp; glides</td>
</tr>
<tr>
<td></td>
<td>posteriorly on ulna</td>
</tr>
</tbody>
</table>
Elbow Mobilization Techniques

Humeroulnar (H/U) Distraction

Indications:

■ To improve both elbow flex & ext

Patient:

■ Supine with upper arm resting on table or bolster & dorsal forearm resting on clinician’s shoulder
■ Elbow in H/U open-packed position of 70° of flex & 10° of supination
■ May pre-position with arm at point of restriction

Clinician:

■ Sitting on ipsilateral side
■ *Stabilizing contact:* Holds upper arm in contact with bolster
■ *Mobilizing contact:* Grasps the most proximal aspect of anterior ulna (avoid contact with radius)

Accessory Motion Technique:

■ While stabilizing upper arm, force is exerted through ulnar contact in caudal direction
■ Progress this technique by moving elbow in direction of greatest restriction

Accessory With Physiologic Motion Technique:

■ Pt supine & clinician standing on ipsilateral side with mobilizing contact as above & stabilizing contact now moved to posterior aspect of distal forearm
■ Pt actively moves in direction of greatest restriction
During active mov’t, clinician applies force perpendicular to olecranon against stabilizing force at distal forearm

Requires a change in clinician position t/o technique

**H/U Distraction**

**H/U Distraction With Physiologic Motion**
H/U Medial & Lateral Glides

Indications:
■ Medial glide is component motion of elbow flex
■ Lateral glide is component motion of elbow ext
■ Gliding indicated in cases where pain &/or symptoms are present with elbow ext or gripping

Patient:
■ Supine or sitting with elbow flexed to ~90° & arm at side; may pre-position with arm at point of restriction

Clinician:
■ Sitting or standing on ipsilateral side
■ Stabilizing contact: Contacts distal humerus
■ Mobilizing contact: Thenar eminence placed posteriorly over the olecranon & proximal ulna
■ Alternate contact includes contacting proximal radius

Accessory Motion Technique:
■ Using a “closed lumbral grip”
■ Medial glide: Glide olecranon & ulna medially; if alternate contacts are used, gliding is performed through proximal radius
■ Lateral glide: Glide olecranon & ulna laterally

Accessory With Physiologic Motion Technique:
■ Pt supine or sitting with elbow flexed to 90°
■ Clinician standing on ipsilateral side with stabilizing contact as noted above & mobilizing hand, or mobilization belt, at proximal radius or ulna as described for alternate contact
- Pt actively moves into direction of greatest restriction or performs repeated gripping
- During active mov’t, clinician applies force in lateral direction through same hand contacts or belt, t/o entire ROM

**Note:** Hand dynamometer force expected to improve upon mobilization

**H/U Medial & Lateral Glides**

**H/U Medial & Lateral Glides With Physiologic Motion**
Humeroradial (H/R) Anterior & Posterior Glide

Indications:
- Anterior glide is component motion of elbow flex & pronation
- Posterior glide is component motion of elbow ext & supination

Patient:
- Supine with arm on table or towel
- Elbow in open-packed position of 70° of flex & 35° of supination
- May pre-position with arm at point of restriction

Clinician:
- Sitting on ipsilateral side
- Stabilizing contact: Grasps distal aspect of humerus
- Mobilizing contact: 3-jaw pinch contact used to grasp proximal radius

Accessory Motion Technique:
- Anterior glide: Force provided in an anterior direction on stabilized humerus
- Posterior glide: Force provided in a posterior direction on stabilized humerus

Accessory With Physiologic Motion Technique:
- Pt supine
- Clinician sitting on ipsilateral side with same hand contacts
- Pt actively moves into direction of greatest restriction
- During active mov’t, clinician applies force in anterior or posterior direction through same hand contacts for flex & ext, respectively, t/o entire ROM
Proximal Radioulnar (R/U) Anterior & Posterior Glide

Indications:

- Anterior glide of radius on ulna is component of forearm pronation
- Posterior glide of radius on ulna is component of forearm supination

Patient:

- Supine with upper arm resting on table or towel
- Elbow in open-packed position of 70° of flex & 35° of supination
- May pre-position with arm at point of restriction

Clinician:

- Sitting on ipsilateral side
- Stabilizing contact: Grasps distal ulna
- Mobilizing contact: 3-jaw pinch contact used to grasp proximal radius

Accessory Motion Technique:

- Anterior glide: Proximal radius moved anteriorly on fixed ulna
- Posterior glide: Proximal radius moved posteriorly on fixed ulna
- Alternate technique, known as “squeeze maneuver,” may be used whereby fingers provide mobilizing force over radius as if to bring radius & ulna together as thumb stabilizes ulna

Accessory With Physiologic Motion Technique:

- Pt supine with arm at side & elbow flexed to 90°
- Clinician standing on ipsilateral side with hand contacts as above
Pt actively moves into pronation or supination in direction of greatest restriction
- During active movement, clinician performs “forearm rolling” technique including stabilizing ulna with anterior force during pronation & posterior force during supination
- Force direction changes during movement

**Proximal R/U Anterior Glide**

**Proximal R/U Anterior Glide With Physiologic Motion**
Proximal R/U Inferior Glide

**Indications:**
- To improve elbow ext & wrist flex
- May also be used to distract humeroulnar joint & serve to enhance all physiologic motions of elbow

**Patient:**
- Supine with upper arm resting on table or towel
- Elbow in open-packed position of 70° of flex & 35° of supination
- May pre-position with arm at point of restriction

**Clinician:**
- Standing on ipsilateral side facing cephalad
- **Stabilizing contact:** Contacts anterior humerus distally
- **Mobilizing contact:** “Golfer’s grip” contact applied at distal radius

**Accessory Motion Technique:**
- While maintaining contacts, clinician rotates away from pt imparting an inferiorly directed force to radius on stabilized ulna

**Accessory With Physiologic Motion Technique:**
- Pt in supine as above
- Clinician in standing as above
- Pt actively moves into progressively greater ranges of elbow ext with some pronation, supination, & wrist flex
- During active mov’t, clinician maintains force t/o entire ROM
Proximal R/U Superior Glide

Indications:
- To improve elbow flex & wrist ext

Patient:
- Supine with upper arm resting on table or towel
- Elbow in open-packed position of 70° of flex & 35° of supination
- May pre-position with arm at point of restriction

Clinician:
- Standing on ipsilateral side facing cephalad
- Stabilizing contact: Contacts anterior humerus distally holding arm firmly into towel
- Mobilizing contact: “Saw grip” position through hand while locking wrist in ext to allow support for compressive forces

Accessory Motion Technique:
- Superiorly directed force provided through “saw grip” position into thenar eminence of pt’s hand
- Once performed in open-packed position, elbow may be moved to end of available range

Accessory With Physiologic Motion Technique:
- Pt supine as above
- Clinician standing as above
- Pt actively moves into progressively greater ranges of elbow flex with some pronation & supination
- During active mov’t, clinician maintains force t/o entire ROM
Proximal R/U Anterior High-Velocity Thrust
(Mills Manipulation Thrust)

Indications:
- Used to alter positional relationships of R/U joint
- Break through adhesions that may be restricting motion
- Effective for chronic cases of recalcitrant lateral epicondylalgia

Patient:
- Supine or standing
- Elbow in 20° of flex, forearm fully pronated, wrist flexed & ulnarly deviated

Clinician:
- When pt supine, stand on ipsilateral side facing caudally; when pt standing, stand to side & behind pt
- Thumb contacts posterior aspect of radial head
- Other hand flexes & ulnarly deviates pt’s wrist & controls elbow position

Thrust Technique:
- Thumb maintains an anteriorly directed force through radial head
- Clinician’s other hand brings elbow toward ext & at end range provides a short-amplitude, high-velocity thrust while maintaining wrist position, thereby imparting stretch to extensor muscles of forearm
Anatomy of the Wrist and Hand

Anterior View

Posterior View

Radius
Ulna
Carpals
Metacarpals
Phalanges

Ulna
Radius
Ulna styloid
Carpals
Metacarpals
Phalanges
### Physiologic (Osteokinematic) Motions of the Wrist and Hand

<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>Normal End Feel(s)</th>
<th>Abnormal End Feel(s)</th>
</tr>
</thead>
</table>
| Distal radioulnar | Pronation = 90°  
Supination = 90°  
Flex = 45°–50°  
Ext = 70°–80°  
Abd = 70°  
RD/UD = 20°–30° | Pronation = capsular  
Supination = capsular  
Flex = firm/ligamentous/elastic  
Ext = firm/ligamentous/elastic  
RD = bony  
UD = firm/bony | Capsular = pronation & supination equally restricted |
| Radiocarpal     | Flex = 60°–80°  
Ext = 60°–70°  
RD/UD = 20°–30° | Flex = firm/ligamentous/elastic  
Ext = firm/ligamentous/elastic  
RD = bony  
UD = firm/bony |                                        |
| Intercarpal     | Flex with RC jt = 60°–80°  
Ext with RC jt = 60°–80°  
RD/UD with RC jt = 20°–30° | Flex = firm/ligamentous/elastic  
Ext = firm/ligamentous/elastic  
RD = bony  
UD = firm/bony |                                        |
| CMC thumb       | Flex = 45°–50°  
Ext = 70°–80°  
Abd = 70° | Elastic |                                        |
| MCP thumb       | Flex = 75°–90° | Flex = bony/firm/ligamentous/elastic  
Ext = firm/elastic |                                        |
<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>Normal End Feel(s)</th>
<th>Abnormal End Feel(s)</th>
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<tr>
<td>MCP 2–5</td>
<td>Flex = 90°</td>
<td>Flex = elastic/bony/firm/ligamentous</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ext = elastic/capsular/ligamentous</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Abd = firm/ligamentous</td>
<td></td>
</tr>
<tr>
<td>IP 2–5</td>
<td>PIP flex = 100°</td>
<td>PIP flex = firm/bony/elastic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DIP flex = 80°</td>
<td>PIP ext = firm/ligamentous/elastic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIP flex = firm/ligamentous/elastic</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIP ext = firm/ligamentous/elastic</td>
<td></td>
</tr>
</tbody>
</table>
## Accessory (Arthrokinematic) Motions of the Wrist and Hand

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<th>Arthrokinematics</th>
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</tr>
<tr>
<td>Concave surface: Ulnar notch of radius</td>
<td>To facilitate pronation: Radius rolls &amp; glides medially over ulna</td>
</tr>
<tr>
<td>Convex surface: Head of ulna</td>
<td></td>
</tr>
<tr>
<td><strong>Radiocarpal/Intercarpal</strong></td>
<td></td>
</tr>
<tr>
<td>Concave surface: Radius &amp; R/U disk</td>
<td>To facilitate wrist flexion: Proximal carpal rolls anterior &amp; glides posterior on radius with distal carpal rolling anterior &amp; gliding posterior on proximal carpal</td>
</tr>
<tr>
<td>Convex surface: Proximal carpals</td>
<td>To facilitate radial deviation: Proximal carpal rolls lateral &amp; glides medial on radius with distal carpal rolling lateral &amp; gliding medial on proximal carpal</td>
</tr>
<tr>
<td>Arthrology</td>
<td>Arthrokinematics</td>
</tr>
<tr>
<td>------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>CMC 2-5</strong></td>
<td><strong>CMC thumb</strong></td>
</tr>
<tr>
<td>Concave surface: Base of metacarpals</td>
<td>To facilitate thumb flex: MC rolls &amp; glides medial on trapezium</td>
</tr>
<tr>
<td>Convex surface: Distal row of carpals</td>
<td>To facilitate thumb add: MC rolls proximal &amp; glides distal on trapezium</td>
</tr>
<tr>
<td><strong>MCP 2-5</strong></td>
<td><strong>MCP thumb</strong></td>
</tr>
<tr>
<td>Concave surface: Base of proximal phalanx</td>
<td>To facilitate flex: Proximal phalanx rolls &amp; glides anterior on MC</td>
</tr>
<tr>
<td>Convex surface: Head of metacarpal</td>
<td>To facilitate thumb flex: Distal phalanx rolls &amp; glides anterior on the proximal phalanx</td>
</tr>
<tr>
<td><strong>IP 2-5</strong></td>
<td><strong>IP</strong></td>
</tr>
<tr>
<td>Concave surface: Head of proximal phalanx</td>
<td>To facilitate flex: Distal phalanx rolls &amp; glides anterior on the proximal phalanx</td>
</tr>
<tr>
<td>Convex surface: Base of distal phalanx</td>
<td>To facilitate ext: Distal phalanx rolls &amp; glides posterior on the proximal phalanx</td>
</tr>
</tbody>
</table>
Wrist & Radioulnar (R/U) Mobilization Techniques

Distal R/U Dorsal & Volar Glide

Indications:
■ Dorsal glides to improve forearm pronation & wrist flex & ext
■ Volar glides to improve forearm supination & wrist flex & ext

Patient:
■ Technique #1: Sitting with forearm supinated 0°–10° supported on table & dorsum of hand facing clinician; may pre-position with joint at point of restriction
■ Technique #2: Sitting with elbow flexed on table in 0°–10° of supination & dorsum of hand facing clinician

Clinician:
■ Sitting on ipsilateral side
■ Technique #1:
  ■ Stabilizing contact: “Lumbrical grip” over ulnar side of wrist & hand
  ■ Mobilizing contact: “Lateral pinch grasp” contacts distal radius
■ Technique #2:
  ■ Stabilizing contact: “Lumbrical grip” over radial side of wrist & hand
  ■ Mobilizing contact: “Lateral pinch grasp” contacts distal ulna

Accessory Motion Technique:
■ Technique #1: Mobilizing hand imparts a dorsal or volar glide of distal radius on fixed ulna
■ Technique #2: Mobilizing hand imparts a dorsal or volar glide of distal ulna on fixed radius
Accessory With Physiologic Motion Technique:

- Sitting or supine with elbow flexed to 90° & forearm in full supination for dorsal glide & pronation for volar glide
- Clinician sitting with the ability to move to maintain force t/o ROM
- Pt actively moves from full supination to full pronation or the reverse as clinician maintains a dorsally directed or volarly directed force, respectively

Radius on Ulna Dorsal & Volar Glides
Technique #1

Ulna on Radius Dorsal & Volar Glides
Technique #2
Radiocarpal (R/C) Distraction

Indications:
■ To improve motion in all directions

Patient:
■ Sitting with the elbow flexed to 90° & forearm pronated with wrist in neutral & hand over edge of table; may pre-position with joint at point of restriction

Clinician:
■ Sitting on ipsilateral side
■ Stabilizing contact: Grasps distal radius & ulna
■ Mobilizing contact: Immediately adjacent to stabilizing hand just distal to wrist over proximal row of carpal bones

Accessory Motion Technique:
■ Force is applied in direction of long axis of forearm

Accessory With Physiologic Motion Technique:
■ Pt & clinician sitting as above
■ Pt actively flexes & extends wrist
■ During active mov’t, clinician applies distraction force through same hand contacts t/o entire ROM
■ Alternate technique includes medial & lateral glides applied with active wrist flex & ext t/o ROM (see RC medial/lateral glide)
R/C Dorsal & Volar Glide

Indications:
- Dorsal glides to improve wrist flex
- Volar glides to improve wrist ext

Patient:
- Sitting with elbow flexed to 90°; may pre-position with joint at point of restriction
- Dorsal glides: Forearm supinated & palm facing upward with wrist in neutral & hand over edge of table
- Volar glides: Forearm pronated & palm facing downward with wrist in neutral & hand over edge of table

Clinician:
- Sitting on ipsilateral side
- Stabilizing contact: Grasps distal radius & ulna
- Mobilizing contact: Immediately adjacent to stabilizing hand just distal to wrist over proximal row of carpal bones

Accessory Motion Technique:
- Force is applied in a downward direction

Accessory With Physiologic Motion Technique:
- Pt & clinician sitting as above
- Pt actively moves into wrist flex or ext in direction of greatest restriction
- During active wrist flex, clinician applies a dorsal glide
During active wrist ext, clinician applies a volar glide
Alternate technique includes medial & lateral glides applied with active wrist flex & ext t/o ROM (see R/C medial/lateral glide)
R/C Medial & Lateral Glide

Indications:
■ Medial & lateral glides to improve RD & UD, respectively

Patient:
■ Sitting with elbow flexed to 90° & forearm between pronation & supination with wrist over edge of table; may pre-position with joint at point of restriction

Clinician:
■ Sitting on ipsilateral side
■ Stabilizing contact: Grasps distal radius & ulna
■ Mobilizing contact: Immediately adjacent to stabilizing hand just distal to wrist over proximal row of carpal bones

Accessory Motion Technique:
■ Force is applied in a downward direction for medial glide when thumb is facing upward
■ Force is applied in upward direction for lateral glide when thumb is facing upward

Accessory With Physiologic Motion Technique:
■ Pt & clinician sitting as above
■ Pt actively moves into RD as medial glide is performed & lateral glide is performed as pt moves into UD
■ Medial & lateral glides may be applied with active wrist flex & ext t/o ROM
R/C Medial Glide

R/C Lateral Glide
Midcarpal (M/C) & Intercarpal (I/C) Multiplanar Glide

Indications:
- Dorsal & volar glides of proximal row of carpal bones to improve wrist flex & ext, respectively
- Dorsal & volar glides of the distal row of carpal bones to improve wrist ext & flex, respectively
- Multiplanar glides important for intercarpal mobility in all directions

Patient:
- Sitting with elbow flexed to 90° & forearm fully pronated; may pre-position with joint at point of restriction

Clinician:
- Sitting on ipsilateral side
- Stabilizing contact: “Tip-to-tip pinch grasp” used to stabilize carpal bone adjacent to bone to be mobilized
- Mobilizing contact: “Tip-to-tip pinch grasp” on the carpal bone to be mobilized

Accessory Motion Technique:
- Force applied in dorsal or volar direction & with slight variation in direction of greatest restriction

Accessory With Physiologic Motion Technique:
- Pt & clinician sitting as above
- Pt actively performs wrist mov’t in any direction as stabilization & mobilization contacts are maintained t/o ROM
Carpometacarpal (CMC) Distraction & Glide

Indications:
- Distraction to improve motion in all directions
- For the 1st CMC joint, medial glides to improve flex & abd & lateral glides to improve ext & add
- Lateral glides of 1st CMC joint are component motion of ext & medial glides are important for flex
- For CMC joints 2–5, volar glides to improve flex & dorsal glides to improve ext

Patient:
- Sitting with the elbow flexed to 90° & forearm fully pronated with the palm facing downward; may pre-position at point of restriction

Clinician:
- Sitting on ipsilateral side
- **Stabilizing contact:** Grasps distal row carpal bone between finger & thumb that corresponds to metacarpal to be mobilized
- **Mobilizing contact:** Grasp base of metacarpal immediately adjacent to stabilizing hand

Accessory Motion Technique:
- Force applied in direction of long axis of metacarpal
- Lateral force for lateral glides
- Medial force for medial glides
- Upward force applied for dorsal glides
- Downward force applied for volar glides
Accessory With Physiologic Motion Technique:

- Pt & clinician sitting as above
- As pt actively performs CMC flex/ext, abd/add, while distraction or glide of joint is maintained

**CMC Distraction**

**CMC Medial Glide**
Metacarpophalangeal (MCP) Distraction

Indications:
■ To improve motion in all directions

Patient:
■ Sitting with elbow flexed to 90° & forearm fully pronated

MCP Distraction:
■ MCP joint in 20° of flex; may pre-position at point of restriction

Clinician:
■ Sitting on ipsilateral side
■ Stabilizing contact: Grasps metacarpal head between thumb & index finger
■ Mobilizing contact: Hook grasp of proximal phalanx immediately adjacent to stabilizing hand

Accessory Motion Technique:
■ Force is applied in direction of long axis of phalanx

Accessory With Physiologic Motion Technique:
■ Pt & clinician sitting as above
■ As pt actively performs MCP flex & ext, distraction is maintained t/o ROM
■ Clinician alters direction of force to remain in line with long axis of phalanx
■ Alternate technique includes medial & lateral glides applied with active MCP flex & ext t/o ROM (see MCP medial/lateral glide)
MCP Dorsal & Volar Glide

**Indications:**
- Dorsal glides to improve MCP ext
- Volar glides to improve MCP flex

**Patient:**
- Sitting with elbow flexed to 90° & forearm fully pronated; MCP joint in 20° of flex; may pre-position at point of restriction

**Clinician:**
- Sitting on ipsilateral side
- *Stabilizing contact:* Grasp distal metacarpal head between thumb & index finger
- *Mobilizing contact:* Grasp base of proximal phalanx immediately adjacent to stabilizing hand

**Accessory Motion Technique:**
- Force applied in upward direction for dorsal glides & downward direction for volar glides

**Accessory With Physiologic Motion Technique:**
- Pt & clinician sitting as above
- As pt actively performs MCP flex & ext, volar & dorsal glides are maintained t/o ROM
- Alternate technique includes medial & lateral glides applied with active MCP flex & ext t/o ROM (see MCP medial/lateral glide)
MCP Dorsal Glide

MCP Volar Glide
MCP Medial & Lateral Glide

Indications:

■ Medial glides to improve add of digits 1, 2 & abd of digits 4, 5
■ Lateral glides to improve abd of digits 1, 2 & add of digits 4, 5

Patient:

■ Sitting with elbow flexed to 90° & forearm fully pronated; MCP joint in 20° of flex; may pre-position at point of restriction

Clinician:

■ Sitting on ipsilateral side
■ Stabilizing contact: Grasps distal metacarpal head between thumb & index finger
■ Mobilizing contact: Grasp base of proximal phalanx immediately adjacent to stabilizing hand

Accessory Motion Technique:

■ Force is applied in a medial direction for medial glide & a lateral direction for lateral glide

Accessory With Physiologic Motion Technique:

■ Pt & clinician sitting as above
■ As pt actively performs MCP abd/add or flex/ext; lateral & medial glides are performed t/o ROM
MCP Medial Glide

MCP Lateral Glide
Proximal/Distal Interphalangeal (I/P) Distraction

Indications:
■ To improve motion in all directions

Patient:
■ Sitting with elbow flexed to 90° & forearm fully pronated
■ I/P jt is in 20° of flexion; may pre-position at point of restriction

Clinician:
■ Sitting on ipsilateral side
■ Stabilizing contact: Grasp proximal phalanx between thumb & index finger
■ Mobilizing contact: Hook grasp of next distal phalanx immediately adjacent to stabilizing hand

Accessory Motion Technique:
■ Force is applied in direction of long axis of phalanx

Accessory With Physiologic Motion Technique:
■ Pt & clinician sitting as above
■ As pt actively performs I/P flex & ext, distraction is applied & maintained t/o ROM
■ Alternate technique includes medial & lateral glides applied with active proximal I/P flex & ext t/o ROM (see proximal I/P medial/lateral glide)
Proximal/Distal I/P Dorsal & Volar Glide

Indications:
■ Dorsal & volar glides to improve I/P ext & flex, respectively

Patient:
■ Sitting with elbow flexed to 90° & forearm fully pronated; I/P joint in 20° of flex; may pre-position at point of restriction

Clinician:
■ Sitting on ipsilateral side
■ Stabilizing contact: Grasps more proximal phalanx between thumb & index finger
■ Mobilizing contact: Grasps base of next distal phalanx immediately adjacent to stabilizing hand

Accessory Motion Technique:
■ Force is applied in dorsal or volar direction

Accessory With Physiologic Motion Technique:
■ Pt & clinician sitting as above
■ As pt actively performs I/P flex & ext, glide is applied & maintained t/o ROM
■ Alternate technique includes medial & lateral glides applied with active proximal I/P flex & ext t/o ROM (see proximal I/P medial/lateral glide)
Proximal I/P Dorsal Glide

Proximal I/P Volar Glide
Intercarpal (I/C) Volar Glide High-Velocity Thrust

Indications:
- To alter positional relationships, break adhesions that may be restricting motion, or to facilitate general improvements in mobility at any of the I/C joints

Patient:
- Sitting with wrist held in 20° of flex with fingers relaxed

Clinician:
- Standing facing the pt
- Both hands grasp pt's hand
- Thumb over thumb or thumbs side by side are placed on dorsal aspect of carpal bone to be mobilized
- Fingers wrap around hand & control wrist motion

Thrust Technique:
- From a slightly flexed position, wrist is brought toward ext & at end range a short-amplitude, high-velocity thrust is imparted in a volar direction through thumb contacts
Anatomy of the Hip

Anterior View

- Lumbar vertebra
- Iliac crest
- Greater trochanter
- Sacrum
- Lesser trochanter
- Pubic symphysis

Posterior View

- Lumbar vertebra
- Iliac crest
- Greater trochanter
- Sacrum
- Ischial tuberosity
- Lesser trochanter
Physiologic (Osteokinematic) Motions of the Hip

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<tr>
<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
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<tr>
<td>Flex = 100°–120°</td>
<td>30° flex</td>
<td>Max ext, IR, abd</td>
<td>Flex &amp; add = elastic or tissue approx</td>
<td>IR &gt; ext &gt; abd</td>
</tr>
<tr>
<td>Ext = 15°</td>
<td>30° flex</td>
<td></td>
<td>SLR = elastic</td>
<td></td>
</tr>
<tr>
<td>Abd = 40°–45°</td>
<td>30° abd &amp; slight ER</td>
<td></td>
<td>Ext &amp; abd = elastic/firm</td>
<td></td>
</tr>
<tr>
<td>IR = 30°–40°</td>
<td></td>
<td></td>
<td>IR &amp; ER = elastic/firm</td>
<td></td>
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<tr>
<td>ER = 40°–50°</td>
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Accessory (Arthrokinematic) Motions of the Hip

Arthrology

<table>
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<tr>
<th>Concave surface: acetabulum</th>
<th>To facilitate hip flex: Femur spins posterior</th>
<th>Arthrokinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convex surface: femoral head</td>
<td>To facilitate hip abd: Femur spins lateral &amp; glides medial on pelvis</td>
<td>To facilitate hip ext: Femur spins anterior</td>
</tr>
<tr>
<td></td>
<td>To facilitate hip IR: Femur rolls medial &amp; glides posterior &amp; lateral on pelvis</td>
<td>To facilitate hip add: Femur spins medial &amp; glides lateral on pelvis</td>
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<tr>
<td></td>
<td>To facilitate hip ER: Femur rolls lateral &amp; glides anterior &amp; medial on pelvis</td>
<td>To facilitate hip ER: Femur rolls lateral &amp; glides anterior &amp; medial on pelvis</td>
</tr>
</tbody>
</table>
Hip Mobilization Techniques

Hip Distraction

**Indications:**
- To improve motion in all directions

**Patient:**
- Supine with hip in open-packed position

**Clinician:**
- At pt’s feet in a tandem stance facing pt
- *Stabilizing contact:* Provided by pt’s body weight with assistance from a belt around pelvis
- *Mobilizing contact:* Both hands grasp pt’s distal tibia/fibula just proximal to ankle (or above knee if knee pathology exists); belt may be used to reinforce hand contacts

**Accessory Motion Technique:**
- While maintaining all contacts, clinician shifts weight from front to back foot

**Accessory With Physiologic Motion Technique:**
- Pt & clinician in same position
- Pt & clinician move hip in direction of greatest restriction
- Clinician maintains hand contacts & distraction force t/o ROM
Hip Inferior Glide

Indications:
- To improve hip flex

Patient:
- Supine with hip flexed to 90° & lower leg draped over clinician’s shoulder (knee flexed); may incorporate add/abd or ER/IR to pre-position at point of restriction

Clinician:
- Stand to side facing pt with pt’s posterior thigh in contact with clinician’s shoulder
- Stabilizing contact: Provided by pt’s body weight with assistance from belt around pt’s pelvis
- Mobilizing contact: Clasped hands mobilize by contacting anterior aspect of proximal femur. Mobilization belt may be used around clinician’s waist & pt’s thigh to reinforce hand contacts

Accessory Motion Technique:
- Both hands exert inferior mobilizing force; clinician may lean back to use body weight to assist mobilization if belt is used
Accessory With Physiologic Motion Technique:

- Pt & clinician in same position with pt on lower surface & all hand contacts maintained
- Inferior mobilizing force at proximal femur provided as counterforce elicited distally through clinician’s shoulder contact in scooping-type motion
- While mobilizing, hip brought into progressively greater degrees of flex
- Modifications include mov’t into other planes to address motions that are most restricted

Hip Inferior Glide
Hip Anterior Glide

Indications:
■ To improve hip ext & ER

Patient:
■ Prone near edge of surface with hip in slight flex, abd, & ER (FABER) with foot secured at posterior aspect of other leg (figure-4 position); may pre-position at point of restriction

Clinician:
■ Standing on contralateral side
■ Stabilizing contact: Provided by pt’s body weight & through securing leg into surface
■ Mobilizing contact: Hand-over-hand contact placed at posterior aspect of proximal femur (just below gluteal fold); elbows extended & forearms positioned in anterolateral direction

Accessory Motion Technique:
■ Force is exerted through extended arms in an anterolateral direction

Accessory With Physiologic Motion Technique:
■ Pt in prone with hip in neutral or pre-positioned at point of restriction & knee flexed with pelvis secured by belt to table or standing with mobilization belt from clinician’s waist to posterior aspect of proximal femur (technique can also be performed with belt over clinician’s shoulder)
■ Clinician standing on ipsilateral side with one hand supporting flexed knee & other at posterior aspect of proximal femur to mobilize
■ In prone, hip brought into progressively greater degrees of hip ext as anterior mobilizing force maintained
In standing, pt performs trunk backward bending or side stepping, rotation, or lunging while anteriorly directed mobilizing force is provided through belt contact.

**Hip Anterior Glide**

**Hip Anterior Glide With Accessory Motion**
Hip Posterior Glide

Indications:
- To improve hip flex & IR

Patient:
- Supine with hip flexed to 90°, slightly adducted, & IR (FADIR); knee flexed; may pre-position with hip at point of restriction

Clinician:
- Standing on contralateral or ipsilateral side, depending on required force direction
- Stabilizing contact: Provided by pt’s body weight & bolster placed under posterior ischium just proximal to hip
- Mobilizing contact: Clasped hands over pt’s flexed knee

Accessory Motion Technique:
- Posterior mobilizing force elicited through long axis of femur

Accessory With Physiologic Motion Technique:
- Technique #1: Pt & clinician in same position, with pt on a lower surface, with clasped hands over pt’s flexed knee or standing with mobilization belt from clinician’s waist to anterior aspect of the proximal femur
Technique #2: In supine, pt moves into progressively greater degrees of hip flex while clinician maintains posteriorly directed mobilizing force

Technique #3: In standing, pt performs trunk forward bending or side stepping, rotation, or lunging while posteriorly directed mobilizing force provided through belt contact

**Hip Posterior Glide**

**Hip Posterior Glide With Physiologic Motion**

**Technique #3**
Hip Medial Glide

**Indications:**
- To improve hip abd & ER

**Patient:**
- Side-lying or supine with hip in neutral; may pre-position at point of restriction

**Clinician:**
- Standing on ipsilateral side
- *Stabilizing contact:* Hand supports leg at medial aspect of knee
- *Mobilizing contact:* Open hand over lateral aspect of proximal femur

**Accessory Motion Technique:**
- While stabilizing distally at knee, proximal hand elicits mediately directed mobilizing force

**Accessory With Physiologic Motion Technique:**
- Pt & clinician with hand contacts in same position
- Pt moves into progressively greater degrees of hip abd or flex while clinician maintains mediately directed mobilizing force
Hip Lateral Glide

Indications:

- To improve hip add & IR

Patient:

- Supine with hip in neutral or with hip flexed to 90° & in varying degrees of ER/IR & abd/add or standing; may pre-position at point of restriction

Clinician:

- Standing on ipsilateral side
- **Stabilizing contact:** Hand on lateral aspect of knee or, if mobilization belt used, at lateral aspect of pelvis as well
- **Mobilizing contact:** Hand on medial aspect of proximal femur or through mobilization belt from clinician’s waist to medial aspect of proximal femur

Accessory Motion Technique:

- Laterally directed force applied through either proximal hand contact or mobilization belt

Accessory With Physiologic Motion Technique:

- In supine, pt moves into progressively greater degrees of hip flex, IR, or ER while clinician maintains laterally directed mobilizing force through mobilization belt
- In standing, pt performs forward/backward lunging, hip IR or ER, or squatting as laterally directed mobilizing force maintained through mobilization belt contact at medial aspect of proximal femur
Hip Lateral Glide

With Physiologic Motion
Anatomy of the Knee

Lateral View

Anterior View

Femur
Patella
Tibia
Fibula
Meniscus
Cruciate ligaments
Fibular collateral ligament
Posterior cruciate ligament
Anterior cruciate ligament
Meniscus
Tibial collateral ligament
Patellar ligament (cut)
Tibia
Fibula
### Physiologic (Osteokinematic) Motions of the Knee

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<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tibiofemoral</td>
<td>Flex &gt;130° Ext = 10° Tibial rotation = 10°</td>
<td>25° flex</td>
<td>Maximal ext &amp; tibial ER</td>
<td>Flex = tissue approximation Ext = elastic/firm</td>
<td>Flexion &gt; ext</td>
</tr>
<tr>
<td>Patellofemoral</td>
<td>Distal glide = 5–7 cm Medial-lateral glide is up to ½ the width of the patella</td>
<td>10°–20° flex</td>
<td>Full flex</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Accessory (Arthrokinematic) Motions of the Knee

<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concave surface</strong>: Tibial plateau</td>
<td>To facilitate knee extension: OKC = Tibia rolls &amp; glides anterior on femur</td>
</tr>
<tr>
<td><strong>Convex surface</strong>: Femoral condyles</td>
<td>CKC = Femur rolls anterior &amp; glides posterior on tibia</td>
</tr>
<tr>
<td><strong>To facilitate knee flexion</strong>:</td>
<td>OKC = Tibia rolls &amp; glides posterior on femur</td>
</tr>
<tr>
<td></td>
<td>CKC = Femur rolls posterior &amp; glides anterior on tibia</td>
</tr>
</tbody>
</table>
Knee Mobilization Techniques

**Patellofemoral (P/F) Glide & Tilt**

**Indications:**
- Superior & inferior glide is to improve knee ext & flex, respectively
- Medial & lateral glide is to improve knee IR & ER, respectively
- Tilt is to improve all physiologic knee motions

**Patient:**
- Supine with knee in open-packed position

**Clinician:**
- Stands to side of pt
- Stabilization: Provided by the weight of the leg
- Mobilizing hand: Patella is contacted with web space of hand
  - Superior or inferior glide: hand placed at inferior or superior poles of patella, respectively
  - Medial or lateral glide: hand placed at lateral or medial aspects of patella, respectively
  - Tilt: thumbs placed over superior, inferior, medial, or lateral aspect of patella
Accessory Motion Technique:
- Glide: forearm aligned in direction in which force applied; other hand provides reinforcement
- Tilt: force applied in a posterior direction through patellar contact with the goal of moving opposing pole of patella anteriorly

Accessory With Physiologic Motion Technique:
- Superior or inferior glide can be performed during OKC or CKC active knee ext or flex, respectively
- Medial or lateral glide can be performed during CKC tibial IR or ER, respectively, or during ext & flex as above

P/F Inferior Glide

P/F Medial Glide
Tibiofemoral (T/F) Distraction

**Indications:**
- To improve all knee motions

**Patient:**
- Supine with knee in open-packed position or prone with knee flexed to point of restriction

**Clinician:**
- Stands at foot of pt facing cephalad
- **Stabilizing contact:** In supine, distal thigh is stabilized over a bolster or mobilization straps can be used; in prone, stabilization provided through clinician’s elbow over posterior thigh
- **Mobilizing contact:** 1–2 hands grasp just proximal to ankle

**Accessory Motion Technique:**
- In supine, 1–2 hands exert a long-axis distraction force
- In prone, clinician performs hand placement as previously noted with knee extended & maintains hand contacts as knee flexes; as length of tibia effectively decreases relative to length of clinician’s forearm, distraction force produced; no additional distraction force needed during this procedure

**Accessory With Physiologic Motion Technique:**
- Pt performs OKC knee flex & ext in sitting while distraction force applied & maintained t/o ROM
T/F Distraction Supine

T/F Distraction Prone

T/F Distraction With Physiologic Motion
**T/F Anterior Glide**

**Indications:**
- To improve knee ext

**Patient:**
- Prone with knee in open-packed position & bolster or wedge just proximal to knee to eliminate pressure on patella
- May be pre-positioned in varying degrees of flex to point of restriction with bolster under distal leg for support

**Clinician:**
- Stands on ipsilateral side
- **Technique 1:** Prone
  - *Stabilizing contact:* Just proximal to ankle providing counterforce to maintain knee position or stabilization provided by placing lower leg on clinician’s shoulder if knee is flexed ≥90°
  - *Mobilizing contact:* Heel of hand contacts posterior aspect of proximal tibia just below knee with forearm in direction of force (may vary, depending on position of knee) or both hands contact proximal tibia if knee is flexed ≥90°
- **Technique 2:** Supine
  - *Stabilizing contact:* Cephalad hand just proximal to anterior aspect of knee
  - *Mobilizing contact:* Caudal hand scooped under posterior aspect of proximal tibia with forearm controlling distal tibia

**Accessory Motion Technique:**
- Mobilizing contact exerts an anteriorly directed force parallel to the treatment plane
Accessory With Physiologic Motion Technique:

- Pt stands with knees flexed in squat position
- Clinician stands facing the pt with mobilization belt positioned over posterior aspect of pt’s proximal tibia & around clinician’s knees
- Pt moves to upright standing from a squat as clinician exerts a posterior glide through proximal hand contact on the femur while applying anterior glide through mobilization belt

T/F Anterior Glide: Prone  

T/F Anterior Glide: Supine  

T/F Anterior Glide With Accessory Motion
## T/F Posterior Glide

**Indications:**
- To improve knee flex

**Patient:**
- Supine with knee in open-packed position & bolster or wedge just proximal to knee
- May be pre-positioned in varying degrees of flex to point of restriction

**Clinician:**
- Stands on ipsilateral side
- *Stabilizing contact:* Hold distal femur against bolster or use pt’s body if the knee is flexed to ≥90°
- *Mobilizing contact:* Heel of hand contacts anterior aspect of proximal tibia

**Accessory Motion Technique:**
- Mobilizing hand exerts a posteriorly directed force parallel to the treatment plane

**Accessory With Physiologic Motion Technique:**
- Pt stands with knees flexed in squat position
- Clinician stands behind pt with mobilization belt positioned over anterior aspect of pt’s proximal tibia & around clinician’s knee
- Pt actively moves down into squat as clinician exerts an anterior glide via proximal hand contact on femur while applying posterior glide through mobilization belt
T/F Posterior Glide

T/F Posterior Glide With Physiologic Motion
T/F Anterior Glide of Medial or Lateral Tibial Plateau

**Indications:**

- Anterior glide of medial tibial condyle is to improve tibial ER & knee ext
- Anterior glide of lateral condyle is to improve tibial IR & knee flex

**Patient:**

- Prone with knee in open-packed position & bolster or wedge just proximal to knee
- May be pre-positioned in varying degrees of flex to point of restriction

**Clinician:**

- Stands on ipsilateral side
- *Stabilizing contact:* Hand placed just proximal to ankle, providing counterforce to maintain knee position, or stabilization provided by placing lower leg on clinician’s shoulder if knee flexed ≥90°
- *Mobilizing contact:* Heel of hand contacts posterior aspect of proximal medial or lateral tibial condyle just below knee with forearm in direction of force or both hands contact proximal tibia if knee flexed ≥90°

**Accessory Motion Technique:**

- Mobilizing hand exerts anteriorly directed force through either the medial or lateral condyle which varies depending on position of knee (parallel to treatment plane)
- If both hands are used, one hand may provide mobilizing force anteriorly while other hand provides posteriorly directed force
Accessory With Physiologic Motion Technique:

- Pt stands in lunge position with involved foot placed on stool
- Clinician hands contact proximal tibia & fibula
- Anteriorly directed force applied to lateral condyle & posteriorly directed force applied to medial condyle as pt lunges forward, bringing knee into flexion

T/F Anterior Glide of Lateral Plateau

With Physiologic Motion
T/F Posterior Glide of Medial or Lateral Tibial Plateau

Indications:
- Posterior glide of medial tibial condyle is to improve tibial IR & knee flex
- Posterior glide of lateral condyle is to improve tibial ER & knee ext

Patient:
- Supine with knee in open-packed position & bolster or wedge just proximal to knee
- May be pre-positioned in varying degrees of flex to point of restriction

Clinician:
- Stands on ipsilateral side
- **Stabilizing contact:** Hold distal femur against bolster or stabilization provided by pt's body if knee flexed to ≥90°
- **Mobilizing contact:** Heel of hand contacts anterior aspect of proximal medial or lateral tibial condyle just below knee with forearm in direction of force or both hands contact proximal tibia if knee is flexed to ≥90°

Accessory Motion Technique:
- Mobilizing hand exerts posteriorly directed force through either medial or lateral condyle, which varies depending on position of knee (parallel to treatment plane)
- If both hands used, one hand may provide mobilizing force posteriorly while other hand provides anteriorly directed force

Accessory With Physiologic Motion Technique:
- Pt stands in lunge position with involved foot placed on stool
- Clinician hands contact proximal tibia & fibula
- Anteriorly directed force applied to medial condyle & posteriorly directed force applied to lateral condyle as pt lunges forward, bringing knee into ext

T/F of Posterior Glide of Medial Plateau  
T/F Posterior Glide of Medial Plateau  
With Physiologic Motion
Proximal Tibiofibular Anterior & Posterior Glide

Indications:
- Anterior fibular & posterior tibial glide to improve knee flex
- Posterior fibular & anterior tibial glide to improve knee ext

Patient:
- Supine with knee in open-packed position & bolster or wedge just proximal to knee
- May be pre-positioned in varying degrees of flex to point of restriction

Clinician:
- Stands on ipsilateral side
- **Stabilizing contact:** Hold distal femur against the bolster with belt
- **Mobilizing contact:** For anterolateral mobilization, fingers grasp posterior aspect of proximal fibular head with forearm in direction of force; for posteromedial mobilization, heel of hand contacts anterior aspect of proximal fibular head with forearm in direction of force

Accessory Motion Technique:
- One mobilizing hand exerts an anterolaterally directed force to fibular head with posteromedial force to tibia through other mobilizing hand for flex
- One mobilizing hand exerts posterolaterally directed force to fibular head with anteromedial force to tibia through other mobilizing hand for ext
**T/F Flexion High-Velocity Thrust**

**Indications:**
- To improve motion or reduce symptoms associated with deficits in knee flex ROM

**Patient:**
- Supine with knee in flex & foot supported by clinician

**Clinician:**
- Stands on ipsilateral side
- **Stabilizing contact:** Fingers placed within popliteal crease to form fulcrum & grasp posterior aspect of tibia & fibula
- **Mobilizing contact:** Grasp distal lower leg just proximal to ankle

**Thrust Technique:**
- As stabilizing hand maintains fulcrum, mobilizing hand flexes knee to maximal available range
- Once resistance engaged at end range, high-velocity thrust imparted by moving knee into further degrees of flex against fulcrum of stabilizing hand
<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talocrural</td>
<td>Dorsiflex = 20°&lt;br&gt;Plantarflex = 30°–50°&lt;br&gt;Inv = 10°–30°&lt;br&gt;Ev = 10°–20°</td>
<td>10° PF</td>
<td>Max DF</td>
<td>Elastic (tissue stretch) for all planes</td>
<td>Plantarflex &gt; dorsiflex</td>
</tr>
<tr>
<td>Subtalar</td>
<td>Inv/add = 5°–12°&lt;br&gt;Ev/abd = 20°–30°</td>
<td>Full pronation</td>
<td>Full supination</td>
<td>Elastic (tissue stretch) for all planes</td>
<td>Inv &gt; ev</td>
</tr>
<tr>
<td>Midtarsal</td>
<td>Inv/ev = 10°&lt;br&gt;Abd/dorsiflex = 10°&lt;br&gt;Add/plantarflex = 20°</td>
<td>Abd</td>
<td>Add</td>
<td>Elastic (tissue stretch) for all planes</td>
<td></td>
</tr>
<tr>
<td>TMT</td>
<td>Dorsiflex = 10°&lt;br&gt;Plantarflex = 10°</td>
<td>Pronation</td>
<td>Supination</td>
<td>Capsular</td>
<td></td>
</tr>
<tr>
<td>1st MTP</td>
<td>Flex = 75°&lt;br&gt;Ext = 35°</td>
<td>5°–10° ext</td>
<td>Maximal ext</td>
<td>Capsular</td>
<td>Ext &gt; flex</td>
</tr>
<tr>
<td>2–5 MTP</td>
<td>Flex = 75°&lt;br&gt;Ext = 35°</td>
<td>Slight flex</td>
<td>Maximal ext</td>
<td>Flex/ext = capsular, elastic Abd/add = ligamentous</td>
<td>Ext ≥ flex</td>
</tr>
<tr>
<td>IP</td>
<td>Flex = 110°&lt;br&gt;Ext = 25°</td>
<td>Slight flex</td>
<td>Maximal ext</td>
<td>Flex/ext = capsular, elastic Abd/add = ligamentous</td>
<td></td>
</tr>
</tbody>
</table>
### Accessory (Arthrokinematic) Motions of the Ankle & Foot

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<th>Concave surface:</th>
<th>Convex surface:</th>
<th>To facilitate ankle dorsiflex:</th>
<th>To facilitate ankle plantarflex:</th>
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</thead>
<tbody>
<tr>
<td>Talocrural joint</td>
<td>Distal tibia/fibula</td>
<td>Talus</td>
<td>OKC: talus rolls anterior &amp; glides posterior on tibia</td>
<td>OKC: talus rolls posterior &amp; glides anterior on tibia</td>
</tr>
<tr>
<td></td>
<td><em>Concave surface:</em></td>
<td></td>
<td>CKC: tibia rolls &amp; glides anterior</td>
<td>CKC: tibia rolls &amp; glides posterior</td>
</tr>
<tr>
<td></td>
<td>Anterior calcaneal facet &amp; posterior talus</td>
<td>Posterior calcaneal facet &amp; anterior talus</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Convex surface:</em></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>MTP joint</td>
<td>Phalanx</td>
<td>To facilitate flex:</td>
<td>To facilitate ext:</td>
</tr>
<tr>
<td></td>
<td><em>Concave surface:</em></td>
<td>Metatarsal</td>
<td>Phalanx rolls &amp; glides plantar on metatarsal</td>
<td>Distal phalanx rolls &amp; glides dorsal on metatarsal</td>
</tr>
<tr>
<td></td>
<td>Distal phalanx</td>
<td><em>Convex surface:</em></td>
<td>To facilitate flex:</td>
<td></td>
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<tr>
<td></td>
<td>Proximal phalanx</td>
<td>Phalanx</td>
<td>Distal phalanx rolls &amp; glides plantar on proximal phalanx</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Concave surface:</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>IP joint</td>
<td>Distal phalanx</td>
<td>To facilitate ext:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Concave surface:</em></td>
<td>Proximal phalanx</td>
<td>Distal phalanx rolls &amp; glides dorsal on proximal phalanx</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

**IP joint**

- *Concave surface:* Distal phalanx
- *Convex surface:* Proximal phalanx

- To facilitate *ext*: Distal phalanx rolls & glides dorsal on proximal phalanx

---

**Arthrology**

- Concave surface: Distal tibia/fibula
- Convex surface: Talus

---

**Arthrokinematics**

- To facilitate ankle dorsiflex:
  - OKC: talus rolls anterior & glides posterior on tibia
  - CKC: tibia rolls & glides anterior

- To facilitate ankle plantarflex:
  - OKC: talus rolls posterior & glides anterior on tibia
  - CKC: tibia rolls & glides posterior
Ankle & Foot Mobilization Techniques

Distal Tibiofibular Glide

**Indications:**
- To improve all motions of the talocrural joint

**Patient:**
- Supine with foot supported on table in neutral position
- Posterior glide in supine, anterior glide in prone

**Clinician:**
- Standing at the foot of pt facing cephalad
- *Stabilizing contact:* Provided by table & “lumbrical grip” of clinician over tibia/fibula
- *Mobilizing contact:* Heel of hand contacts distal aspect of tibia/fibula

**Accessory Motion Technique:**
- While stabilizing tibia, posterior or anterior glide imparted to fibula
- While stabilizing fibula, posterior or anterior glide imparted to tibia
Accessory With Physiologic Motion Technique:

- Pt & clinician in same position as previously described
- Active or passive dorsiflex elicited as anterior or posterior glide provided over tibia/fibula
- Posterior glide of fibula performed during active or passive inversion with sustained hold at end range

Distal Tibiofibular Glide  Distal Tibiofibular Glide With Physiologic Motion
Talocrural Distraction

**Indications:**
- To improve motion in all directions

**Patient:**
- Supine with foot over edge of table

**Clinician:**
- Standing at foot of pt facing cephalad
- **Stabilizing contact:** Weight of body & mobilization strap may be used to stabilize distal leg
- **Mobilizing contact:** Fingers interlaced over dorsum of foot & anterior talus, with thumbs on plantar surface of foot & forearms parallel to one another; mobilization belt may be used to reinforce hand contacts

**Accessory Motion Technique:**
- Through hand contacts over talus, distraction force provided in direction of forearms by leaning back

**Accessory With Physiologic Motion Technique:**
- Pt & clinician in same position as previously described
- Fulcrum provided over talus by hand contacts as ankle moved into dorsiflex
Talocrural Posterior Glide

Indications:
■ To improve talocrural dorsiflex

Patient:
■ Supine with foot over edge of table

Clinician:
■ Standing at foot of pt facing cephalad
■ Stabilizing contact: Clinician stabilizes distal leg by cupping calcaneus with hand
■ Mobilizing contact: Web space contacts anterior aspect of talus

Accessory Motion Technique:
■ Posteriorly directed force applied to talus

Accessory With Physiologic Motion Technique:
■ Pt in standing lunge position with ankle to be mobilized forward on stool
■ Clinician kneeling facing pt with web space of both hands reinforcing one another over anterior aspect of talus
■ Pt slowly shifts weight onto front leg while maintaining heel in contact with ground; clinician applies posterior force through talus
■ Mobilization belt may be used to provide additional force by placing it around clinician’s hips to distal lower leg of pt
Talocrural Posterior Glide

Talocrural Posterior Glide With Physiologic Motion
**Talocrural Anterior Glide**

**Indications:**
- To improve talocrural plantarflex

**Patient:**
- Technique #1: Prone with foot over edge of table
- Technique #2: Supine with hip & knee in flex

**Clinician:**
- Technique #1:
  - Stabilizing contact: Clinician stabilizes distal leg
  - Mobilizing contact: Web space contacts posterior aspect of talus/calcaneus
- Technique #2:
  - Stabilizing contact: Clinician stabilizes tibia/fibula against wedge with ankle in plantarflex
  - Mobilizing contact: Clinician contacts anterior talus with web space of hand

**Accessory Motion Technique:**
- Technique #1: Mobilizing hand exerts anteriorly directed force through calcaneal contact that mobilizes talus anteriorly
- Technique #2: Proximal hand exerts anteriorly directed force through talus

**Accessory With Physiologic Motion Technique:**
- Pt & clinician in same position as previously described
- Anteriorly directed force applied through calcaneal contact as foot is brought into plantarflex
Talocrural Anterior Glide: Technique #1

Talocrural Anterior Glide: Technique #2
Subtalar (Talocalcaneal) Distraction, Medial, & Lateral Glide

Indications:
- Distraction to improve all physiologic motions of subtalar joint
- Medial & lateral glide to improve rearfoot ev & inv, respectively

Patient:
- Prone with dorsum of foot off edge of table
- Alternate position of side-lying with foot to be mobilized uppermost & knee flexed

Clinician:
- Standing on ipsilateral side facing caudally or sitting on table with pt’s posterior thigh against clinician
- Stabilizing contact: Holds distal leg on table or stabilizes through flexed knee in contact with clinician’s body
- Mobilizing contact: Grasps posterior calcaneus with heel of hand or both hands grasp calcaneus

Accessory Motion Technique:
- Mobilizing hand(s) impart caudal force parallel to long axis of leg

Accessory With Physiologic Motion Technique (Calcaneal Rocking):
- Pt side-lying with uppermost knee flexed with posterior thigh on clinician’s trunk
- Clinician sitting on table with both hands grasping calcaneus
- Distraction force imparted with medial & lateral glide as motion toward the restriction is performed
Midtarsal (Talonavicular & Calcaneocuboid) Glide

Indications:
■ Dorsal glide to improve midtarsal dorsiflex & inv
■ Plantar glide to improve midtarsal plantarflex & ev

Patient:
■ Prone with foot on wedge
■ Alternate position of supine with foot over edge of table & wedge supporting distal leg

Clinician:
■ Standing at foot of pt facing cephalad
■ Stabilizing contact:
  ■ Contact medial aspect of calcaneus & talus & fixate foot onto wedge for talonavicular mobilization
  ■ Contact lateral aspect of calcaneus & fixate foot on wedge for calcaneocuboid mobilization
■ Mobilizing contact: Pinch grip or full hand grip over:
  ■ Medial aspect of foot, grasping navicular for talonavicular mobilization
  ■ Lateral aspect of foot, grasping cuboid for calcaneocuboid mobilization

Accessory Motion Technique:
■ Mobilizing hand exerts dorsal or plantar force through navicular medially or cuboid laterally
Accessory With Physiologic Motion Technique:

- Pt & clinician in same position as previously described
- Dorsal & plantar glide imparted during active or passive ankle dorsiflex & plantarflex, respectively

**Midtarsal (Talonavicular) Glide**

**Midtarsal (Calcaneocuboid) Glide**
Intertarsal Glide

Indications:
■ To improve all physiologic motions of ankle & foot

Patient:
■ Prone with foot over edge of table with wedge supporting joint to be mobilized

Clinician:
■ Standing on medial side of foot to mobilize laterally & standing on lateral side of foot to mobilize medially
■ Stabilizing contact: Pinch grasp used to stabilize adjacent tarsal bone or open hand fixates foot on underlying wedge
■ Mobilizing contact: Pinch grasp used to engage tarsal bone to be mobilized

Accessory Motion Technique:
■ Plantar & dorsal glides imparted while adjacent tarsal bone stabilized
■ Mobilization proceeds sequentially from proximal to distal along medial column, beginning with mobilization of navicular on stabilized talus, followed by mobilization of medial, intermediate, & lateral cuneiforms on stabilized navicular, & mobilization of medial cuneiform on stabilized intermediate cuneiform
■ Mobilization performed sequentially from proximal to distal along lateral column beginning with mobilization of cuboid on stabilized calcaneus, followed by mobilization of lateral cuneiform on stabilized cuboid
■ Mobilization proceeds along each column into TMT joints as will be described
Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as previously described except that pt’s foot over edge of table
- Glides are performed as passive or active motion in all directions

Intertarsal Glide
Tarsometatarsal (TMT) Distraction & Glide

Indications:
- To improve all physiologic motions of TMT joint & overall midfoot/forefoot mobility

Patient:
- Supine with knee in flex & foot resting on wedge at joint to be mobilized

Clinician:
- Standing on medial side of foot to mobilize laterally & standing on lateral side of foot to mobilize medially
- Stabilizing contact: Pinch grasp used to stabilize tarsal bone or open hand fixates foot on underlying wedge
- Mobilizing contact: Pinch grasp used to engage base of metatarsal to be mobilized

Accessory Motion Technique:
- While stabilizing respective tarsal bone, mobilizing hand imparts distraction force followed by a plantar or dorsal glide to base of metatarsal
- Metatarsals 1–3 are mobilized on stabilized medial, intermediate, & lateral cuneiforms, respectively, & metatarsals 4 & 5 are mobilized on stabilized cuboid
TMT Distraction

TMT Glide
Intermetatarsal Sweep

Indications:
- To improve mobility of entire midfoot & forefoot that will assist with all physiologic motions of foot

Patient:
- Supine with foot over edge of table

Clinician:
- Standing at foot of pt facing cephalad
- Technique #1: Fingers placed horizontally over dorsal aspects of foot & thumbs are placed on plantar surface
- Technique #2: Fingers placed horizontally over plantar aspects of foot & thumbs are placed on dorsal surface

Accessory Motion Technique:
- Technique #1: Fingers provide sweeping motion to ↑ plantar arch against fulcrum of opposing thumbs
- Technique #2: Fingers provide sweeping motion to ↓ plantar arch against fulcrum of opposing thumbs

Accessory With Physiologic Motion Technique:
- Technique #1: To ↑ plantar arch performed while pt actively performs plantarflex
- Technique #2: To ↓ plantar arch performed while pt actively performs dorsiflex
Intermetatarsal Sweep:

- Plantar fulcrum
- Dorsal fulcrum
Metatarsophalangeal (MTP) Distraction & Glide

Indications:
- Distraction to improve motion in all directions
- Dorsal & plantar glide to improve MTP ext & flex, respectively

Patient:
- Supine with knee in flex & foot resting on wedge

Clinician:
- Standing at foot of pt
  - Stabilizing contact: Pinch grasp used to stabilize most distal aspect of metatarsal head
  - Mobilizing contact: Pinch or hook grasp to engage most proximal aspect of distal phalanx

Accessory Motion Technique:
- Mobilizing hand imparts distraction force or plantar/dorsally directed glide

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as previously described
- Mobilizing hand contacts proximal phalanx medially & laterally
- Distraction may be performed during active or passive MTP flex or ext
- Dorsal glide imparted during active or passive ext with sustained hold at end range
- Plantar glide imparted during active or passive flex with sustained hold at end range
- Medial or, more commonly, lateral glide may also be provided & maintained t/o active ext & flex with sustained hold at end range
**Interphalangeal (I/P) Distraction & Glide**

**Indications:**
- Distraction & unicondylar glide to improve motion in all directions
- Dorsal & plantar glide to improve I/P ext & flex, respectively

**Patient:**
- Supine with knee in flex & foot resting on wedge

**Clinician:**
- Standing at foot of pt facing cephalad
- *Stabilizing contact:* Pinch grasp used to stabilize most distal aspect of head of proximal or middle phalanx
- *Mobilizing contact:* Pinch or hook grasp performed to engage most proximal aspect of base of middle (for PIP mobilization) or distal phalanx (for DIP mobilization)

**Accessory Motion Technique:**
- Mobilizing hand imparts distraction force or plantar/dorsally directed glide
- Unicondylar glides may be performed by directing forces through either medial or lateral aspects of most proximal aspect of base of middle (for proximal I/P mobilization) or distal (for distal I/P mobilization) phalanx
I/P Distraction

I/P Glide
**Midtarsal High-Velocity Thrust (Whip Technique)**

**Indications:**
- To improve mobility of midfoot & more specifically, mobility of calcaneocuboid or talonavicular joints

**Patient:**
- Prone with knee in 45°–60° of flex near edge of table

**Clinician:**
- Standing at foot of pt facing cephalad
- Thumb-over-thumb contact made over plantar aspect of either cuboid or navicular & fingers of both hands wrapped around & resting on dorsum of foot

**Accessory Motion Technique:**
- Pressure applied through thumb contacts & maintained as knee extended toward end range & ankle plantarflexed
- Once tissue resistance engaged, high-velocity thrust imparted through thumb contacts as foot is brought through elliptical arc of motion produced by ulnar deviation of clinician’s wrists
Midtarsal High-Velocity Thrust (Whip Technique): Start Position

Midtarsal High-Velocity Thrust (Whip Technique): End Position
Anatomy of the Temporomandibular Joint (TMJ)

Lateral View

Physiologic (Osteokinematic) Motions of TMJ

<table>
<thead>
<tr>
<th>Motion</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
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</thead>
<tbody>
<tr>
<td>Opening/closing</td>
<td>Open = tissue stretch/elastic</td>
<td>Opening – deviates toward restriction &amp; contralateral deviation limited</td>
</tr>
<tr>
<td>Protrusion/retrusion</td>
<td>Tissue stretch/elastic</td>
<td></td>
</tr>
<tr>
<td>Lateral deviation</td>
<td>Tissue stretch/elastic</td>
<td></td>
</tr>
</tbody>
</table>
## Accessory (Arthrokinematic) Motions of the TMJ

### Arthrology

**Concave surface:** Mandibular fossa  
**Convex surface:** Mandibular condyle & interposed disk

### Arthrokinematics

<table>
<thead>
<tr>
<th>To facilitate opening:</th>
<th>To facilitate closing:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condyle rotates anterior for 1st 25 mm, followed by anterior &amp; inferior gliding of condyle &amp; disk for remaining 15 mm, resulting in contact between convex condyle &amp; convex articular eminence</td>
<td>Condyle &amp; disk glide posterior &amp; superior followed by posterior ROT of condyle as it returns to mandibular fossa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To facilitate protrusion:</th>
<th>To facilitate retraction:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condyle &amp; disk glide anterior &amp; inferior without ROT</td>
<td>Condyle &amp; disk glide posterior &amp; superior without ROT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To facilitate right deviation:</th>
<th>To facilitate left deviation:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left condyle &amp; disk glide anterior &amp; inferior; right condyle spins around vertical axis</td>
<td>Right condyle &amp; disk glide anterior &amp; inferior; left condyle spins around vertical axis</td>
</tr>
</tbody>
</table>
TMJ Mobilization Techniques

TMJ Distraction

Indications:
- To improve all physiologic motions

Patient:
- Sitting with head & neck in neutral

Clinician:
- Standing to side of pt
- Stabilizing contact: Clinician’s arm cradles pt’s head, keeping it close to clinician’s chest
- Mobilizing contact: Thumb contacts mandibular molars as flexed 2nd digit contacts submandibular region

Accessory Motion Technique:
- Downward distraction force elicited through thumb contact

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as described above
- Pt actively opens mouth while downward force is applied through thumb contact
TMJ Anterior Glide

**Indications:**
- To improve depression, protrusion, & lateral deviation to the contralateral side

**Patient:**
- Sitting with head & neck in neutral

**Clinician:**
- Standing to side of pt
  - *Stabilizing contact:* Clinician’s arm cradles pt’s head, keeping it close to clinician’s chest
  - *Mobilizing contact:* Thumb contacts mandibular molars as flexed 2nd digit contacts sub-mandibular region

**Accessory Motion Technique:**
- Slight distraction force followed by anterior glide elicited through thumb contact

**Accessory With Physiologic Motion Technique:**
- Pt & clinician in same position as described above
- Pt actively protrudes, depresses, or laterally deviates the mandible to the contralateral side while anterior glide applied through mobilizing hand contacts
TMJ Lateral Glide

Indications:
- To improve lateral deviation

Patient:
- Sitting with head & neck in neutral

Clinician:
- Standing to side of pt
- Stabilizing contact: Clinician’s arm cradles pt’s head, keeping it close to clinician’s chest
- Mobilizing contact: Thumb contacts mandibular molars as flexed 2nd digit contacts sub-mandibular region on contralateral side

Accessory Motion Technique:
- Slight distraction force followed by lateral glide elicited through thumb contact toward the clinician

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as described above
- Pt actively deviates mandible laterally while lateral glide applied through mobilizing hand contacts in same direction
- Alternate technique involves lateral glide applied to external surface of mandible while pt actively opens & closes; force maintained throughout entire motion & sustained at end range
TMJ Lateral Glide

TMJ Lateral Glide With Physiologic Motion
Posterior View

Transverse foramen
Odontoid process
C1 (atlas)
C2 (axis)
Transverse process
C3
C4
C5
C6
Facet joint
C7
Spinous process
Lateral View

Costotransverse joint

Costovertebral joint

Intervertebral disk

Spinous process

T6

T9

T10

T11

T12
Anterior View

1st rib

Scapula
Manubrium
Costochondral joint
Body of sternum
Costal cartilage
Interchondral joint
Xiphoid process
Chondrosternal joint
Posterior View

1st thoracic vertebra and rib
Clavicle
Acromion of scapula
T4
T7
Angle of 7th rib
<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>O/A</td>
<td>FB/BB = 15-20°</td>
<td>Slight head</td>
<td>BB</td>
<td>Elastic</td>
<td>Limited BB &amp; ipsilateral deviation</td>
</tr>
<tr>
<td></td>
<td>SB = 5°</td>
<td>on neck FB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROT = 0°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/A</td>
<td>FB/BB = 15°</td>
<td>Slight head</td>
<td>BB</td>
<td>Firm</td>
<td>Limited FB, contralateral deviation</td>
</tr>
<tr>
<td></td>
<td>SB = 0°</td>
<td>on neck FB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROT = 45°</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>C2-T3</td>
<td>FB = 35-45°</td>
<td>FB &amp; contralateral</td>
<td>BB</td>
<td>Elastic</td>
<td>Limited FB, contralateral SB &amp; ROT</td>
</tr>
<tr>
<td></td>
<td>BB = 50-70°</td>
<td>SB &amp; ROT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SB = 35°</td>
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</tr>
<tr>
<td></td>
<td>ROT = 45°</td>
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<tr>
<td></td>
<td>Total Cervical ROM</td>
<td>FB = 80-90°</td>
<td>BB</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FB = 70°</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BB = 20-45°</td>
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<tr>
<td></td>
<td>ROT = 70-90°</td>
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<td></td>
</tr>
<tr>
<td>T4-T12</td>
<td>FB/BB = 4° upper, 6° mid,</td>
<td>FB &amp; contralateral</td>
<td>BB</td>
<td>Elastic</td>
<td>Limited FB, contralateral SB &amp; ROT</td>
</tr>
<tr>
<td></td>
<td>12° lower, 30° total</td>
<td>SB &amp; ipsilateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SB = 6° upper, 8° mid,</td>
<td>SB &amp; contralateral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8° lower, 25-40° total</td>
<td>ROT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ROT = 9° upper, 9° mid,</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>9° lower, 30-50° total</td>
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</tr>
</tbody>
</table>
# Accessory (Arthrokinematic) Motions of Cervical & Thoracic Spine

<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>O/A Joint</strong></td>
<td><strong>Primarily sagittal &amp; frontal plane motion</strong></td>
</tr>
<tr>
<td>Concave surface: Superior articular facets of C1</td>
<td>Rolling &amp; gliding occur in opposite directions</td>
</tr>
<tr>
<td>Convex surface: Occipital condyles</td>
<td>FB: Occiput rolls anterior, glides posterior</td>
</tr>
<tr>
<td></td>
<td>BB: Occiput rolls posterior, glides anterior</td>
</tr>
<tr>
<td></td>
<td>SB (R): Occiput rolls right, glides left</td>
</tr>
<tr>
<td></td>
<td>Atlas glides in direction in which occiput is rolling</td>
</tr>
<tr>
<td></td>
<td>At end range of ROT, ligaments move O/A into contralateral SB, which produces gliding of Atlas in same direction</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> O/A mechanics results in the ability to keep the eyes level during midcervical ROT</td>
</tr>
<tr>
<td><strong>A/A Joint</strong></td>
<td><strong>Primarily transverse plane motion</strong></td>
</tr>
<tr>
<td>Pivot joint: Odontoid process articulates with anterior arch of atlas &amp; transverse ligament</td>
<td>ROT: ROT about central pivot joint as convex-on-convex articular facets roll in opposite directions</td>
</tr>
<tr>
<td></td>
<td>SB of O/A engages the contralateral alar ligament producing ipsilateral ROT of C2–C3 &amp; relative contralateral ROT of A/A</td>
</tr>
<tr>
<td>Facet joint: Convex inferior facets of C1 with convex superior facets of C2 sloping inferiorly from medial to lateral</td>
<td>Furthermore, at end range of O/A SB, atlas rotates contralaterally resulting in contralateral A/A ROT</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> A/A mechanics result in the ability to keep the head facing forward during midcervical SB</td>
</tr>
<tr>
<td>Arthrology</td>
<td>Arthrokinematics</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------</td>
</tr>
</tbody>
</table>
| **Facet joints:**  
Synovial joints at 45° orientation between frontal & transverse planes  
**Intervertebral joints:**  
Fibrocartilaginous joints with interposed disk between adjacent vertebral bodies  
**Uncovertebral joints:**  
Planar joints formed between uncinate processes of inferior vertebra & anterolateral aspect of superior vertebra | **Forward bending:**  
Inferior facets of superior vertebra upglide on superior facets of inferior vertebra  
Nucleus pulposis migrates posteriorly, annulus fibrosis bulges anteriorly  
Spinal canal & intervertebral foramen lengthen & open  
**Backward bending:**  
Reverse of FB until end range when facets slightly gap  
**SB (R):**  
Right inferior facets of superior vertebra downglide, left inferior facets upglide  
Right intervertebral foramen closes, left opens  
Coupled with ipsilateral ROT  
**ROT (R):**  
Right inferior facets of superior vertebra downglide, left inferior facets upglide  
Right intervertebral foramen closes, left opens  
Coupled with ipsilateral SB  
**Functional SB/ROT:**  
Midcervical SB & ROT occur ipsilaterally  
**Nonfunctional SB/ROT:**  
Midcervical SB & ROT occur ipsilaterally  
With SB, contralateral A/A ROT allows head to face forward  
With ROT, contralateral O/A SB allows eyes to remain level |

*Continued*
<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
</table>
| **Facet joints:**  
Synovial joints with frontal plane orientation  
**Intervertebral joints:**  
Fibrocartilaginous joints with interposed disk between adjacent vertebral bodies | **Maximal opening:** FB, contralateral SB, contralateral ROT  
**Maximal closing:** BB, ipsilateral SB, ipsilateral ROT  
**FB/BB:**  
Inferior facets of superior vertebra upglide on superior facets of inferior vertebra  
Nucleus pulposus migrates posteriorly, annulus fibrosus bulges anteriorly  
Spinal canal & intervertebral foramen lengthen & open  
Restricted by frontal plane orientation, costal cage, inferiorly sloping spinous processes  
**SB (R):**  
Right inferior facets of superior vertebra downglide, left inferior facets upglide  
Right intervertebral foramen closes, left opens  
Coupled with contralateral ROT in neutral, ipsilateral ROT out of neutral  
**ROT (R):**  
Right inferior facets of superior vertebra downglide, left inferior facets upglide  
Right intervertebral foramen closes, left opens  
Coupled with contralateral SB in neutral, ipsilateral SB out of neutral |

Continued
<table>
<thead>
<tr>
<th>Costal Cage</th>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manubriosternal &amp; xiphosternal joints:</strong></td>
<td>Synchondrosis joints with fibrocartilaginous disk</td>
<td><strong>Pump-handle motion:</strong> Sagittal plane motion of upper ribs during inspiration</td>
</tr>
<tr>
<td><strong>Chondrosternal, costochondral, inter-chondral joints:</strong></td>
<td>Between cartilage &amp; sternum, ribs &amp; cartilage, cartilage of adjacent ribs</td>
<td><strong>Bucket-handle motion:</strong> Frontal plane motion of mid-lower ribs during inspiration</td>
</tr>
<tr>
<td><strong>Costovertebral joints:</strong></td>
<td>Convex head of rib articulates with 2 concave vertebral body demifacets &amp; disk (i.e., rib 7 articulates with T6 &amp; T7 vertebrae)</td>
<td><strong>Caliper motion:</strong> Transverse plane motion of ribs 11 &amp; 12</td>
</tr>
<tr>
<td><strong>Costotransverse joints:</strong></td>
<td>Costal tubercle of rib &amp; costal facet of transverse process (i.e., rib 7 articulates with TP of T7) cartilage</td>
<td><strong>Internal/external torsion:</strong> Anterior border of rib moves superior during inspiration &amp; inferior during expiration</td>
</tr>
</tbody>
</table>
Cervical Spine Mobilization Techniques

Cervical Central & Unilateral Anterior Glide

**Indications:**
- To improve segmental mobility in all directions
- Central glide to improve FB & BB
- Unilateral glide to improve SB & ROT
- Combined physiologic & accessory mobilizations to reduce symptoms & improve motion for all physiologic motions

**Patient:**
- Prone with head in neutral with arms at side
- Sitting in chair may be alternative

**Clinician:**
- Standing at head of pt or standing alongside sitting pt
- *Stabilization:* General technique not requiring stabilization; if pt seated, stabilization provided by clinician’s anterior hip in contact with pt’s shoulder & held in place by clinician’s forearm
Mobilizing contact: For central glides, both thumbs side by side or thumb over thumb over spinous process on superior vertebra of desired segment or bilateral transverse processes of same vertebra; for unilateral glides, same contact as above but over articular pillars/transverse processes; if pt seated, clinician’s 5th digit placed over desired segment & thenar eminence of other hand contacts 5th digit

Accessory Motion Technique:
- Fingers alongside neck pull soft tissues upward, forming gutter for thumbs
- For C3–T5, gentle force applied in anterior direction through thumb contacts or, if pt seated, force applied by thenar eminence through 5th digit
- For O/A, gentle force applied through thumb contacts to C1 lateral mass in an anterior direction toward ipsilateral eye
- For A/A, gentle force applied through thumb contacts to C2 articular pillar in an anterior direction toward mouth with head ipsilaterally rotated 30°

Accessory With Physiologic Motion Technique:
- Pt in seated position with clinician standing behind or to side of pt & prepared to change position throughout mobilization
- Thumb-over-thumb contact made through transverse or spinous processes of desired segment
- Superoanterior force applied to symptomatic segment in the plane of the facet joint while pt performs movement that reproduces symptoms
- Force applied throughout entire motion & sustained at end range
- Slight changes in force direction can be provided to improve specificity
- Self-mobilization performed using mobilization strap or towel placed over segment to be mobilized with force maintained while pt performs active physiologic motion
Cervical Upglide (Opening)

Indications:
- To improve segmental upglide (opening), which is a component motion of FB, contralateral SB, & contralateral ROT

Patient:
- Supine with head & neck in neutral

Clinician:
- Standing at head of pt
- Stabilizing contact: Supports occiput allowing it to move during mobilization
- Mobilizing contact: MCP joint of 2nd digit contacts articular pillar of desired segment

Accessory Motion Technique:
- Stabilizing hand at occiput elicits movement into contralateral ROT to segment to be mobilized
- Mobilizing hand contact pulls along treatment plane of facet joint toward pt’s eye as occiput remains supported
- Alternate technique consists of utilizing chin cradle to control & support head movement; thumb placed on ipsilateral articular pillar & index finger of same hand hooks around spinous process & contacts contralateral transverse process; ROT of head & neck produced via chin-cradle hold while force elicited through thumb contact at articular pillar to enhance segmental upglide (opening); varying degrees of FB & BB may be utilized to localize force to desired segment
Accessory With Physiologic Motion Technique:

- See accessory with physiologic motion technique described for central & unilateral anterior glide

Cervical Upglide (Opening)
Cervical Downglide (Closing)

Indications:
- To improve segmental downglide (closing), which is a component motion of BB, ipsilateral SB, & ipsilateral ROT

Patient:
- Supine with head & neck in neutral & even with edge of table

Clinician:
- Standing at head of pt
- Stabilizing contact: Supports occiput, allowing it to move during mobilization
- Mobilizing contact: MCP joint of 2nd digit contacts articular pillar of desired segment with forearm angled toward pt’s contralateral hip with elbow braced against clinician’s ASIS

Accessory Motion Technique:
- Mobilizing hand elicits force in inferoposterior direction toward pt’s contralateral hip while stabilizing hand supports occiput as it BB, SB, & ROT ipsilaterally

Accessory With Physiologic Motion Technique:
- Pt in seated position with clinician standing behind
- Metacarpophalangeal joint of 2nd digit contacts articular pillar of desired segment with forearm in line with treatment plane of facet joint
- Inferoposterior force applied as pt actively performs SB & ipsilateral ROT
Cervical Downglide (Closing) With Physiologic Motion
Cervical FB With Finger Block

Indications:
■ To improve FB & bilateral segmental upglide (opening) mobility throughout cervical spine

Patient:
■ Sitting with head & neck in neutral

Clinician:
■ Standing to side of pt
■ Stabilizing contact: Thumb & flexed 2nd digit forms “golf-tee” hand position & placed at spinous process of inferior vertebra of desired segment to block motion as it arrives
■ Mobilizing contact: Clinician’s arm cradles pt’s head, keeping it close to clinician’s chest with 5th digit placed across spinous process of superior vertebra of desired segment

Accessory Motion Technique:
■ Mobilizing hand moves head & neck into FB to desired level as inferior vertebra is stabilized

Accessory With Physiologic Motion Technique:
■ Pt & clinician in same position as described above
■ Pt actively flexes neck with guidance of clinician while inferior vertebra of desired segment blocked by stabilizing hand
Cervical SB With Finger Block

Indications:
- To improve SB & segmental upglide (opening) mobility on contralateral side to which motion occurs throughout cervical spine

Patient:
- Sitting with head & neck in neutral

Clinician:
- Standing behind pt
- **Stabilizing contact:** Thumb is placed on side of spinous process of inferior vertebra of desired segment to block motion on side to which motion occurs
- **Mobilization contact:** Open hand is placed on side of pt’s head

Accessory Motion Technique:
- Head & neck moved into physiologic SB to desired level as inferior vertebra is stabilized by thumb

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as described above
- Pt actively side bends neck with guidance of clinician while inferior vertebra of desired segment blocked by stabilizing thumb
Cervical ROT With Finger Block

Indications:
- To improve ROT & segmental upglide (opening) mobility on contralateral side to which motion occurs throughout cervical spine
- To improve A/A mobility

Patient:
- Sitting with head & neck in neutral

Clinician:
- Standing to side of pt
- Stabilizing contact: Thumb placed on articular pillar of inferior vertebra of desired segment ipsilateral to side in which clinician is standing to block motion as it arrives
- Mobilizing contact: Clinician’s arm cradles pt’s head, keeping it close to clinician’s chest with 5th digit placed across spinous process of superior vertebra of desired segment

Accessory Motion Technique:
- Mobilizing hand moves head & neck into ROT to desired level as inferior vertebra is stabilized by thumb

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as described above
- Pt actively rotates neck with guidance of clinician while inferior vertebra of desired segment blocked by stabilizing thumb
Suboccipital Distraction

Indications:
■ To improve all physiologic motions of suboccipital region

Patient:
■ Supine with head & neck in neutral

Clinician:
■ Sitting at head of pt
■ Fingertips of both hands contact occiput just inferior to inferior nuchal line

Accessory Motion Technique:
■ Gentle distraction force applied through clinician’s contacts
■ For increased distraction, forward nodding is added; to perform, clinician’s anterior shoulder contacts pt’s forehead & provides a fulcrum as distraction force applied through fingers
■ Increased specificity provided by adding slight SB
■ This technique may be preceded by gently resisting BB isometrically

Accessory With Physiologic Motion Technique:
■ Pt & clinician in same position as that described above with same hand contacts
■ Pt gently forward nods head on neck as clinician provides gentle distraction force
Suboccipital Transverse Glide

Indications:
- To improve mobility of O/A & A/A segments, particularly for SB

Patient:
- Supine with head & neck in neutral

Clinician:
- Sitting at head of pt
- Stabilization: Chin cradle hold provided on side ipsilateral to direction of glide
- Mobilizing contact: 2nd MCP joint in contact with lateral mass of C1
- Finger of mobilizing hand palpatates & identifies lateral mass of C1 by rotating head contralaterally; chin cradle hold achieved as palpating finger over C1 replaced by radial aspect of 2nd MCP

Accessory Motion Technique:
- Motion recruited at C1–C2 by slight SB of head on neck
- Stabilizing hand maintains chin cradle & SB head toward side to be mobilized as mobilizing hand provides a transverse force through 2nd MCP to lateral mass

Accessory With Physiologic Motion Technique:
- Pt sitting with clinician sitting behind pt
- Mobilizing hand contact at lateral mass remains same & provides a transverse force as pt performs active SB in direction of lateral glide
- Clinician’s hand on top of pt’s head guides pt’s head into SB as glide is performed
Suboccipital Transverse Glide

Suboccipital Transverse Glide With Physiologic Motion
O/A Unilateral Nod

Indications:
- To improve O/A mobility

Patient:
- Supine with head & neck in neutral

Clinician:
- Sitting at head & to side of pt
- Stabilizing contact: Tip of middle finger placed under neck & on posterior arch or lateral mass of atlas (C1) on contralateral side
- Mobilizing contact: Open hand on pt's forehead

Accessory Motion Technique:
- Mobilizing hand forward nods head on neck against counterforce of stabilizing contact
- Slight changes in force direction achieved by tilting chin in direction of greatest restriction against counterpressure of stabilizing finger

Accessory With Physiologic Motion Technique:
- Pt & clinician in same position as previously described
- Pt performs active forward nodding of head on neck
O/A Distraction High-Velocity Thrust

**Indications:**
- To improve mobility of O/A joint in all directions

**Patient:**
- Supine with head & neck in neutral

**Clinician:**
- Standing to side of pt
- *Stabilizing contact:* Forearm creates chin cradle hold over pt’s occiput & mandible
- *Mobilizing contact:* MCP joint of 2nd digit contacts pt’s mastoid process on ipsilateral side

**Accessory Motion Technique:**
- Forearm flexes head, side bends toward, & rotates away until tissue resistance is experienced; once all contacts locked, gentle squeeze applied through chin cradle hold contact, followed by high-velocity thrust in a straight cephalad direction through mobilizing hand contact
Cervical Downglide (Closing) High-Velocity Thrust

Indications:
■ To improve downglide mobility of midcervical spine

Patient:
■ Supine with head & neck in neutral

Clinician:
■ Standing to side of pt
■ Stabilizing contact: Forearm provides chin-cradle hold over pt’s occiput & mandible
■ Mobilizing contact: PIP joints of 2nd digit cradling segment to be mobilized

Accessory Motion Technique:
■ Head & neck are first flexed or extended to segment to be mobilized, then ROT contralaterally down to segment to be mobilized to achieve facet opposition locking, then SB toward side to be mobilized (i.e., if C5–C6 on right is to be mobilized, neck extended, ROT left, then SB right down to C5–C6 until end-range resistance experienced in each plane)
■ Once end range achieved in all three planes, high-velocity thrust delivered in direction of SB; adding slight distraction may assist in making technique more effective
Upper Thoracic Upglide Mobilization (Scoop Technique)

**Indications:**
- To improve upglide mobility of upper thoracic spine

**Patient:**
- Sitting with forehead placed on folded arms

**Clinician:**
- Standing in front of pt in straddle position
- **Stabilization:** Provided by pt’s weight
- **Mobilizing contacts:** 2nd & 3rd fingers of both hands are placed over articular pillars of superior vertebra of segment to be mobilized; fingers may be placed bilaterally for bilateral upglide (i.e., FB) or unilaterally to facilitate unilateral upglide (i.e., SB or ROT); to achieve contacts, clinician’s arms are threaded through pt’s folded arms

**Accessory Motion Technique:**
- Using pt’s arms as counterpressure, superoanterior force provided through finger contacts in a scooping motion as clinician shifts weight from front to back leg

**Accessory With Physiologic Motion Technique:**
- Pt & clinician as noted above with patient actively moving into ext & assisted by clinician
Thoracic Spine Mobilization Techniques

Mid-Lower Thoracic Central & Unilateral Glide

Indications:
■ To improve segmental mobility for all physiologic motions of thoracic spine

Patient:
■ Prone with head & neck in neutral with head supported & pillow under thoracic spine

Clinician:
■ Standing to side of pt
■ Stabilization: Provided by pillow support & table
■ Mobilizing contact: Any one of the following mobilizing hand contacts may be used:
  ■ Region just distal to pisiform with thumb directed caudally
  ■ Split finger with digits 2 & 3 each contacting transverse processes of same vertebra
  ■ Split finger with digits 2 & 3 each contacting transverse processes of adjacent vertebrae on different sides (i.e., 1 contact on transverse process of T5 on left & or on transverse process of T6 on right)
  ■ Thumb over thumb or hypothenar eminence over thumb contact at transverse process

Accessory Motion Technique:
■ Anteriorly directed forces elicited through mobilizing hand contacts; for upper thoracic spine (T1–T4) force direction is superior & anterior
■ Patient may be prepositioned in ROT of head & neck during unilateral glides contralateral to side of mobilization
Accessory With Physiologic Motion Technique:

■ FB: Pt sitting with arms folded across chest; clinician’s arm grasps pt across folded arms or weaves through folded arms to rest on contralateral shoulder; hypothenar eminence of other hand on spinous or transverse process of segment to be mobilized

■ BB: Pt sitting with folded arms raised & forehead resting on arms; clinician supports weight of folded arms & head; hypothenar eminence of other hand on spinous or transverse process of segment to be mobilized

■ SB: Pt sitting with arms folded across chest; for SB toward clinician, clinician’s axilla rests on ipsilateral shoulder; for SB away, clinician’s arm weaves through pt’s folded arms to rest on contralateral shoulder; hypothenar eminence of other hand on spinous or transverse process of segment to be mobilized

■ ROT: Pt sitting with arms folded across chest; clinician’s arm weaves through folded arms to rest on contralateral shoulder with hypothenar eminence of other hand on spinous or transverse process of segment to be mobilized

■ Clinician assists pt through each motion while eliciting force through hand contacts & sustaining force at end range
Mid-Lower Thoracic Central & Unilateral Anterior Glide With (FB) Physiologic Motion

Mid-Lower Thoracic Central & Unilateral Anterior Glide With (BB) Physiologic Motion

Mid-Lower Thoracic Lateral Glide With (SB) Physiologic Motion

Mid-Lower Thoracic Central & Unilateral Anterior Glide With (ROT) Physiologic Motion
Thoracic Physiologic SB With Finger Block

**Indications:**
- To improve segmental SB & opening mobility throughout thoracic spine

**Patient:**
- Sitting with arms folded across chest

**Clinician:**
- Standing to side of pt
- For SB toward, axilla rests on pt’s ipsilateral shoulder; for SB away, clinician’s arm weaves through pt’s folded arms to rest on contralateral shoulder with other hand to side of inferior spinous process of segment to be mobilized on side to which pt will move

**Technique:**
- Clinician assists pt into SB while localizing force through blocking movement from occurring below desired segment
- Pt actively SB with guidance of clinician while inferior vertebra of desired segment blocked by stabilizing hand
Thoracic Physiologic ROT With Finger Block

**Indications:**
- To improve segmental ROT & opening mobility throughout thoracic spine

**Patient:**
- Sitting with arms folded across chest

**Clinician:**
- Clinician’s arm weaves through folded arms to rest on contralateral shoulder with thumb on inferior transverse process on side to which pt is rotating

**Technique:**
- Clinician assists pt into ROT while localizing force through blocking movement from occurring below desired segment
- Pt actively ROT with guidance of clinician while inferior vertebra of desired segment blocked by stabilizing thumb
Thoracic Anterior Glide With ROT High-Velocity Thrust (Screw Technique)

Indications:
- To improve segmental mobility throughout thoracic spine

Patient:
- Prone with head & neck in neutral with head supported & pillow under thoracic spine

Clinician:
- Stabilization: Provided by table & pt’s body weight
- Mobilizing contacts: Standing to side of pt facing pt with shoulders directly over pt’s thoracic spine; hypothenar eminence of both hands at opposite sides of transverse processes at same segment for anterior glide or adjacent segments for anterior glide with ROT; elbows flexed

Accessory Motion Technique:
- Soft-tissue slack taken up as hand contacts increase pressure to create a skin lock; anteriorly directed force applied through hand contacts until end range achieved, at which time high-velocity thrust applied
Thoracic Segmental Anterior Glide With ROT
High-Velocity Thrust (Pistol Technique)

Indications:
- To improve segmental mobility primarily in midthoracic spine

Patient:
- Supine with hands clasped behind neck or folded across chest & SB slightly to achieve localization

Clinician:
- Standing to side of pt
- **Stabilizing contact:** Pistol grip used with thenar eminence contacting transverse process of inferior vertebra of motion segment to be mobilized & flexed 3rd digit positioned over contralateral transverse process of superior vertebra of motion segment to be mobilized; thenar eminence flexed; 3rd digit may be positioned over contacts of same vertebra
- **Mobilizing contact:** Grasps pt’s flexed elbows & forearms to control motion with clinician’s forearms across flexed elbows waiting to deliver force, or contact may be provided under pt’s neck & upper thoracic spine to control motion down to desired segment

Accessory Motion Technique:
- Pt slowly lowered over stabilizing hand until motion recruited to desired segment
- High-velocity thrust applied once end range has been recruited, which is directed posteriorly through long axis of humerus or through pt’s folded arms
Upper-Mid Thoracic Distraction High-Velocity Thrust

Indications:
■ To improve segmental mobility in upper to midthoracic spine

Patient:
■ Sitting with fingers clasped behind head

Clinician:
■ Stabilization: Pt’s body weight
■ Mobilizing contact: Standing behind pt with arms threaded through pt’s arms with hands resting over pt’s hands, which are positioned at cervical spine posteriorly, or contacts placed over pt’s flexed elbows which may be useful for mobilizing lower segments

Accessory Motion Technique:
■ While maintaining hand contacts, lean back & flex pt to desired level; pt elicits a downward force of arms into clinician’s arms; while maintaining hand contacts, arms pulled up & back, thus producing distraction force to pt’s upper thoracic spine; once motion recruited to desired segment, high-velocity thrust applied
Upper Thoracic Facet Opposition Lock High-Velocity Thrust

Indications:
■ To improve unilateral opening of desired segment in upper thoracic spine

Patient:
■ Sitting with head & neck in neutral

Clinician:
■ Standing to side contralateral from where finger block is to be applied
■ Stabilizing contact: Moves pt’s head & cervical/upper thoracic spine into SB down to level of fixation & ROT down to level of fixation; SB away from clinician with ROT toward clinician, thus providing facet opposition locking of superior segments; pt’s head held against clinician’s chest
■ Mobilizing contact: Finger or thumb contacts side of spinous process of inferior vertebra of segment to be mobilized

Accessory Motion Technique:
■ While maintaining all hand contacts & recruitment down to desired segment, gentle distraction provided by clinician standing erect from squat position
■ Once end range achieved, high-velocity thrust imparted through mobilizing hand contact at side of spinous process in transverse direction
First Rib Depression

Indications:

■ To improve normal position & motion to an elevated rib; serves as an important component of intervention in cases of anterior cervical muscle hypertonicity due to altered breathing patterns & in cases of TOS

Patient:

■ Pt sitting with arm over clinician’s bent knee with head SB & ROT toward side to be mobilized
■ Alternate position: Supine with cervical spine SB & ROT toward side to be mobilized

Clinician:

■ Half-kneeling on table alongside pt; alternate position: standing at head of table facing pt
■ Stabilizing contact: Stabilize arm; maintains pt’s head in SB
■ Mobilizing contact: Radial side of 2nd MCP joint contacting superior aspect of 1st rib; forearm dictates direction of force, which is inferior & medial

Accessory Motion Technique:

■ Pt leans onto clinician’s bent knee as anterior, inferior, & medial pressure applied to 1st rib; alternate position: as patient exhales, mobilization performed to 1st rib in caudal direction toward pt’s opposite ASIS
■ Pt inhales as 1st rib held in inferior direction, thus producing specific mobilization to restricted structures
Accessory With Physiologic Motion Technique:

- Towel may be placed across rib to be mobilized with 1 end secured under pt’s axilla &/or held by pt
- Downward force applied to 1st rib through towel contact as pt exhales & SB cervical spine contralaterally

First Rib Depression  First Rib Depression With Physiologic Motion

![First Rib Depression](image1)

![First Rib Depression With Physiologic Motion](image2)
Rib Elevation (Inhalation) Mobilization

Indications:
■ To improve normal position & motion to a depressed rib (i.e., rib unable to perform bucket handle motion during inhalation); most effective on ribs 3–10

Patient:
■ Technique 1: Sidelying with uppermost arm overhead
■ Technique 2: Sitting with arms across chest

Clinician:
■ Standing at head of table facing pt
■ Stabilizing contact: Web space contacts rib below level to be mobilized in both sidelying & sitting positions
■ Mobilizing contact:
  ■ Technique 1: Pt’s arm supported by clinician in overhead position
  ■ Technique 2: Clinician’s arm weaved through pt’s folded arms with hand resting on contralateral shoulder

Accessory Motion Technique:
■ Technique 1:
  ■ Clinician moves pt’s arm into elevation as rib contact maintained, producing separation between ribs
  ■ Force may be coordinated with pt breathing with force elicited during inhalation
Technique 2:
- Clinician SB pt away through mobilizing arm contact as rib contact maintained, producing separation between ribs
- Force may be coordinated with pt breathing with force elicited during inhalation

Accessory With Physiologic Motion Technique:
- With pt sitting, application of upward forces may be applied in conjunction with active arm elevation &/or contralateral SB & inhalation

Rib Elevation (Inhalation): Sidelying

Rib Elevation (Inhalation): Sitting
Rib Depression (Exhalation) Mobilization

Indications:
- To improve normal position & motion to elevated rib
- Most effective on ribs 3–10

Patient:
- Sitting with arms across chest

Clinician:
- Standing on same side to be mobilized
- Stabilizing contact: Web space contacts rib to be mobilized
- Mobilizing contact: Clinician’s axilla placed over pt’s ipsilateral shoulder as arm is weaved through pt’s folded arms with hand resting on pt’s contralateral torso

Accessory Motion Technique:
- Pt brought into SB toward clinician as downward force applied through rib contact
- Force may be coordinated with pt breathing with force elicited during exhalation

Accessory With Physiologic Motion Technique:
- With pt sitting, application of downward forces may be applied with active ipsilateral SB & exhalation
Rib Anterior Mobilization

Indications:
- To improve normal position & motion to a posteriorly subluxed or hypomobile rib; most effective on ribs 3–10.

Patient:
- Sitting with arms across chest

Clinician:
- Standing on side opposite to be mobilized
- Stabilization: Pt’s body weight
- Mobilizing contacts: Clinician’s arm weaved through pt’s folded arms with hand resting on contralateral shoulder; web space contacts rib to be mobilized along posterior aspect; alternate placement is on rib just inferior to one to be mobilized on its anterior aspect

Accessory Motion Technique:
- Pt rotated toward clinician down to rib to be mobilized
- Anteriorly directed force applied to rib to be mobilized or clinician may move to anterior aspect of rib immediately inferior to rib to be mobilized & prevent motion anteriorly as involved rib & ribs superior are brought further anteriorly through greater degrees of ROT

Accessory With Physiologic Motion Technique:
- With pt sitting, application of anterior forces may be applied in conjunction with active ROT toward clinician
Rib Posterior Mobilization

Indications:
- To improve normal position & motion to an anterior subluxated rib; most effective on ribs 3–10

Patient:
- Sitting with arms across chest

Clinician:
- Standing on side opposite to be mobilized
- Stabilization: Pt’s body weight
- Mobilizing contacts: Clinician’s arm over pt’s folded arms with hand resting on contralateral shoulder; web space contacts rib to be mobilized along anterior aspect; alternate placement is on rib just inferior to one to be mobilized on its posterior aspect

Accessory Motion Technique:
- Pt ROT away from clinician down to rib to be mobilized
- Rib to be mobilized grasped & pulled posteriorly as pt rotated, or clinician may move to posterior aspect of rib immediately inferior to rib to be mobilized & prevent motion as involved rib & ribs superior are brought further posterior through greater degrees of ROT

Accessory With Physiologic Motion Technique:
- With pt sitting, application of posterior forces may be applied in conjunction with active ROT away from clinician
Anatomy of the Lumbopelvic Spine

Superior View

- Vertebral body
- Vertebral foramen
- Transverse process
- Superior articular process
- Spinous process
- Articulating facet

Lateral View

- Vertebral body
- Intervertebral foramen
- Transverse process
- Superior articular process
- Spinous process
- Intervertebral disk
Physiologic (Osteokinematic) Motions of Lumbopelvic Spine

Operant Definitions

- **Iliosacral (I/S) motion**: Motion of ilium in reference to sacrum
- **Sacroiliac (S/I) motion**: Motion of sacrum in reference to ilium
  - Reference for lumbar motion is superior vertebra of motion segment
  - Reference for I/S motion is ASIS
  - Reference for S/I motion is anterior base of sacrum
- **I/S anterior/posterior ROT (tilt)**: Motion of ASIS anterior/inferior & posterior/superior in sagittal plane
- **I/S inflare/outflare**: Motion of ASIS medially & laterally in transverse plane
- **I/S upslip/downslip**: Motion of ASIS superiorly & inferiorly in frontal plane
- **S/I flexion/extension (nutation/counternutation)**: Motion of sacral base anterior & posterior in sagittal plane
- **S/I SB**: Motion of sacral base in frontal plane
- **S/I ROT**: Motion of sacral base in transverse plane
- **S/I forward/backward torsion**: Triplanar motion of sacral sulcus anteriorly & posteriorly about an oblique axis

Coupled/Combined Motion

- Lumbar SB & ROT occur contralaterally in neutral
- Lumbar SB & ROT occur ipsilaterally out of neutral
- Hip motion coupled with ilial (I/S) motion
- Lumbar motion coupled with sacral (S/I) motion
- Lumbar segmental maximal facet opening (R) occurs with FB, SB (L), ROT (R)
- Lumbar segmental maximal facet closing (R) occurs with BB, SB (R), ROT (L)
### Coupled Joint Motions

<table>
<thead>
<tr>
<th>Motion</th>
<th>Innominate (I/S)</th>
<th>Sacrum (S/I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip flex</td>
<td>Ipsilateral posterior ROT</td>
<td>Ø</td>
</tr>
<tr>
<td>Hip ext</td>
<td>Ipsilateral anterior ROT</td>
<td>Ø</td>
</tr>
<tr>
<td>Hip IR</td>
<td>Ipsilateral inflare</td>
<td>Ø</td>
</tr>
<tr>
<td>Hip ER</td>
<td>Ipsilateral outflare</td>
<td>Ø</td>
</tr>
<tr>
<td>Lumbar FB</td>
<td>Anterior ROT</td>
<td>Ext, then flex</td>
</tr>
<tr>
<td>Lumbar BB</td>
<td>Posterior ROT</td>
<td>Flex, then ext</td>
</tr>
<tr>
<td>Lumbar ROT</td>
<td>Ipsilateral posterior ROT &amp; contralateral anterior ROT</td>
<td>Ipsilateral ROT</td>
</tr>
<tr>
<td>Lumbar SB</td>
<td>Ipsilateral anterior ROT &amp; contralateral posterior ROT</td>
<td>Ipsilateral SB</td>
</tr>
</tbody>
</table>
### Physiologic (Osteokinematic) Motions of the Lumbopelvic Spine

<table>
<thead>
<tr>
<th>Joint</th>
<th>Normal ROM</th>
<th>OPP</th>
<th>CPP</th>
<th>Normal End Feel(s)</th>
<th>Capsular Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>S/I &amp; I/S</td>
<td>Angular motion = 3°–20° Translatory motion = 0.5–8.0 mm Triplanar 5°–8°</td>
<td>Max hip ER</td>
<td>Max hip IR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Lumbar Arthrology

<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
</table>
| Primarily sagittal plane orientation with superior facets of inferior vertebra facing medially & inferior facets of superior vertebra facing laterally | FB  
- Inferior facet of superior vertebra glides up & forward on superior facet of inferior vertebra  
- Nucleus pulposus migrates posteriorly, annulus fibrosis bulges anteriorly  
- Spinal canal & intervertebral foramen lengthen & open  
BB  
- Inferior facet of superior vertebra glides down & back on superior facet of inferior vertebra  
- Nucleus pulposus migrates anteriorly, annulus fibrosis bulges posteriorly  
- Spinal canal & intervertebral foramen shorten & close  
SB(R)  
- Inferior facets of superior vertebra upglide on L & downglide on R  
- R intervertebral foramen closes, L opens  
- Coupled with contralateral ROT in neutral & ipsilateral ROT out of neutral |

Continued
<table>
<thead>
<tr>
<th>Arthrology</th>
<th>Arthrokinematics</th>
</tr>
</thead>
</table>
| • Synovial joint anteriorly, syndesmosis joint posteriorly  
• Highly variable, irregular joint surfaces allowing a limited amount of motion  
• Motion occurs around an oblique axis, which allows triplanar motion  
• Most motion occurs in sagittal plane  
• Controversy exists regarding topography, type of cartilage, & axis of joint motion | **ROT**  
• Inferior facets of superior vertebra open on R & close on L  
• R intervertebral foramen opens, L closes  
• Coupled with contralateral SB in neutral & ipsilateral SB out of neutral  
**Anterior/Posterior ROT (TILT)**  
Inflare/outflare  
**Upslip/downslip**  
• Minimal amount of combined rotatory & translatory motion, which is less in males & reduces with age  
**Flex/FB (nutation)**  
**Ext/BB (counternutation)**  
**SB**  
**ROT**  
**Forward/Backward torsion**  
• Minimal amount of combined rotatory & translatory motion, which is less in males & reduces with age |
Lumbopelvic Spine Mobilization Techniques

Lumbar Central & Unilateral Anterior Glide

Indications:
- Central glide to improve FB & BB
- Unilateral glide to improve ROT & SB

Patient:
- Prone with pillow supporting lumbar spine

Clinician:
- Standing close to pt
- Stabilizing contact: None
- Mobilizing contact: Region of hand just distal to pisiform contacts spinous process for central & transverse process for unilateral glides while mobilizing hand lies over contact hand; elbows extended & forearms in direction of force application; alternate hand placement includes single-hand pressure through region just distal to pisiform, split finger, or thumb-over-thumb pressure

Accessory Motion Technique:
- Anteriorly directed pressure applied through hand contacts at either spinous processes for central glides or transverse processes for unilateral glides
- Slight changes in force direction can be provided to improve specificity
Accessory With Physiologic Motion Technique:

- Pt in seated, prone, quadruped, or standing position
- Clinician standing behind or to side of pt
- Mobilization belt may be placed from clinician to anterior aspect of pt’s pelvis to provide stabilization during force application
- Anteriorly directed force in same plane as facet joint of segment applied through spinous or transverse processes while pt performs movement that reproduces symptoms
- Force applied throughout entire motion & sustained at end range
- Slight changes in force direction can be provided to improve specificity
- Self-mobilization performed using mobilization strap or towel placed over segment to be mobilized & force applied while pt performs active physiologic motion

Lumbar Central Anterior Glide

Lumbar Central Anterior Split Finger Glide
**Lumbar Unilateral Anterior Glide**

**Lumbar Anterior Glide With (FB)**

*Physiologic Motion: Sitting*

**Lumbar Anterior Glide With (BB)**

*Physiologic Motion: Sitting*

**Lumbar Anterior Glide With (ROT)**

*Physiologic Motion: Sitting*

**Lumbar Anterior Glide With FB With**

*Physiologic Motion: Quadruped*

**Lumbar Anterior Glide With (BB)**

*Physiologic Motion: Prone*
Lumbar Physiologic FB

**Indications:**
- To improve physiologic segmental FB &/or improve facet joint opening

**Patient:**
- Technique 1: Sidelying with ⅔ of pt’s thigh over edge of table & tibial tuberosity of uppermost leg or both legs resting on clinician’s ASIS
- Technique 2: Supine with B knees to chest

**Clinician:**
- Standing in straddle position facing pt
- **Stabilizing contact:**
  - Technique 1: Cephalad hand stabilizes at spinous or transverse processes of superior aspect of segment to be mobilized
  - Technique 2: Provided by pt’s weight on table
- **Mobilizing contact:**
  - Technique 1: Caudal hand placed across sacrum with fingers contacting spinous or transverse processes of inferior aspect of segment to be mobilized
  - Technique 2: Cephalad hand rests on anterior flexed knees holding legs to chest while caudal hand reaches under pt, contacting spinous or transverse processes of inferior aspect of segment to be mobilized
Technique:
- Technique 1: Pt’s knee fixed at clinician’s ASIS; clinician shifts weight from caudal to cephalad leg, creating physiologic FB; stabilizing hand maintains constant force as mobilizing hand localizes FB forces to segment to be mobilized
- Technique 2: Both hand contacts work together to produce a scooping motion, bringing segment to be mobilized into FB

Lumbar Physiologic FB: Sidelying  
Lumbar Physiologic FB: Supine
Lumbar Physiologic BB

Indications:
- To improve physiologic segmental BB &/or improve facet joint closing

Patient:
- Sidelying with hips & knees flexed up to segment to be mobilized with ⅓ of pt’s thighs over edge of table & fixed on clinician’s ASIS

Clinician:
- Standing in straddle position facing pt
- Stabilizing contact: Cephalad hand stabilizes at spinous or transverse processes of superior aspect of segment to be mobilized
- Mobilizing contact: Caudal hand maintains pt’s flexed knees against clinician’s ASIS

Technique:
- Force imparted through long axis of thigh in posterior direction as superior aspect of segment is stabilized
Lumbar SB With Finger Block

Indications:
■ To improve physiologic segmental SB &/or to improve facet joint opening or closing

Patient:
■ Technique 1: Prone with pillow supporting lumbar spine
■ Technique 2: Sidelying with ⅓ of pt’s thigh over edge of table & resting on clinician’s anterior leg
■ Technique 3: Sitting with arms folded across chest

Clinician:
■ Technique 1: Standing to side of pt
■ Technique 2: Standing facing pt in a straddle position with caudal-most leg forward to support pt’s knees
■ Technique 3: Standing to side of pt
■ Stabilizing contact:
■ Technique 1: Finger or thumb block to side of superior spinous process of segment to be mobilized
■ Technique 2: Finger or thumb block on uppermost side of superior spinous process of segment to be mobilized
■ Technique 3: Finger or thumb block to side of inferior spinous process of segment to be mobilized on side ipsilateral to direction of SB
■ Mobilizing contact:
■ Technique 1: Grasp pt’s distal thigh with knee flexed or extended
■ Technique 2: Grasp pt’s ankles, which supports pt’s flexed knees against clinician’s leg
■ Technique 3: Arm weaves through pt’s folded arms with hand resting on contralateral shoulder
Technique:

- Technique 1 (prone):
  - Clinician moves pt’s leg into abd until movement recruited up to segment to be mobilized
  - Prolonged stretch or oscillations performed by moving leg against blocked segment

- Technique 2 (sidelying):
  - Clinician moves pt’s ankles up & down, rolling legs on fulcrum created by clinician’s leg, which induces a SB movement up to segment to be mobilized
  - Prolonged stretch or oscillations performed by moving leg against blocked segment

- Technique 3 (sitting):
  - Finger block maintained while active or passive SB performed down to segment to be mobilized

Lumbar SB With Finger Block:
Technique 1 (Prone)
Lumbar SB With Finger Block: Technique 2 (Sidelying)

Lumbar SB With Finger Block: Technique 3 (Sitting)
Lumbar ROT With Finger Block

**Indications:**

- To improve physiologic segmental ROT &/or to improve facet joint opening or closing

**Patient:**

- Technique 1: Prone with pillow supporting lumbar spine with knees extended or flexed
- Technique 2: Sitting with arms folded across chest

**Clinician:**

- Standing to side of pt
- **Stabilizing contact:**
  - Technique 1: Finger or thumb block provided at side of superior spinous process of segment to be mobilized
  - Technique 2: Finger or thumb block provided at side of inferior spinous process of segment to be mobilized on side contralateral to direction of ROT or on transverse process of side ipsilateral to direction of ROT
- **Mobilizing contact:**
  - Technique 1: With knees flexed, clinician grasps pt’s ankles in order to induce movement or mobilizing forearm moves gluteals aside as hand grasps ASIS
  - Technique 2: Arm weaves through pt’s folded arms with hand resting on contralateral shoulder
Accessory Motion Technique:

- Technique 1
  - Rotational forces produced through movement of legs from side to side, or mobilizing hand contact at ASIS imparts upward force through pelvis that creates ROT up to segment to be mobilized; prolonged stretch or oscillations performed by moving pelvis or legs against blocked segment
- Technique 2
  - Finger block maintained while pt performs active ROT that is controlled & assisted by clinician down to segment to be mobilized

Lumbar ROT With Finger Block:

- Technique 1 (Prone)
- Technique 2 (Sitting)
Iliosacral (I/S) Anterior & Posterior ROT Isometric

**Indications:**
- I/S anterior ROT indicated:
  - For increased anterior ROT mobility of innominate in sagittal plane
  - In presence of posteriorly rotated positional fault
- I/S posterior ROT indicated:
  - For increased posterior ROT mobility of innominate in sagittal plane
  - In presence of anteriorly rotated positional fault

**Patient:**
- Supine with hips in a variable degree of flex with hip on side to be mobilized flexed to a greater degree

**Clinician:**
- Standing to side of pt
- **Stabilizing contact:** Anterior or posterior aspect of distal thigh on contralateral side
- **Mobilizing contact:** Opposite hand contacts from above with contact at anterior aspect of distal thigh for anterior ROT mobilization & posterior aspect of distal thigh for posterior ROT mobilization

**Technique:**
- Force/counterforce used by applying equal force through all hand contacts simultaneously
- Resisted isometric contraction of hip flexors imparts anterior ROT force to pelvis & resisted isometric contraction of hip extensors imparts posterior ROT force
I/S Anterior ROT

Indications:
- To improve anterior ROT mobility of innominate in sagittal plane
- In presence of a posteriorly rotated positional fault

Patient:
- Prone in diagonal orientation on table with one foot on floor & side to be mobilized on table with knee flexed

Clinician:
- Standing in straddle position facing same direction as pt
  - Stabilizing contact: Provided through foot in contact with floor
  - Mobilizing contact: Caudal hand grasps distal aspect of anterior thigh as heel of cephalad hand engages PSIS of leg on table

Accessory Motion Technique:
- Caudal hand moves hip into ext as cephalad hand applies anterosuperior force through PSIS
- Between each progression pt may impart isometric hip flex force into clinician’s caudal hand contact at anterior thigh
Accessory With Physiologic Motion Technique:

- Pt standing in lunge position or half-kneeling with side to be mobilized back; clinician standing on side contralateral to one to be mobilized with stabilizing hand across pt’s abdomen & mobilizing hand at PSIS
- Pt gently shifts weight from back leg to front leg, producing hip ext on side to be mobilized as clinician imparts anteriorly directed force through PSIS contact while maintaining stabilization
- Alternate technique involves pt performing active hip ext in sidelying, using powder board as clinician imparts anteriorly directed force through PSIS as above

I/S Anterior ROT  I/S Anterior Rotation With Physiologic Motion
I/S Posterior ROT

Indications:
■ To improve posterior ROT mobility of innominate in sagittal plane
■ In presence of an anteriorly rotated positional fault

Patient:
■ Sidelying with side to be mobilized uppermost & hip flexed to 90°

Clinician:
■ Standing in straddle position facing pt with posterior thigh of pt resting against clinician’s trunk
■ Stabilizing contact: Provided by maintaining contralateral hip in neutral & in contact with table
■ Mobilizing contact: Heel of cephalad hand contacts ASIS & heel of caudal hand contacts ischial tuberosity on side to be mobilized

Accessory Motion Technique:
■ Equal & opposite force imparted through both hand contacts that are slightly offset, therefore producing a posteriorly directed rotatory force
■ Between each progression, pt may impart isometric hip ext force into clinician’s trunk for purpose of utilizing hip extensors to impart additional posteriorly directed rotatory force
Accessory With Physiologic Motion Technique:

- Pt standing with clinician standing on side contralateral to one to be mobilized with stabilizing hand at sacrum & mobilizing hand at ASIS
- Pt actively flexes hip on side to be mobilized as clinician imparts posteriorly directed force through ASIS contact while maintaining stabilization at sacrum
- Alternate technique involves pt performing active hip flex in sidelying, using powder board as clinician imparts posteriorly directed force through ASIS with stabilization as above

I/S Posterior ROT

I/S Posterior ROT With Physiologic Motion
I/S Downslip

Indications:
- To improve mobility of innominate in caudal direction
- In presence of upslip positional fault of innominate

Patient:
- Supine, if also mobilizing into posterior ROT with hip in add & IR
- Prone, if also mobilizing into anterior ROT with hip in add & IR

Clinician:
- Standing in straddle position at foot of pt facing cephalad
- Stabilizing contact: Provided by pt’s body weight on table
- Mobilizing contact: Both hands grasp distal leg just proximal to ankle or proximal to knee as required; hand contacts may be reinforced by “figure 8” mobilization belt

Accessory Motion Technique:
- Clinician shifts weight from front leg to back leg while maintaining hand contacts
- Continuum of grades may be used, including high-velocity thrust

Accessory With Physiologic Motion Technique:
- Pt standing on step with side to be mobilized off the step
- Clinician, kneeling & grasping distal leg, applies caudally directed force through leg & pelvis that may be enhanced by pt relaxation or assistance in producing reaching of unsupported leg toward floor
- Alternate technique involves pt sidelying with pt actively producing pelvic downslip during application of caudally directed force by clinician through iliac crest
I/S Outflare & Inflare

Indications:
- To improve mobility of innominate in lateral & medial direction, which occurs as accessory movement of hip ER & IR, respectively
- In presence of positional fault of innominate

Patient:
- Supine with hips in neutral

Clinician:
- Standing on side of pt to be mobilized
- **Stabilizing contact:** Provided by pt's body weight on table
- **Mobilizing contact:**
  - For outflare, hand grasps medial aspect of pt's ASIS as other hand grasps PSIS
  - For inflare, hand grasps lateral aspect of ASIS as other hand grasps PSIS

Accessory Motion Technique:
- Force imparted through B hand contacts moving ASIS laterally & PSIS medially for outflare & moving ASIS medially & PSIS laterally for inflare

Accessory With Physiologic Motion Technique:
- Pt standing with clinician standing on contralateral side
- For outflare, stabilization provided over posterior aspect of contralateral ilium & sacrum; mobilizing hand contacts ASIS; for inflare, stabilization provided across abdomen & mobilizing hand contacts lateral aspect of ilium
For outflare, pt performs hip ER as force imparted through ASIS in posterolateral direction with sacral stabilization; for inflare, pt performs hip IR as force imparted through lateral aspect of ilium in anterolateral direction with abdominal stabilization.
**Sacroiliac (S/I) FB & BB**

**Indications:**
- To improve mobility of sacrum into FB & BB which is a coupled motion of lumbar BB & FB, respectively
- In presence of a positional fault of sacrum

**Patient:**
- Prone with hips in ER for FB & IR for BB

**Clinician:**
- Standing behind or to side of pt
- *Stabilizing contact:* Provided by pt’s body weight on table
- *Mobilizing contact:*
  - For FB/BB, hand just distal to pisiform or thumb-over-thumb contacts base apex of sacrum, respectively

**Accessory Motion Technique:**
- Force imparted through hand contacts, with force direction dictated by position of forearm, which can be varied slightly for best results
- FB mobilization may be timed with expiration & BB mobilization timed with inspiration

**Accessory With Physiologic Motion Technique:**
- Pt sitting or standing, with clinician standing behind or to side of pt
- For FB, pt actively moves into lumbar BB as force imparted through contact at base of sacrum & maintained throughout entire motion & held at end range
For BB, pt actively moves into lumbar FB as force imparted through contact at apex of sacrum & maintained throughout entire motion & held at end range

Self-mobilization may be performed utilizing fist pressure or ball with mobilization strap in sitting
S/I FB (Base) With Lumbar BB Physiologic Motion

S/I BB (Apex) With Lumbar FB Physiologic Motion
S/I Forward & Backward Torsion

Indications:
- To improve mobility of sacrum into forward & backward torsion, coupled with lumbar motion
- In presence of a positional fault of sacrum

Patient:
- Prone with hip ER on side to which forward torsion force imparted & IR on side to which backward torsion force imparted

Clinician:
- Standing behind or on contralateral side to be mobilized
  - Stabilizing contact:
    - For forward torsion, stabilizing hand contacts ASIS on side to be mobilized
    - For backward torsion, stabilizing hand contacts PSIS on side to be mobilized
  - Mobilizing contact:
    - For forward torsion, aspect of hand just distal to pisiform or thumb-over-thumb contacts sacral sulcus on side to be mobilized
    - For backward torsion, aspect of hand just distal to pisiform or thumb-over-thumb contacts sacral inferior lateral angle (ILA) contralateral to side to be mobilized

Accessory Motion Technique:
- Force imparted through hand contacts while maintaining stabilization, with force direction dictated by position of forearm, which can be varied slightly for best results
- Forward torsion mobilization may be timed with expiration & backward torsion mobilization timed with inspiration
Accessory With Physiologic Motion Technique:

- Pt sitting or standing with clinician standing behind or to side of pt
- Pt performs trunk ROT as clinician applies anteriorly directed force through contralateral sacral sulcus
- Pt performs trunk ROT as clinician applies anteriorly directed force through contralateral inferior lateral angle

S/I (Sulcus): Forward Torsion  
S/I: Backward Torsion (ILA)
S/I Forward Torsion (Sulcus) With Lumbar ROT Physiologic Motion

S/I Backward Torsion (ILA) With Lumbar ROT Physiologic Motion
Lumbar ROT With Ligamentous Tension
Locking High-Velocity Thrust

Indications:
■ To improve unilateral opening of desired segment

Patient:
■ Sidelying over bolster that is placed at segment to be mobilized

Clinician:
■ Standing in straddle position facing pt
■ Stabilizing contact: Clinician stabilizes distal leg by hooking uppermost foot behind underlying knee
■ Mobilizing contact: Both hands produce skin lock with cephalad fingers at uppermost side of spinous process of superior vertebra & caudal hand at underside of spinous process of inferior vertebra of desired motion segment

Accessory Motion Technique:
■ Uppermost hip flexed as clinician shifts weight from caudal to cephalad foot
■ Hip flexed to point of desired segment, monitored by cephalad hand
■ Uppermost leg fixed into position by hooking foot around underlying leg
■ Clinician changes hands & monitors spinal movement with caudal hand as cephalad hand produces ROT down to segment to be mobilized by pulling pt's underlying arm up & forward
■ Clinician threads cephalad arm through pt’s, allowing elbow to rest on pt’s anterior shoulder with caudal arm resting on posterior gluteal region & pt rolled toward clinician
■ Slack taken up at all hand contacts & ROT force imparted as high-velocity thrust from either cephalad or caudal hand contact as other stabilizes
■ Alternate hand contact utilizes caudal forearm to scoop gluteals superior & anterior to close involved segment
Lumbopelvic Regional High-Velocity Thrust

**Indications:**
- To improve mobility & reduce symptoms of lumbopelvic region

**Patient:**
- Supine & side bent away from clinician
- While maintaining SB, pt’s trunk lifted & rotated with shoulder planted onto table

**Clinician:**
- Standing on side contralateral to one to be mobilized
- Caudal hand contact made on pt’s contralateral ASIS & cephalad hand contacts posterior aspect of scapula

**Accessory Motion Technique:**
- Scapular hand contact rotates trunk toward clinician as ASIS remains stabilized
- Once ASIS begins to elevate, scapula stabilized & high-velocity thrust in posterior direction imparted through ASIS contact


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