Objectives for Today

- Examine the biomechanical components of mobilization
- Identify the principles behind Maitland’s approach to mobilization
- Outline the different grades used by Maitland
- Discuss the use of mobilization techniques in treatment of conditions

Orthopedic Manual Therapy

Benjamin Rush

- America’s most prominent physician in 1796
- Believed mental illness was caused by irritation of blood vessels in the brain
- He also concluded that the most logical approach for the treatment of fever – was ‘bleeding’.
- The patient went from being hot, flushed, and delirious to being cold, pallid, and euphoric, in the eyes of physicians of that time clearly the first step to a cure.
Popularity and Prominence do Not Make Something Right

- Named after the instrument used to 'bleed' patients who had fever – some mistakes are remembered

Where Did Manual Physical Therapy Come From?

- Cyriax: Father of Orthopedic Medicine (1930’s onwards)
  - Specific and scientifically sound examination approach, which delineates faulty structures by "selective tension"
  - Systematic joint examination processes
  - Disc as the primary source of low back pain
  - Tendons treated with cross friction massage.

- Accessory Motion: Frank Mennel (1940’s)
  - Mennel first described joint play as involuntary motion that is present in all synovial joints.
  - It is necessary for normal, pain free voluntary motion.
  - When joint play is diminished as in cases of hypomobility therapeutic intervention becomes necessary.
  - Abnormalities in joint play form the basis for mobilization.

- Norwegian/Kaltenborn (1950’s)
  - Normalization of function is dependent upon the restoration of normal arthrokinematics.
  - Influence of "somatic dysfunction" (muscle function and soft tissue alteration,
  - Cause for the presence of symptoms and therefore, loss of function.

- Stanley Paris (1950’s)
  - Synthesis of osteopathic and chiropractic from work originated by Alan Stoddard.
  - Orientation views the "normalization of arthrokinematics" as key to improvement in function.
  - Generally does not use the patient's pain symptoms as a guide to treatment.
Travell/Simmons (1960’s)

• Recognized that skin and underlying musculoskeletal structures when irritated may refer symptoms regionally and cause regional soft tissue changes (trigger points).
• Stimulation of the regional areas can reflexively alter the pain referral: soft tissue alteration cycle.

Kinematics

• Arthrokinematics - the motion (translatory) that occurs within the joint (concave - same as osteokinematic motion, convex - opposite of osteokinematic motion).
• Osteokinematics - motion of the bone example - abduction refers to humeral motion, when addressing the shoulder.

Mobilization

Mobilization is passive movement using arthro- and osteo-kinematic principles to increase the mobility of joints.

Joint Play and Component Motion Grading

<table>
<thead>
<tr>
<th>Motion</th>
<th>Grade</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>Ankylosed Surgery (?)</td>
</tr>
<tr>
<td>Hypo</td>
<td>1</td>
<td>Gross Restrict. Manipulation</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Slight Restrict. Mobilization</td>
</tr>
<tr>
<td>Normal</td>
<td>3</td>
<td>Normal</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Slight Increase Exercise</td>
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<tr>
<td>Hyper</td>
<td>5</td>
<td>Moderate Increase Brace/Exercise</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Unstable Surgery</td>
</tr>
</tbody>
</table>

Convex and Concave Joint Surfaces

• Joint movement requires combined motions of rolling and gliding.
• As a bone moves in one direction, the associated roll occurs in the same direction.

Component Motions

• Component motions are those motions necessary for full active motion but are not generally recognized as part of the motion.
• An example would be the anterior glide and external rotation of the tibia during knee extension.
**Associated Translatory Glide**

- Kaltenborn (1980) proposed the convex-concave rule
- Based decision on mechanical models
- Questions have been raised as to the effectiveness of this ‘rule’
- In the opposite direction if the moving joint surface (usually the distal surface) is convex.
- In the same direction if the moving joint surface is concave.

**Restoring Motion**

- The inhibiting factor for that movement should be established
  - articular surfaces
  - joint capsule
  - ligaments
  - muscles
- Appropriate treatment given to the inhibiting structure

**Stretching**

- Stretching, regardless of the source, is a common and effective method for restoring motion.
- Common methods include static, muscle-energy, and passive stretching.
- Classically used in instances of tight musculature or even ligamentous structures.

**Joint Capsule**

- The joint capsule is an innervated bi-layered structure.
- The inner layer is the synovial lining and the outer or external layer is dense, irregular collagenous connective issue.
- The outer layer tends to become thickened and immobile in joints demonstrating a capsular pattern of motion restriction.

**Joint Capsule**

- Collagen fibers do not stretch like elastic fibers, but do exhibit a degree of plasticity.
- They tend to deform over time and respond to mobilization that is graded and persistent (as opposed to manipulation).
- Articulating and stretching techniques are most appropriate when confronted with a capsular pattern of hypo-mobility.
Articulating Techniques (Maitland)

Articulations are graded oscillations, used to restore joint play, component motion, or range of motion in a hypo-mobile joint.

Articular Range

The extent of accessory movement from beginning to end of range.

Grades for Normal Range

Grade I Oscillation

- Small amplitude movement – short of resistance (R1)
- Gentle oscillation used for pain relief
- Requires great control to remain within the required small amplitude

Grade II Oscillation

- Large amplitude movement – short of resistance (R1)
- Can occupy any part of the range that is free of any stiffness or spasm
- Never reach into resistance, always resistance-free movements

Grade III Oscillations

- Large amplitude movement to mid-point of resistance (50% of R1 – R2)
- Move from R1 to half way between R1 and R2
Grade IV Oscillations

- Small amplitude movement to the mid-point of resistance—between R1 and R2
- Oscillatory movement often stretching into stiffness or spasm

Grade V Oscillations

- Small amplitude, high velocity thrust at the end of motion—at R2
- Single thrust once patient is correctly positioned—may or may not be an audible associated

Manipulation — Grade V

- Manipulations include the same techniques as articulations but incorporate a high velocity thrust.

  - The thrust is usually a short arc at the end of the available range of motion, i.e at or close to R2.

Application of Mobilization Forces

- Movements are oscillations within the range
- If the oscillations are too fast or too slow it will be impossible to gain any feel of the movement
- The whole body (of the PT) should be used to generate the movement, not just the small muscles of the hands and fingers

Application of Mobilization Forces

- Maximum movement will be produced when the joint to be mobilized is in the mid-position for all other movements
- The therapist’s hands must be relaxed so the ‘feeling’ can be maximized
- Pressure and force should be sufficient to the grade intended

Application of Mobilization Forces

- Pain often limits the therapists’ ability to mobilize in the appropriate direction.
- In these cases, it is desirable to continue in a pain limited or pain free range.
Application of Mobilization Forces

• Occasionally, it may be necessary to mobilize in the direction opposite to what is desired.
• This can lead to appropriate mobilization because of the effect of tractioning the joint followed by relaxation.

Direction of Mobilization Forces

![Correct vs Incorrect Directions of Pressure on Spinous Processes]

Treatment using Mobilization Forces

• Initial sessions should be relatively brief and tolerated well by the patient.
• Initial mobilization should only last 30 secs
• Five to thirty second delays between mobilizations are desirable for relaxation and accommodation.

Rules of Mobilization

• Patient and therapist must relax.
• Keep procedures as pain free as possible.
• Stabilize and mobilize.
• Brief first session, monitor reaction.
• Compare to the "normal" side.
• One joint, one movement at a time.
• Do not mobilize acute, actively inflamed joints.

Contraindications to Mobilization

• **ABSOLUTE**
  - Malignancy involving the spine
  - Cauda equina or spinal cord compression (≥2 levels)
  - Rheumatoid Arthritis (acute inflammatory stage)
  - Active inflammation or infective arthritis
  - Bone disease
  - Fracture
  - Vertebral Artery insufficiency
  - Undiagnosed pain

• **CARE REQUIRED**
  - Presence of Neurological deficit
  - Rheumatoid Arthritis (no inflammation, stable C sp)
  - Osteoporosis
  - Spondylolysthesis
  - Hypermobility
  - Instability
Contraindications to Mobilization

- Pregnancy
- Malignant disease not affecting the spine
- Acute trauma
- Protective spasm
- Gross degenerative changes or foraminal encroachment
- Psychological pain
- Steroid or anticoagulant therapy
- Sever nerve root pain

Contraindications & Limiting Factors

• Malignancy (especially involving the spine)

• Neurological
  • Signs and symptoms of cauda equina & spinal cord compression involvement of more than one nerve root
  • Neurological diseases (i.e. transverse myelitis)

Contraindications & Limiting Factors

• Bone
  • Articular
    • Fracture
    • Spondylolisthesis
    • Gross foraminal encroachment on X-ray
  • Disease
    • Osteoporosis
    • TB
    • Osteomyelitis
    • Paget’s Disease

• General Health

Contraindications & Limiting Factors

• Inflammatory conditions
  • Rheumatoid arthritis (acute inflammatory stage)
  • Active inflammation or infective arthritis
  • Ankylosing Spondylitis
  • Pregnancy
  • Advanced diabetes
  • Hx of steroid use/abuse

• General Health

Contraindications & Limiting Factors

• Pain
  • Psychological
  • Undiagnosed

• Palpation
  • Hypermobility
  • Instability
  • Spasm or lack of relaxation
  • Rubbery resistance

Articular Positions

How Joints Fit Together
Close Packed Position

• The close-packed position is the extreme of one of the most habitual motions of a joint.
• It is the position in which:
  – The concave surface (smaller area) is in complete congruence with the larger, convex surface.
  – The capsule and ligaments are under maximal tension.
  – The joint is minimally distracted when a traction force is applied.

Loose Packed Position

• Any position other than the close packed position is considered to be loose packed.
• Articular surfaces are not in complete congruence
• Some parts of the capsule are lax

General Rules for Articular Positions

• Joint rotation will cause close packed position
• The extremes of all motion tends to be close packed
• Mid-range of motion tends to be loose packed
• There are exceptions to the rules

End Feel Types

• Capsular - stretching leather, gradual increasing resistance
• Ligamentous - (similar to capsular) but harder
• Soft - soft tissue approximation - painless compression of soft tissues

End Feel Types

• Hard - bone on bone - hard, sudden stop
• Spastic - palpable muscular resistance to stretch
• Springy - loose-body blockage
• Empty - patient stops motion before resistance is felt

Somatic Dysfunction

Diagnosing and Treating Peripheral Joints
**Somatic Dysfunction**

- An area of impaired function of related components of the musculoskeletal system (muscle, bone, fascia, ligament) and its associated or related parts of the vascular, lymphatic, and nervous system.

**Components of Somatic Dysfunction**

- Symptoms
- Soft tissue changes
- Changes in function:
  - strength
  - co-ordination
  - mobility (joints, neural, vascular)
  - endurance

**Etiology of Somatic Dysfunction**

- Neurophysiological
- Mechanical
- Combinations

**Assessment of Somatic Dysfunction**

- By integrating data obtained from the subjective examination (base history) and objective (physical examination) assessment of the patient you can assess the effects on other body systems.

**To Relieve Pain**

- Immobilization:
  - General
  - Local
  - Thermo-Hydro-Electric
  - Special Procedures e.g. relaxation techniques, breathing, visual imagery
To Increase Mobility

- Soft Tissue Mobilization:
  - Massage
  - Active relaxation
  - Passive stretch
  - Exercises

To Increase Mobility

- Joint Mobilization:
  - General
  - Specific
  - Thrust
  - Exercises
  - General & Regional Manipulation

To Reduce Mobility

- Supportive and Controlling Procedures
- Exercise

To Inform, Instruct, and Train

- Exercises
- Prophylactic Procedures
- Activities of Daily Living