

School of Medical & Allied Sciences

Course Code : BPTH2003

Course Name: Exercise therapy

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Joint Mobilization

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What is Joint Mobilization?

- “Joint Mobs”
- ***Manual therapy technique***
 - Used to modulate pain
 - Used to increase ROM
 - Used to treat joint dysfunctions that limit ROM by specifically addressing altered joint mechanics
- Factors that may alter joint mechanics:
 - Pain & Muscle guarding
 - Joint hypomobility
 - Joint effusion
 - Contractures or adhesions in the joint capsules or supporting ligaments
 - Malalignment or subluxation of bony surfaces

Terminology

- Mobilization – passive joint movement for increasing ROM or decreasing pain
 - Applied to joints & related soft tissues at varying speeds & amplitudes using physiologic or accessory motions
 - Force is light enough that patient's can stop the movement
- Manipulation – passive joint movement for increasing joint mobility
 - Incorporates a sudden, forceful thrust that is beyond the patient's control

Terminology

- *Self-Mobilization (Automobilization)* – self-stretching techniques that specifically use joint traction or glides that direct the stretch force to the joint capsule
- *Mobilization with Movement (MWM)* – concurrent application of a sustained accessory mobilization applied by a clinician & an active physiologic movement to end range applied by the patient
 - Applied in a pain-free direction

Terminology

- Physiologic Movements – movements done voluntarily
 - Osteokinematics – motions of the bones
- Accessory Movements – movements within the joint & surrounding tissues that are necessary for normal ROM, but can not be voluntarily performed
 - Component motions – motions that accompany active motion, but are not under voluntary control
 - Ex: Upward rotation of scapula & rotation of clavicle that occur with shoulder flexion
 - Joint play – motions that occur within the joint
 - Determined by joint capsule's laxity
 - Can be demonstrated passively, but not performed actively

Terminology

- Arthrokinematics – motions of bone surfaces within the joint
 - 5 motions - Roll, Slide, Spin, Compression, Distraction
- Muscle energy – use an active contraction of deep muscles that attach near the joint & whose line of pull can cause the desired accessory motion
 - Clinician stabilizes segment on which the distal aspect of the muscle attaches; command for an isometric contraction of the muscle is given, which causes the accessory movement of the joint
- Thrust – high-velocity, short-amplitude motion that the patient can not prevent
 - Performed at end of pathologic limit of the joint (snap adhesions, stimulate joint receptors)
 - Techniques that are beyond the scope of our practice!

Terminology

- Concave – hollowed or rounded inward
- Convex – curved or rounded outward

The logo of Galgotias University is a circular emblem with a stylized 'G' shape in the center. The 'G' is composed of several overlapping, curved segments in shades of yellow, orange, and blue. The background of the emblem is a light, warm tone.

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Relationship Between Physiological & Accessory Motion

- Biomechanics of joint motion

- **Physiological motion**

- Result of concentric or eccentric active muscle contractions
- Bones moving about an axis or through flexion, extension, abduction, adduction or rotation

- **Accessory Motion**

- Motion of articular surfaces relative to one another
- Generally associated with physiological movement
- Necessary for full range of physiological motion to occur
- Ligament & joint capsule involvement in motion

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Joint Shapes & Arthrokinematics

- Ovoid – one surface is convex, other surface is concave
 - What is an example of an ovoid joint?
- Sellar (saddle) – one surface is concave in one direction & convex in the other, with the opposing surface convex & concave respectively
 - What is an example of a sellar joint?
- 5 types of joint arthrokinematics
 - Roll
 - Slide
 - Spin
 - Compression
 - Distraction
- 3 components of joint mobilization
 - Roll, Spin, Slide
 - Joint motion usually often involves a combination of rolling, sliding & spinning

Roll



- A series of points on one articulating surface come into contact with a series of points on another surface
 - Rocking chair analogy; ball rolling on ground
 - Example: Femoral condyles rolling on tibial plateau
 - Roll occurs in direction of movement
 - Occurs on incongruent (unequal) surfaces
 - Usually occurs in combination with sliding or spinning

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- Occurs when one bone rotates around a stationary longitudinal mechanical axis
 - Same point on the moving surface creates an arc of a circle as the bone spins
 - Example: Radial head at the humeroradial joint during pronation/supination; shoulder flexion/extension; hip flexion/extension
- Spin does not occur by itself during normal joint motion

Slide



- Specific point on one surface comes into contact with a series of points on another surface
- Surfaces are congruent
- When a passive mobilization technique is applied to produce a slide in the joint – referred to as a **GLIDE**.
- Combined rolling-sliding in a joint
 - The more congruent the surfaces are, the more sliding there is
 - The more incongruent the joint surfaces are, the more rolling there is

• Compression –

- Decrease in space between two joint surfaces
- Adds stability to a joint
- Normal reaction of a joint to muscle contraction

Normal compression occurs in spine and extremities during weight bearing.

Normal intermittent compressive load helps move synovial fluid and thus maintain cartilage health.

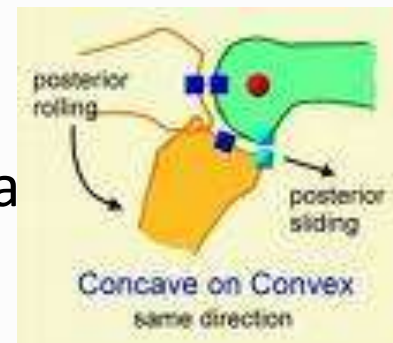
Abnormal high compression loads may lead to articular cartilage changes and deterioration.

• Distraction -

- Two surfaces are pulled apart
- Often used in combination with joint mobilizations to increase stretch of capsule.
- Long axis traction is different form distraction.

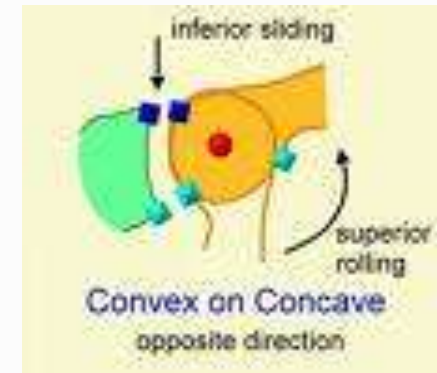
Convex-Concave & Concave-Concave Rule

- Basic application of correct mobilization techniques - ****need to understand this!**
 - Relationship of articulating surfaces associated with sliding/gliding
- One joint surface is **MOBILE** & one is **STABLE**
- **Concave-convex** rule: **concave** joint surfaces slide in the **SAME** direction as the bone movement (**convex** is STABLE)
 - If concave joint is moving on stationary convex surface glide occurs in same direction as roll



Convex-concave rule: **convex** joint surfaces slide in the **OPPOSITE** direction of the bone movement (**concave** is STABLE)

If convex surface is moving on stationary concave surface – gliding occurs in opposite direction to roll



Effects of Joint Mobilization

- **Neurophysiological** effects –
 - Stimulates mechanoreceptors to ↓ pain
 - Affect muscle spasm & muscle guarding – nociceptive stimulation
 - Increase in awareness of position & motion because of afferent nerve impulses
- **Nutritional** effects –
 - Distraction or small gliding movements – cause synovial fluid movement
 - Movement can improve nutrient exchange due to joint swelling & immobilization
- **Mechanical** effects –
 - Improve mobility of hypomobile joints (adhesions & thickened CT from immobilization – loosens)
 - Maintains extensibility & tensile strength of articular tissues
- Cracking noise may sometimes occur

Indications

- **Pain, muscle spasm, muscle guarding**:- these can be treated with joint play techniques to stimulate neurophysiologic and mechanical effects.

Neurophysiologic effects:- small amplitude oscillatory and distraction movements are used to stimulate the mechanoreceptors that may inhibit the transmission of nociceptive stimuli at spinal cord or brain stem levels.

Mechanical effects:- gliding and distraction movements are used to cause synovial fluid motion, which brings nutrition to the avascular portions of articular cartilage, thus preventing from painful and degenerating effects of stasis.

- **Reversible joint hypomobility**:- can be treated with vigorous joint play stretching techniques to elongate the hypomobile capsular and ligamentous connective tissues.
- **Subluxations and positional faults**:- mostly MWM are used to treat such conditions.
- **Progressive limitation**:- diseases which progressively limit the joint play techniques can be treated with joint play tech to maintain available motion or retard progressive mechanical restrictions.
- **Functional immobility**:- when pt cannot functionally move a joint for a period of time the joint can be treated with non stretch gliding or distraction techniques to maintain available joint play and prevent the degenerating and restricting effects of immobility.

Contraindications for Mobilization

- Should not be used haphazardly
- Avoid the following:
 - Inflammatory arthritis
 - Malignancy
 - Tuberculosis
 - Osteoporosis
 - Ligamentous rupture
 - Herniated disks with nerve compression
 - Bone disease
 - Neurological involvement
 - Bone fracture
 - Congenital bone deformities
 - Vascular disorders
 - Joint effusion
 - May use I & II mobilizations to relieve pain

- **hypermobility**- joints of the patient with potential necrosis of ligaments or capsule should not be stretched.

patient with hypermobile joints may benefit from gentle joint play techniques if kept within the limits of motion, no stretching

- **Joint effusion** – there may be swelling from trauma or disease. Rapid swelling- bleeding within the joints.(hemophilia). Medical interventions required for aspiration of blood to minimize necrotizing effect on articular cartilage.

slow swelling usually indicates serous effusion or edema within the joint from mild trauma, irritation or a disease.

- ✓ Gentle oscillation techniques that do not stretch the joint capsule may be used to block transmission of pain stimulus and improve fluid flow while maintaining available joint play.
- ✓ If pain results techniques should not be done.
- ✓ Never stretch a swollen joint with mobilization or passive stretching techniques. The capsule is already on a stretch by being distended to accommodate the extra fluid. The limited motion is from the extra fluid and muscle response to pain, not from shortened fibers.
- **Inflammation** – stretching will increase pain and muscle guarding and will result in greater tissue damage. Gentle oscillation or distraction motion may temporarily inhibit the pain response.

Precautions

- Osteoarthritis
- Pregnancy
- Flu
- Total joint replacement
- Severe scoliosis
- Poor general health
- Patient's inability to relax

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Maitland Joint Mobilization Grading Scale

- Grading based on amplitude of movement & where within available ROM the force is applied.
- **Grade I**
 - **Small amplitude** rhythmic oscillating movement at the **beginning** of range of movement
 - Manage pain and spasm
- **Grade II**
 - **Large amplitude** rhythmic oscillating movement within **midrange** of movement
 - Manage pain and spasm
- Grades I & II – often used before & after treatment with grades III & IV

- **Grade III**

- **Large amplitude** rhythmic oscillating movement **up to point of limitation** (PL) in range of movement
- Used to gain motion within the joint
- Stretches capsule & CT structures

- **Grade IV**

- **Small amplitude** rhythmic oscillating movement at very **end** range of movement
- Used to gain motion within the joint
 - Used when resistance limits movement in absence of pain

- **Grade V** – (thrust technique) - Manipulation

- Small amplitude, quick thrust at end of range
- Accompanied by popping sound (manipulation)
- Requires training

Indications for Mobilization

- Grades I and II - primarily used for **pain**
 - Pain must be treated prior to stiffness
 - Painful conditions can be treated daily
 - Small amplitude oscillations stimulate mechanoreceptors - limit pain perception
- Grades III and IV - primarily used to **increase motion**
 - Stiff or hypomobile joints should be treated 3-4 times per week – alternate with active motion exercises

ALWAYS Examine PRIOR to Treatment

- If limited or painful ROM, examine & decide which tissues are limiting function
 - Determine whether treatment will be directed primarily toward **relieving pain** or **stretching a joint or soft tissue limitation**
 - Quality of pain when testing ROM helps determine stage of recovery & dosage of techniques
- 1) If pain is experienced **BEFORE** tissue limitation, gentle pain-inhibiting joint techniques may be used
 - Stretching under these circumstances is contraindicated
 - 2) If pain is experienced **CONCURRENTLY** with tissue limitation (e.g. pain & limitation that occur when damaged tissue begins to heal) the limitation is treated cautiously – gentle stretching techniques used
 - 3) If pain is experienced **AFTER** tissue limitation is met because of stretching of tight capsular tissue, the joint can be stretched aggressively

- If joint capsule is limiting the range of motion, it responds very well to mobilization techniques if following signs are present:-
 - ✓ Passive ROM is limited in a capsular pattern.
 - ✓ Firm capsular end feel when overpressure applied.
 - ✓ Decreased joint play when mobility test performed

Joint Positions

- **Resting** position
 - Maximum joint play - position in which joint capsule and ligaments are most relaxed
 - Evaluation and treatment position utilized with hypomobile joints
- **Loose-packed** position
 - Articulating surfaces are maximally separated
 - Joint will exhibit greatest amount of joint play
 - Position used for both traction and joint mobilization
- **Close-packed** position
 - Joint surfaces are in maximal contact to each other
- General rule: Extremes of joint motion are close-packed, & midrange positions are loose-packed.

Joint Mobilization Application

- **All** joint mobilizations follow the convex-concave rule
- Patient should be relaxed
- Explain purpose of treatment & sensations to expect to patient
- Evaluate **BEFORE** & **AFTER** treatment
- Stop the treatment if it is too painful for the patient
- Use proper body mechanics
- Use gravity to assist the mobilization technique if possible
- Begin & end treatments with Grade I or II oscillations

Positioning & Stabilization

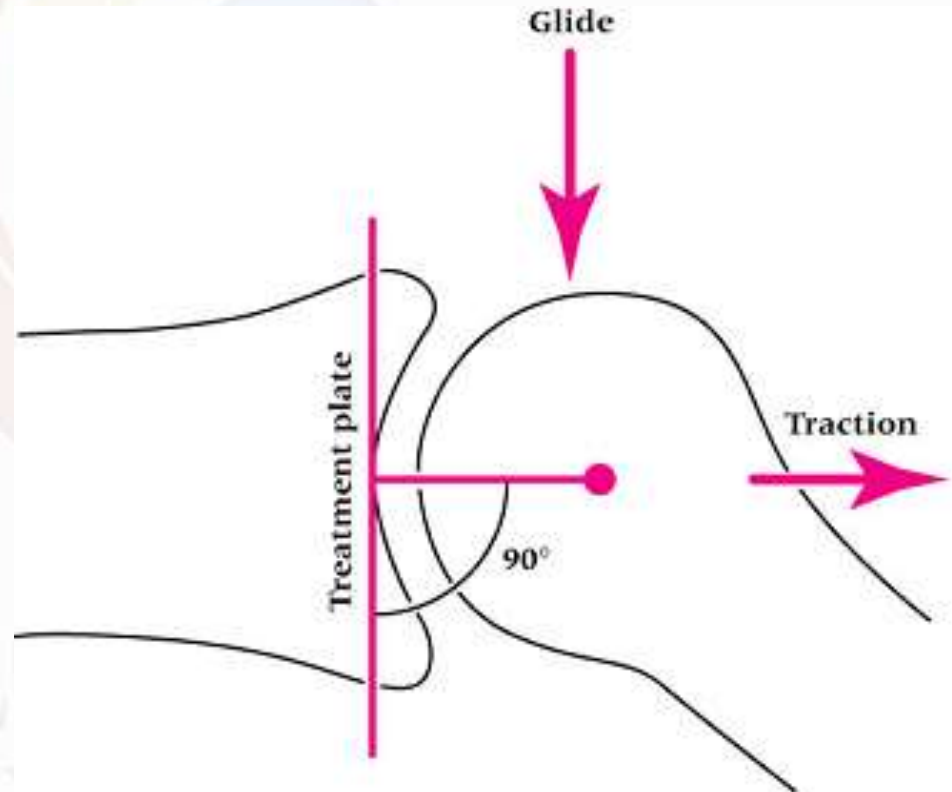
- Patient & extremity should be positioned so that the patient can **RELAX**
- To relax the muscles techniques of inhibition may be appropriately used prior to and in between joint mob
- Initial mobilization is performed in a loose-packed position
 - In some cases, the position to use is the one in which the joint is least painful
- Firmly & comfortably stabilize one joint segment, usually the proximal bone
 - Hand, belt, assistant
 - Prevents unwanted stress & makes the stretch force more specific & effective

Treatment Force & Direction of Movement

- Treatment force is applied as close to the opposing joint surface as possible
 - The larger the contact surface is, the more comfortable the procedure will be (use flat surface of hand vs. thumb)
- Direction of movement during treatment is either PARALLEL or PERPENDICULAR to the treatment plane

Treatment Direction

- Treatment plane lies on the concave articulating surface, perpendicular to a line from the center of the convex articulating surface (Kisner & Colby, p. 226 Fig. 6-11)
- Joint traction techniques are applied perpendicular to the treatment plane
 - Entire bone is moved so that the joint surfaces are separated



- **Gliding techniques are applied parallel to the treatment plane**
 - Glide in the direction in which the slide would normally occur for the desired motion
 - Direction of sliding is easily determined by using the convex-concave rule
 - The entire bone is moved so that there is gliding of one joint surface on the other
 - When using grade III gliding techniques, a grade I distraction should be used
 - If gliding in the restricted direction is too painful, begin gliding mobilizations in the painless direction then progress to gliding in restricted direction when not as painful
- **Reevaluate the joint response the next day or have the patient report at the next visit**
 - If increased pain, reduce amplitude of oscillations
 - If joint is the same or better, perform either of the following:
 - Repeat the same maneuver if goal is to maintain joint play
 - Progress to sustained grade III traction or glides if the goal is to increase joint play

Speed, Rhythm, & Duration of Movements

- Joint mobilization sessions usually involve:
 - 3-6 sets of oscillations
 - Perform 2-3 oscillations per second
 - Lasting 20-60 seconds for tightness
 - Lasting 1-2 minutes for pain 2-3 oscillations per second
- Apply smooth, regular oscillations
- Vary speed of oscillations for different effects
- For painful joints, apply intermittent distraction for 7-10 seconds with a few seconds of rest in between for several cycles
- For restricted joints, apply a minimum of a 6-second stretch force, followed by partial release then repeat with slow, intermittent stretches at 3-4 second intervals

Patient Response

- May cause soreness
- Perform joint mobilizations on alternate days to allow soreness to decrease & tissue healing to occur
- Patient should perform ROM techniques
- Patient's joint & ROM should be reassessed after treatment, & again before the next treatment
- Pain is always the guide

Joint Traction Techniques

- Technique involving pulling one articulating surface away from another – creating separation
- Performed perpendicular to treatment plane
- Used to decrease pain or reduce joint hypomobility
- Kaltenborn classification system
 - Combines traction and mobilization
 - Joint looseness = slack

Kaltenborn Traction Grading

- **Grade I (loosen)**
 - Neutralizes pressure in joint without actual surface separation
 - Produce pain relief by reducing compressive forces
- **Grade II (tighten or take up slack)**
 - Separates articulating surfaces, taking up slack or eliminating play within joint capsule
 - Used initially to determine joint sensitivity
- **Grade III (stretch)**
 - Involves stretching of soft tissue surrounding joint
 - Increase mobility in hypomobile joint

- Grade I traction should be used initially to reduce chance of painful reaction
- 10 second intermittent grade I & II traction can be used
- Distracting joint surface up to a grade III & releasing allows for return to resting position
- Grade III traction should be used in conjunction with mobilization glides for hypomobile joints
 - Application of grade III traction (loose-pack position)
 - Grade III and IV oscillations within pain limitation to decrease hypomobility

Initial treatment sustained grade II jt traction in R.P.

or

Increase pain

same or better

Grade 1 oscillations
To control pain

or

Grade 2 oscillations

sustained grade 2
traction or glide
in R.P. to maintain
joint play

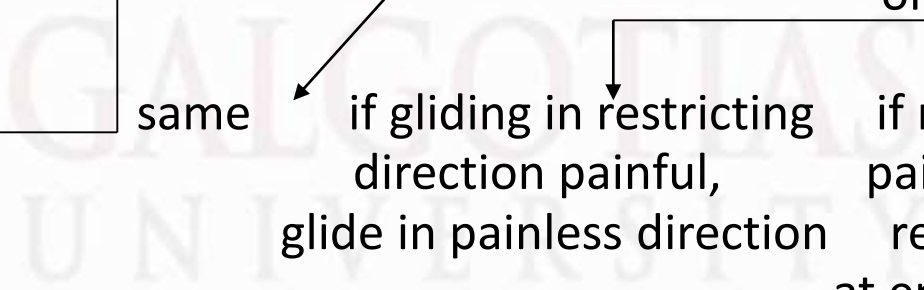
sustained grade 3
tech to increase
joint play

same

if gliding in restricting
direction painful,
glide in painless direction

if restricted w/o
pain glide in
restricted direction
at end of
available range

or



References

- M. Dena Gardiner. Principles of Exercise Therapy 4th edition, , CBS Publishers & Distributors Pvt Ltd, 2005, ISBN: 978-8123908939
- Margaret Hollis & Phyl Fletcher Cooks. Practical Exercise Therapy 4th edition, Wiley Publishers, 1999, ISBN: 9780632049738
- Carolyn Kisner, Lynn Allen Colby. Therapeutic Exercise: Foundations and Techniques 6th edition, F.A. Davis Company, 2012, ISBN: 978-0803625747
- Pamela K Levangie, Cynthia C Norkins. Joint Structure and Function: A Comprehensive Analysis 5th edition, , F. A. Davis Company, 2010, ISBN: 978-0803623620
- Textbook of Therapeutic Exercises by Narayanan S Lakshmi, Jaypee Brothers 1st Edition, ISBN:9788180614699
- <http://www.pt.ntu.edu.tw/hmchai/Kinesiology/KINmotion/JointStructureAndFunction.files/ConvexOnConcave.jpg>