SPINAL JOINT MOBILIZATION

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Effects of Mobilization

**Neurophysiological effects:**

- Restoration of neurodynamics
- Stimulates mechanoreceptors
- Decrease muscle spasm & muscle guarding
- Increase in awareness of position & motion because of afferent nerve impulses
- Correction of positional faults
- Relaxation
- Decrease pain
- Decrease stiffness in joints as well as soft tissues
**Nutritional effects:**

- Distraction or small gliding movements – cause synovial fluid movement
- Movement can improve nutrient exchange
- Improve blood flow
- *Help normalize joint fluid viscosities that interfere with movement.*
**Mechanical effects:**

- Improve mobility of hypomobile joints
- Lengthening of shortened muscle connective tissues.
- Restoration of accessory movements
- Breaking of adhesions
- Maintains extensibility & tensile strength of the tissues
- Improve flexibility

Cracking noise may sometimes occur.
Goals of joint mobilization

1. Pain-relief mobilization
   - To ease severe pain, spasm, and paraesthesia,
   - to help normalize joint fluid viscosities that interfere with movement.

2. Relaxation mobilization
   - To relax muscles, decrease pain and facilitate movement ease.

3. Stretch mobilization and manipulation (quick mobilization)
   - To stretch shortened joint tissues,
   - increase movement range
   - correct positional faults.
Joint mobilization

1. Pain-relief mobilization
   - Grade I - II in the (actual) joint resting position

2. Relaxation mobilization
   - Grade I - II in the joint (actual) resting position

3. Stretch mobilization
   - Grade III in the joint (actual) resting position
   - Grade III at the point of restriction

4. Manipulation – Grade III,
   - high velocity, short amplitude, low force traction manipulation in the (actual) resting position.
Pain-relief mobilization

- severe pain or other symptoms (e.g., spasm, paraesthesia) such that
  - the biomechanical status of the joint cannot be confirmed
  - or that Grade III stretching techniques cannot be tolerated,

- direct treatment toward symptom control.

- Symptom-control treatment should be applied only in the Slack Zone of the Grade I - II range.
Grade I and II Slack Zone mobilizations,
- particularly intermittent traction movements,
- also help to normalize joint fluid viscosities
- thus improve joint movement

when movement is restricted by joint fluids rather than by shortened periarticular tissues.
Pain-relief traction mobilization (Grade I - IISZ)

- Intermittent Grade I and II traction-mobilizations in the Slack Zone, applied in the resting position or actual resting position (i.e., three-dimensional positioned traction),
  - is the initial trial treatment of choice for symptom control.
- As soon as decreased symptoms allow the patient to tolerate full biomechanical testing with end-feel assessment, then focus of treatment can shift to the appropriate mobilization for
  - Hypomobility
  - or stabilization for hypermobility.
Vibrations and oscillations

- Short amplitude, oscillatory joint movements other than traction are also used for the treatment of pain.
- Vibrations and oscillations applied in the Grade I, II SZ
  - usually applied manually, but the use of mechanical devices such as vibrators
  - decrease pain and muscle spasm, therefore improving mobility without stretching tissues.
- Vibrations and oscillations can also be applied in the Grade II, II, and III range, interspersed with stretch mobilizations, to minimize discomfort.
Relaxation mobilizations differ from pain-relief mobilizations in that they can be applied anywhere in the Grade I-II range,

- including both the Slack Zone and Transition Zone.
- used to decrease pain and relax muscles.

- Relaxation mobilizations should not produce or increase pain.
- Use them in cases where joint movement is limited by muscle spasm rather than by shortened tissues.

- Relaxation mobilizations are also useful as preparation for more intensive treatments (for example, a Grade III stretch mobilization) which can be more effective when the patient's muscles are fully relaxed.
Relaxation-tra
cction mobilization

Grade I - II

- Apply intermittent traction-mobilizations in the actual joint resting position within the Grade I or II range, including the Transition Zone.
  - Slowly distract the joint surfaces, then slowly release until the joint returns to the starting position.
  - Rest the joint a few seconds in the starting position before you repeat the procedure.
  - Between each traction movement, readjust three-dimensional positioning (the actual resting position) of the involved joint as joint tissue response allows.
- You may need to interrupt the traction procedure and reposition the joint in different dimensions until the new actual resting position is found and repeated traction relieves symptoms.

- **There should be a natural progression in joint position toward the resting position of the joint.**

  - Avoid tissue stretching, stay well within the Grade I and II range
  - Do not mobilize into the Grade III range where tissue stretching occurs.
Subtly and continuously modify

- joint positioning,
- mobilization forces,
- rhythm
- amplitude of the traction procedure

Based on the patient’s response to treatment.

Evaluate the effect of these carefully graded traction forces.

Observe an immediate improvement in signs and symptoms if your treatment approach is correct.
Stretch mobilization

Grade III

- Grade III stretch mobilizations are one of the most effective means for restoring normal joint play.
- Stretching shortened connective tissues in muscles, joint capsules and ligaments
  - can increase and maintain mobility
  - delay progressive stiffness and loss of range of movement in chronic musculoskeletal disorders.

- Hypomobility presenting with a hard end-feel is characteristic of a bony limitation and should not be stretched.
Restricted range of movement presenting with a normal end-feel is a normal anatomical variation, so rarely symptomatic, and is not stretched as a primary treatment.

However, such "normal" joints may be stretched in order to release stress to a vulnerable neighboring hypermobile joint.
¢ Sustain a stretch mobilization for a
  ➢ **minimum of seven seconds, up to a minute or longer, as long as the patient can comfortably tolerate the stretch.**
  ➢ In viscoelastic structures, the longer a stretch is sustained the greater and more lasting the mobility gain.
  ➢ **apply at least 30 to 40 seconds of stretch with the assistance of a mobilization belt in the larger joints.**
¢ **For greatest effect, continue the treatment for 10-15 minutes in a cyclic manner.**
  ‧ Fixation of one joint partner is absolutely essential for an effective stretch mobilization.
• It is not necessary to release the joint completely between stretch mobilizations.

➢ A return to the end of the Grade II range, just easing off the stretch into the Transition Zone, is adequate before repeating the process.

□ Normally **the time a stretch is sustained is more critical than the amount of force** used.

• **Poor gains in range are more commonly due to insufficient duration of stretch, rather than insufficient force.**
However, you must apply enough force to stretch the shortened tissue.

To determine the most effective amount of force to use, begin with forces approaching, but not exceeding,

In some larger joints, for example, shoulder, elbow, hip and knee joints, lumbar spine,

the force of Grade III stretch traction mobilizations can be significant.
Grade III stretch mobilizations should not

- produce or increase the patient's dominant symptoms (chief complaint).

However, a sensation of stretching in the form of slight local discomfort is a normal response to stretch-mobilization.

- A Grade III stretch mobilization should be discontinued if it produces
  - Protective muscle spasm,
  - severe pain,
  - or symptoms at locations other than the site being treated.

Such a response to treatment suggests the need to

- reposition the joint,
- alter the intensity
- or direction of treatment,

- or discontinue stretch-mobilization treatment.
Preparation for stretch mobilization

- Soft tissue dysfunction can alter joint movement and decrease the effectiveness of joint stretch-mobilizations.
- That is why treatment often begins with procedures to:
  - decrease pain
  - muscle spasm
  - or increase soft tissue mobility.
- These adjunct procedures may also make the joint mobilization easier to perform and produce a longer lasting effect.
Warming the tissues

- Treatment to improve circulation and thereby elevate soft tissue temperatures is useful preparation for Grade III stretch mobilizations.

- Warming tissues surrounding the joint prior to Grade III mobilizations makes them easier to stretch.

Effective warming can be achieved by

- surface heat application
- deep heat application (e.g., ultrasound, diathermy).

However, the most effective way to "warm-up" tissues is with exercise.
Cooling tissues after stretch mobilization treatment often helps preserve mobility gains for a longer period of time.

- do not recommend cold application prior to or during stretch technique,
- since cooled tissues can be more easily injured from overstretching.

So cold should be applied after mobilization procedure.
Progression of stretch-mobilization treatments

- One of the most frequently asked questions, and also hardest to answer is, "How much treatment is enough?"
  
  The easiest answer is
  
  "As much as necessary and as little as possible."

- I therefore provide the following general guidelines which are both conservative and safe.

- With experience, the nuances of clinical decision-making will become more apparent and you will find answers to these difficult questions.
If reassessment reveals

- increased range of movement
- or normalization of end-feel
- and decreased symptoms,

then Grade III stretch-mobilization treatment may continue.

- If there is marked improvement in one treatment session, it is wise to discontinue additional treatments that day.

- Chronic cases and significant hypomobilities may require several treatment sessions before a change is apparent.
If reassessment indicates

- no change in mobility
- or symptoms,

- **reevaluate**
- joint positioning
- time and force and direction of treatment

or reconsider whether mobilization is indicated at all,

- perhaps by referring the patient for further medical diagnostic evaluation.
Discontinuation

- Discontinue stretch mobilization when gains in the patient's symptoms and range of movement plateau and the patient can perform active movement throughout this range.
It is important to stretch a joint in all restricted directions in which the joint would normally move.

However, some stretch mobilizations into some movement patterns and directions are safer, while other stretch mobilizations have greater risk of patient injury so must be applied with skill and caution.
In addition, a joint can be restricted in one direction (e.g., flexion) and hypermobile in another direction (e.g., extension).

In this case mobilization may be indicated for the restricted flexion and contraindicated for the hypermobile extension.
Novice practitioners should begin stretch mobilization treatments with a sustained traction mobilization pre-positioned in the resting position (or actual resting position)

- progressively re-position nearer and nearer to the point of restriction, as tissue response tolerates and allows.

□ If the mobility gains produced by stretch-tract mobilization plateau,

- the practitioner may progress to

✓ stretch-glide mobilizations,

first with the joint pre-positioned in the resting position, then progressing toward the point of restriction, just as for stretch-tract mobilization treatment.
Stretch mobilization is more effective and better controlled when joint stretching is carefully timed to occur during periods of maximum muscle relaxation. Reflex inhibition relaxation techniques such as PNF contract-relax, hold-relax techniques, (i.e., active relaxation, post-isometric relaxation) contraction of antagonists (i.e., reciprocal inhibition) can be very effective.
Stretch-traction mobilization

Grade III

- A series of sustained Grade III stretch traction mobilizations recommended for joint hypomobility.
- Apply stretch-traction mobilization at a right angle to the treatment plane.
- The orientation of the treatment plane in a vertebral segment is determined by the orientation of the caudal surface of the cranial vertebra in the disc joint.
In stretch traction techniques where the caudal vertebra is stabilized,
- the spacial orientation of the treatment plane changes each time the cranial vertebra assumes a new three-dimensional position.
- This is often the case with cervical and thoracic traction techniques.
- Whether the cranial vertebra is pre-positioned in the actual resting position or at the point of restriction, the spacial orientation of the treatment plane follows the new position of the cranial vertebra, and the angle of the traction forces changes accordingly.
Figure 2.8a
CONVEX RULE → OPPOSITE
The occiput moves according to the convex rule in relationship to the atlas.

Figure 2.8b
CONCAVE RULE → SAME
Cervical vertebrae below C2 move according to the concave rule.
Figure 5.1

Interaction at a right angle to the treatment plane.
Vertebrae labelled with an "x" are stabilized.

a

b

Note in Figure 5.1a, you can alternatively fixate the concave joint partner and mobilize the convex joint partner.
If the traction force is applied to the caudal vertebra in a segment, the spacial orientation of the treatment plane does not change (Figure 5.lc).

- This is usually the case with lumbar traction techniques.

- While the sacrum or the caudal vertebra in the segment is pre-positioned, the stabilized cranial vertebra remains stationary, as does the treatment plane.

- The direction of the traction force always remains at a right angle to the stationary treatment plane, independent of the position of the caudal joint partner (Figure 5.lc).
Grade III traction mobilization in the (actual) resting position

- can stretch any soft tissue that crosses the joint and limits joint movement, including
  - muscle connective tissues,
  - joint capsules
  - ligaments.
- As a trial treatment, apply about ten stretch-traction mobilizations.
- If reassessment reveals improvement, continue with this and progress toward the true resting position.
- Progress the stretch-traction mobilization in nonresting positions as improvement allows.
Grade III traction mobilization at the point of restriction

- is applied with the joint pre-positioned near the limit of range in the restricted movement direction.
  - This maneuver will increase joint mobility primarily in the pre-positioned direction. For example,
  - to increase a flexion restriction, pre-position the joint at the limit of the flexion range and apply the stretch-traction mobilization in that position.
Skilled practitioners pre-position and stretch in more than one dimension, for example, in flexion with abduction (bi-axial joint) or flexion with abduction and external rotation (tri-axial joint).

- Progress the stretch-traction mobilization further into the restriction as improvement allows.
- Treatment is often successful with skillful pre-positioning at the point of restriction combined with stretch-traction mobilization alone.

However, in some cases, especially to treat the last degrees of restriction, it can be necessary to use stretch-glide mobilization as well.
Grade III Stretch-glide mobilization

- Stretch-glide mobilization directly stretches the tissues restricting joint movement.
- Progress to Grade III stretch-glide mobilizations if and when stretch-traction mobilizations no longer produce adequate mobility gains. (e.g., the last degree of restriction),
- or to re-position a positional fault.
Glide-mobilizations produce some intra-articular compression,

To facilitate the glide mobilization and reduce these compressive forces acting on the joint, combine it with a Grade I traction movement.

In joints with advanced degenerative changes, or which are painful when compressed, it may be necessary to use additional traction force or less gliding force in order to avoid pain during treatment.

In cases where joint compression testing produces nerve root symptoms, stretch glide mobilization is contraindicated.
Progress joint pre-positioning in the same way as for stretch traction mobilization.

- Start in the actual resting position,
- progress toward the true resting position,
- gradually re-position the joint nearer and nearer to the point of restriction, as improvement allows.

For best effect when the joint is pre-positioned at the movement limit, ease off the limit a little before applying the stretch-glide mobilization.
- Apply vertebral stretch-glide mobilizations parallel to the treatment plane in the joint.

- Remember that the spatial orientation of the treatment plane follows the orientation of the cranial vertebra in the segment.

- When applying glide-mobilization to the cranial vertebra in the segment,
  - the treatment plane and treatment direction changes to follow the pre-positioning orientation of the cranial vertebra.
When applying glide-mobilization to the caudal vertebra in the segment,

- the treatment plane remains stationary,
- so the direction of the glide force does not change regardless of the pre-positioning orientation of the caudal vertebra.

The most effective stretch-glide mobilizations move a joint in the direction of most restricted gliding.

- However, if performed with poor technique
- or with excessive force they can injure sensitive joint structures.
Stretch-glide mobilization in a severely restricted gliding direction may produce joint compression and be too painful for a patient to tolerate.

In this case, return to Grade III stretch-traction mobilizations carefully applied in less restricted and less symptomatic positions.

Once mobility status improves to a slight hypomobility, progress again to specific

Grade III stretch-glide mobilization in the most restricted gliding direction.
Manipulation

Thrust is a high-velocity, short-amplitude motion motion such that the patient cannot prevent the motion.

☐ The motion is performed at the end of the pathological limit of the joint and is intended

➢ to alter positional relationships,
➢ snap adhesions,
➢ to stimulate joint receptors.

◆ Pathological limit means the end of the available ROM when there is restriction.
Afferent nerve impulses from joint receptors transmit information to the central nervous system so provide awareness of position and motion.

With injury or joint degeneration,

there is a potential decrease in an important source of proprioceptive feedback that may affect an individual’s balance response.

Joint motion provides sensory input
Receptors Types

Static position and sense of speed of movement
- type I receptors found in the superficial joint capsule

Change of speed of movement
- type II receptors found in deep layers of the joint capsule and articular fat pads

Sense of direction of movement
- type I and III receptors; type III found in joint ligaments

Regulation of muscle tone
- type I, II, and III receptors

Nociceptive stimuli
- type IV receptors found in the fibrous capsule, ligaments, articular fat pads, periosteum, and walls of blood vessels
Manipulation under anesthesia is a medical procedure used to restore full ROM by breaking adhesions around a joint while the patient is anesthetized.

- The technique may be a rapid thrust or a passive stretch using physiological or accessory movements.
Manipulation also carries risk of serious injury. OMT practitioners must understand the indications and contraindications to manipulation in order to prevent patient injury.
Manipulation technique

- In an attempt to reduce the risks inherent in manipulation, we have worked for many years to perfect techniques which use a translatory linear traction-thrust, rather than a rotatory-thrust.
- A linear thrust is technically more difficult to perform than a rotatory thrust, however it is far safer and just as effective.
- Risks to the patient increase with rotatory manipulation, especially in the craniovertebral region.
- Our linear thrust techniques are primarily applied as traction, however some are applied in a gliding direction.
We no longer teach rotatory manipulation techniques either for the extremity joints (since 1979) or for the spine (since 1991).

We practice manipulation as a high velocity, small amplitude, linear movement in the actual resting position, applied with a quick impulse ("thrust") to a joint showing a suitable end-feel, to effect joint separation and restore translatory glide.
A common misconception is that manipulation is a continuation of a stretch-mobilization.

It is true that the practitioner first confirms that the patient can safely tolerate a low-force manipulation by applying a brief Grade III stretch-mobilization.

After this stretch-mobilization "screening test" the stretch is released into the Grade II range before taking up the slack again, this time tightening the tissues through the Transition Zone into the Grade III range and immediately applying the low-force thrust at the point of the actual pathological stop.

- recognize the risks inherent in rotation manipulations, especially in the cranio-vertebral region,
- They recommend manipulative techniques which "eliminate rotary stresses and emphasize glide and distraction movements."
If a gentle, low-force manipulation is not successful, practitioners should not use more force, but rather return to relaxation or stretch mobilizations until the joint state is amenable to a low force manipulation.
Manipulation education

- Many manipulation techniques, including most spinal manipulations, are advanced and should be used only by those with long-term training and clinical supervision.

- IFOMT guidelines recommend a specific sequence of education that begins with
  - extremity joint mobilization
  - progresses to extremity joint manipulation, before the practitioner begins to learn spinal manipulation.
If traction treatment exacerbates symptoms

It is rare for traction to increase a patient's symptoms.

- If it does, you should:
  - Adjust joint positioning.
  - Continuously monitor changes in the actual resting position and adjust the joint's three dimensional positioning as needed.

- Alter traction force.
  - Early in the healing process a patient may tolerate only minimal forces.
Correct an underlying positional fault

It is a condition in which joint partners are in an abnormal position, most often involving a hypermobile joint stuck in an unusual joint position.

- minor positional faults often correct with a Grade II traction mobilization,
- strongly fixated positional faults may first need correction with a Grade III stretch glide-mobilization or manipulation.

- A positional fault can occur in both hypomobile and hypermobile joints.
Discontinue traction treatment.

In some cases, for instance

- with certain acute soft tissue lesions (e.g., ligamentous strain), traction treatment may be contraindicated along with any form of stretch to the injured fibers.

  - In this case, treatment is postponed until some healing occurs.

- Stretch traction treatment may also be contraindicated in cases where symptoms are produced in an adjacent hypermobile joint which cannot be adequately locked to prevent pain during treatment.
Avoiding high-risk manual treatment

Rotation mobilization

- Avoid general rotation joint mobilizations. These techniques for the spine (mobilization around the longitudinal axis) can be effective in some cases.
- In elderly patients with lumbar facet joint arthrosis, they can also be very dangerous.
- Because general rotational mobilizations offer the promise of quick results and are relatively easy to perform, they are often misused by novice practitioners.
Rotational techniques should not be used if there is any suspicion or history of

- disc involvement,
- vertebral artery involvement,
- irritation of nerve structures.

In these cases, even techniques that produce a lesser vertebral rotation (e.g., muscle stretching techniques)

- can produce damaging compression forces.
The safest way to increase spinal joint rotation range, is to use

- a Grade III stretch-traction mobilization in conjunction with specific three-dimensional positioning.

- Pre-position the specific spinal joint at the point of its restricted rotation, and then apply a Grade III traction mobilization at a right angle to the joint treatment plane.

- Admittedly, the skilled application of

- three-dimensional stretch-traction mobilization is technically more difficult to apply than a general rotational mobilization,

- but it is safer and, in skilled hands, just as effective.
Joint compression

- Avoid joint compression techniques, as they can too easily aggravate a joint condition.
- Techniques that produce indirect compression in the joint should also be used but with caution,
- particularly in cases where compression tests are symptomatic.

- While some practitioners believe that passive manual joint compression can stimulate
  - cartilage nutrition
  - regeneration
  so apply it for that purpose, particularly in certain extremity joints.
Little is known about the physiological effects of manual joint compression treatment or whether an interspersed traction component is essential for its efficacy.

- Critical to the maintenance of articular cartilage is its fluid supply of nutrients by diffusion.
- This fluid nutrient transfer is facilitated by changes in joint loading which create pressure changes.
- Therefore, it has been hypothesized that compression may be a useful joint mobilization technique.
Following the same logic, and based on my nearly 60 years of clinical experience, I believe our intermittent traction approach may also provide the necessary pressure changes to facilitate articular cartilage nutrition.
Rolling, gliding, and compression are physiological stresses joints experience with normal movement.

In fact, these stresses are necessary for the maintenance of articular cartilage.

When there is an imbalance of rolling, gliding and compression,

joints begin to show the effects of wear and tear, marking the onset of degenerative joint disease (DJD).
For example, too much compression may occur with excessive running or jumping activities which can lead to DJD.

On the other hand, not enough stress to the joint, as with prolonged immobilization in a cast or bed rest, can also lead to degenerative joint disease.
Common sites of DJS

- knees
- hips
- cervical spine (Intervertebral discs & Apophyseal joints)
- lumber spine (Intervertebral discs & Apophyseal joints)
- DIP (Heberden’s nodes)
- PIP (Bouchard’s nodes)
- 1st CMC joint of hands
- 1st MTP joints in feet - Hallux Valgus
If joint compression occurs during a patient's treatment program, the amount of load-bearing is increased gradually and monitored closely to avoid pain.

- Therapists use standard protocols for graduated return to full weight-bearing in the lower extremity joints.

The progression usually begins with

- toe-touch weight bearing using two crutches
- progresses to one crutch,
- then a cane,
- and eventually full weight-bearing.
Another common progression starts with

- active assisted movement,
- then active movement,
- and finally resisted movement.

These progressions represent a kind of graduated compression therapy which the patient controls based on their tolerance to the activity.

Premature load-bearing treatment can lead to joint swelling and additional injury to the patient.
Many daily activities produce joint compression and can aggravate a patient's symptoms. For example, side lying induces significant compression both through the shoulder girdle joint complex, in the cervical and upper thoracic spine, and in the hip joint.

Management of this patient would likely include instruction in how to position pillows under the neck to reduce shoulder and spinal compression during side lying sleep.

Management of this patient would also likely avoid additional joint compression during manual treatment.
Be aware that our gliding techniques often also have a compression effect, especially at the end range of motion.

- If a glide-mobilization technique is painful, increase its traction component.
- If, with increased traction, the glide mobilization procedure continues to be painful, discontinue this technique.

- If joint compression tests are symptomatic, it makes little sense to use joint compression as treatment.