SELF-MOBILIZATIONS OF THE HIP WITH BELTING TECHNIQUES

Everett Nicolai, DPT, FAAOMPT

Objectives
- Quick review of anatomy and biomechanics
- Understand regional interdependencies
- Instruct patients to perform home techniques

Description
The hip is of central importance for regional interdependencies for the lumbar spine, SIJ, knee and ankle. Self-mobilizations are brilliant ways to prepare the patient for discharge.

Arthrokinematics vs Osteokinematics
Mobilization Overview
Regional Interdependencies
Techniques

AAOMPT Conference Louisville 2015, Rett Nicolai, DPT FAAOMPT
**ANATOMY & PHYSIOLOGY**

**RANGE of MOTION** (MaGe, 2008)

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Flexion</td>
<td>120˚</td>
</tr>
<tr>
<td>Extension</td>
<td>10˚-20˚</td>
</tr>
<tr>
<td>Adduction</td>
<td>30˚</td>
</tr>
<tr>
<td>Abduction</td>
<td>30˚-50˚</td>
</tr>
<tr>
<td>External Rotation</td>
<td>40˚-60˚</td>
</tr>
<tr>
<td>Internal Rotation</td>
<td>30˚-40˚</td>
</tr>
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**ANATOMY & PHYSIOLOGY**

**Functional ROM**

<table>
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<tr>
<th>Activity</th>
<th>ROM</th>
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</thead>
<tbody>
<tr>
<td>Tie shoes</td>
<td>120˚ flexion</td>
</tr>
<tr>
<td>Sit</td>
<td>112˚ flexion</td>
</tr>
<tr>
<td>Squat</td>
<td>115˚ flexion, 20˚ abduction, 20˚ ER</td>
</tr>
</tbody>
</table>

**ANATOMY & PHYSIOLOGY**

**Bones**

Femur sits in a socket formed by the innominate

**ANATOMY & PHYSIOLOGY**

**Femoral Angles**

<table>
<thead>
<tr>
<th>Angle</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Column &amp; Angle</td>
<td></td>
</tr>
<tr>
<td>Anterior Antetorsion Angle</td>
<td></td>
</tr>
<tr>
<td>Acetabular Angle</td>
<td></td>
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</tbody>
</table>
ANATOMY & PHYSIOLOGY

Hip Joint Capsule
- Ischiofemoral ligament
- Iliofemoral (Y) ligament
- Pubofemoral ligament

ANATOMY & PHYSIOLOGY

Hip Joint
Type: Multi-axial, ball and socket joint
Acetabulum: faces lateral, anterior, inferior
Stable: deep socket, labrum, strong muscles
(Byrne, Mulhall, Baker, 2010)

ANATOMY & PHYSIOLOGY

Other Anatomy of the Hip
- Ligament Teres
- Pulvinar Acetabulum (Fat Pad)
- Labrum
- Cartilage

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Osteokinematic: Movement of Bone
Arthrokinematic: Movement of Joint
OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

To mobilize a CONCAVE surface:
A concave joint surface always moves in the same direction as the bone.

example: finger flexion

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

To mobilize a CONVEX surface:
A convex joint surface always moves in the opposite direction as the bone.

example: shoulder abduction.

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Accessory motions (Glide)
Translational glide is inversely proportional to congruence and depth of concavity:
Hip has ~180°, therefore glide .8 - 4.2 mm (posterior glide) (Loubert et al, 2013)
OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Mobilization Vectors (Grimsby, 2012)

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<tr>
<th>Movement</th>
<th>Neutral Hip</th>
<th>90° Flexed Hip</th>
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<tbody>
<tr>
<td>Flexion</td>
<td>Posterior glide (in sagittal plane)</td>
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MOBILIZATION OVERVIEW

Contraindications (Grimsby 2012)
- Spinal cord injury
- Upper motor neuron lesion with decreasing neurological function
- Unrelenting non-mechanical pain
- Multi-level nerve root pathology
- Unrelenting night pain
- Local recent severe trauma

Precautions (Grimsby 2012)
- Local infection
- Active cancer
- Osteoporosis
- Inflammatory disease
- Prolonged steroid use
- Hypermobility syndrome
- Connective tissue disease
- Systemic pathology

Indications
- Decrease pain, psychological effects
- Improve posture and locomotion
- Restore physiological ROM, reduce adhesions
- Neurophysiological effects / Recruitment
- Normalize hypertonicity / diminish guarding
- Regional interdependencies
- Improve strength
- Therapist is too petit, weak, or broken

MOBILIZATION OVERVIEW

Contraindications (Grimsby 2012)

Precautions (Grimsby 2012)

Indications

MOBILIZATION OVERVIEW

Contraindications (Grimsby 2012)

Precautions (Grimsby 2012)

Indications
**MOBILIZATION OVERVIEW**

### Mechanoreceptors

<table>
<thead>
<tr>
<th>Type I (Ruffini Corpuscles)</th>
<th>Type II (Pacinian Corpuscles)</th>
<th>Type III (GTOs)</th>
<th>Type IV (free nerve endings)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial layers of joint capsule, neck, hip, shoulder</td>
<td>Deep layers of capsule, l.s., foot, hand, TMJ.</td>
<td>Joint capsule, blood vessels, articular fat pads, dura, PLL, ALL, iliac muscles, meniscus, nerve, synovial tissue</td>
<td></td>
</tr>
<tr>
<td><strong>Adaptation</strong></td>
<td>Slow, fires for 1 min</td>
<td>Very slow</td>
<td>Non-adapting</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Stretch articulation (15 seconds) x3</td>
<td>Oscillation (1/sec)</td>
<td>just smile Remove stimulus</td>
</tr>
</tbody>
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**MOBILIZATION OVERVIEW**

### Collagen Deformation:

- **Oscillation**
- **Stretch Articulation**

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**MOBILIZATION OVERVIEW**

### Belting Specificity
MOBILIZATION #1: OSCILLATORY TECHNIQUE

MOBILIZATION #2: STRETCH ARTICATION TECHNIQUE

PRACTICAL APPLICATIONS

You know the science.

Let’s apply it.

REGIONAL INTERDEPENDENCIES

Relationships between seemingly unrelated impairments in remote anatomical regions may contribute to the patient’s primary symptom. (Wainner, et al., 2007)

Biomedical model: musculoskeletal, neurophysiological, somatovisceral, biopsychosocial responses. (Norkin, Cleland, Wainner, 2013)
REGIONAL INTERDEPENDENCIES

Limitation in Total Hip Motion

- Lumbar Pain: Asymmetry in total hip rotation between hips 2.6° to 8.4°. (Van Dillen et al, 2008)(Cibulka, 1999)
- Knee Pain: Overpronation (increased IR & adduction): PFP (Souza & Powers, 2009)

SELF-MOBILIZATION #1:
LONG AXIS DISTRACTION, NON-WEIGHTBEARING

SELF-MOBILIZATION #2:
LATERAL DISTRACTION, 0°, NON-WEIGHTBEARING

SELF-MOBILIZATION #3:
LATERAL DISTRACTION, 45°, NON-WEIGHTBEARING
REGIONAL INTERDEPENDENCIES

Limited Hip Flexion
- Lumbar Pain: Limited flexion. (Sjolie, 2004); (Moblin, 1988); (Zafereo, et al, 2015)
- Knee Pain: Limited flexion: 34.8° for knee OA pain
  37.4° was normal. (Sjolie, et al, 2004)

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

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SELF-MOBILIZATION #6:
INFERIOR GLIDE IN 90°, (SAGITTAL PLANE), NWB
SELF-MOBILIZATION #5:
POSTERIOR GLIDE IN 0°, (SAGITTAL PLANE) WEIGHTBEARING

SELF-MOBILIZATION #7:
INFERIOR GLIDE IN 90°, (SAGITTAL PLANE), NWB

SELF-MOBILIZATION #8:
INFERIOR GLIDE IN 90°, (SAGITTAL PLANE) NON-WEIGHTBEARING

REGIONAL INTERDEPENDENCIES
Limited Hip External Rotation
- Lumbar Pain: Limited ER (Mellin, 1990); (Cibulka, 1999)
OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Mobilization Vectors (Grimsby, 2012)

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SELF-MOBILIZATION #11:
SUPERIOR GLIDE IN 90°, (FRONTAL PLANE)
NON-WEIGHTBEARING

SELF-MOBILIZATION #9:
ANTERIOR GLIDE IN 0°, (TRANSVERSE PLANE)
WEIGHTBEARING

SELF-MOBILIZATION #10:
SUPERIOR GLIDE IN 90°, (FRONTAL PLANE)
PARTIAL WEIGHTBEARING
REGIONAL INTERDEPENDENCIES

Limited Hip Internal Rotation

- Ankle Pain: Limited IR: increased subtalar pronation. (Spada, 1999)

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Mobilization Vectors (Grimsby, 2012)

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SELF-MOBILIZATION #13:
INFERIOR GLIDE IN 60-90˚, (FRONTAL PLANE)
NON-WEIGHTBEARING

SELF-MOBILIZATION #12:
POSTERIOR GLIDE IN 0˚,
(TRANSVERSE PLANE)
NON-WEIGHTBEARING
REGIONAL INTERDEPENDENCIES

Limited Hip Extension

  
  Shortened hip flexor result in external flexor torque and increased metabolic costs.
  
  Shortening result in increased activation of low back musculature with resultant increased internal moment. Excessive activation may lead to early onset fatigue and decreased protection from shearing and torsional loading. (Roach, et al, 2015) (Vad, et al, 2003)
  
  
  
- Gluteus Maximus: anterior glide in neutral; 14% increase strength. (Vare, et al, 2012)

OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT

Mobilization Vectors (Grimsby, 2012)

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SELF-MOBILIZATION #15:
ANTERIOR GLIDE IN 0°, (SAGITTAL PLANE) NON-WEIGHTBEARING

SELF-MOBILIZATION #14:
ANTERIOR GLIDE 0°, (SAGITTAL PLANE) WEIGHTBEARING
**SELF-MOBILIZATION #16:**
SUPERIOR GLIDE IN 90°, (SAGITTAL PLANE)
PARTIAL WEIGHTBEARING

**REGIONAL INTERDEPENDENCIES**

Limited Hip Abduction
- Gluteus Medius: inferior glide in neutral; 17% increase strength (Makofsky, et al, 2009)

**OSTEOKINEMATIC VS ARTHROKINEMATIC MOVEMENT**

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**SELF-MOBILIZATION 17:**
MEDIAL GLIDE IN NEUTRAL, WEIGHTBEARING
REGIONAL INTERDEPENDENCIES

Neurophysiological, Somatovisceral, Radicular Pain

- Joints’ mechanoreceptors influence motor unit activation, therefore muscle function. It may increase strength by removing the reflexogenic inhibition from mechanoreceptors. (Makofsky, et al, 2009); (Warmerdam, 1985); (Wyke, 1985); (Yerys, et al, 2002); (Grimsby, 2012).
- While simultaneously defacilitating through reciprocal innervation. (Yerys, et al, 2002)
- Hypoalgesia effects after mobilization. (Beckers, Bishop, George, 2006).

MOBILIZATION TECHNIQUES

Problem Solving for Self-Mobilization Techniques

- Safety, don’t articulate in close-packed position
- Lack equipment (belt or stable fixture)
- Poor set-up position (individual’s posture or where the belt is)
- Loss of contact point pressure, fix & support one bone
- Incorrect vector
- Incorrect force
- Incorrect amplitude
- Patient not relaxed, motor moron

References:
- Grimsby O. Ola Grimsby Institute, Residency Program Curriculum 2006.
- Grimsby O. Ola Grimsby Institute, Fellowship Program Curriculum 2008.
- Grimsby O. Ola Grimsby Institute, PhD Program Curriculum 2012.
References:


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