Passive Intervertebral Mobilization

Terry Rose DPT, FAAOMPT, Cert, MDT

Guide to Physical Therapy Practice
Section 4D-Impairment/Connective Tissue Dysfunction
Section 4E,4F,4G,4H,4I,4J Impaired Joint Mobility & Impaired Motor Function
Reliability Challenged


- 18 subjects and 6 orthopedic physical therapists evaluated the posterior-anterior (P-A) accessory motion mobility at each of six levels, L-1 to the sacral base, on each subject.

- The mobility was recorded on a nine-point scale, and reproduction of pain was noted.

- Poor interrater reliability of P-A accessory mobility testing R=.25
Reliability Maitlands Grading System Challenged


- explored the intra-rater reliability of applying grades I-IV mobilizations, defined by the detection of resistance, on the L3 vertebra.

- Thirty experienced physiotherapists were recruited and applied intra-day and inter-day force applications.

- The results showed highly variable forces, particularly for grade I and II mobilizations, which on intra-day testing varied by 63 and 44%, and on inter-day testing varied by 114 and 94%
• In numerous studies, the reliability of clinicians performing the four grades of mobilization of manual therapy has been poor.

• The results identified that the independent variables of age, years of experience, gender, frequency of use, education, and background of the rater did not contribute to the overall variance within the study.

• Further investigation is required as to what determines the poor inter-rater reliability of spinal accessory mobilizations by practicing clinicians.

• The validity of Maitland's grading system as a tool for measurement and replication between physiotherapists is challenged.
Then How Can We Use PIVM for Assessment?


- Intervention: Seventy patients were randomized to an intervention involving manipulation and 61 to a stabilization exercise intervention.
Participants: Patients with, mean age 33yo and a median symptom duration of 27 days.

Patients completed a baseline examination, including PA mobility testing, and were categorized with respect to both hypomobility and hypermobility (present or absent), and treated for 4 weeks.

Intervention: Seventy patients were randomized to an intervention involving manipulation and 61 to a stabilization exercise intervention.
Use Hypo or Hypermobile, Painful or Non-Painful

• Results: Ninety-three (71.0%) patients were judged to have hypomobility present and 15 (11.5%) were judged with hypermobility present.

• For patients with hypomobility, failure rates were 26% with manipulation and 74.4% with stabilization.

• For patients with hypermobility, failure rates were 83.3% and 22.2% for manipulation and stabilization, respectively.

• Conclusions: Patients with LBP judged to have lumbar hypomobility experienced greater benefit from an intervention including manipulation; those judged to have hypermobility were more likely to benefit from a stabilization exercise program.
Contraindications/Precautions to Vertebral Mobilization

• Neurological:
  • Patient with arm pain and neurological signs, from two nerve routes

• Disturbance of bladder and bowel function, or perineal anaesthesia

• Spinal cord symptoms

• Radiological changes:
  • Patients with rheumatoid arthritis and osteoporosis are contraindications to forceful mobilizations.

• Any pathology leading to significant bone weakening such as tumours, infections, long-term corticosteroid medication, fracture
Contraindications/Precautions to Vertebral Mobilization

- Patients with vertigo need close supervision

- Hypermobility:
  - If a vertebra in the spine was hypermobile compared to the other vertebra, care must be taken to avoid putting excessive strain on the hypermobile joint

- Vascular
  - Aortic aneurysm, bleeding into joints, e.g. severe Hemophilia

- Pregnancy

- Musculoskeletal deformity

- Spondylolysis, spondylolisthesis
What Maitland force grade for assessment?

- I A small-amplitude movement near the starting position of the range

- II A large-amplitude of movement that carries well into the range. It can occupy any part of the range that is free of any stiffness or muscle spasm that does move into stiffness or muscle spasm

- III Also a large-amplitude movement, but one that does move into stiffness or muscle spasm

- IV A small-amplitude movement stretching into stiffness or muscle spasm
1. First Law / Neutral Mechanics

• When the spine is in neutral, sidebending to one side will be accompanied by horizontal rotation to the opposite side.

• Dr. Fryette in 1918

• Which direction does spinous process move?
2. Second Law / Non – Neutral Mechanics

• When the spine is in a flexed or extended position (non-neutral), sidebending to one side will be accompanied by rotation to the same side.

• Dr. Fryette in 1918

• Which direction does spinous process move?
3. Third Law

• When motion is introduced in one plane it will modify (reduce) motion in the other two planes.

• The third principle sums up the other two laws by stating dysfunction in one plane will negatively affect all other planes of motion.

• C.R. Nelson, D.O in 1948

• When do we use this type of mechanics?
Treatment of Stiffness

• First, assess the patients movement that has limited ROM

• Then Staccato abrupt Oscillatory techniques are used to move a stiff joint through its maximum range before the adjacent segments can move
Painful movement limitations

• The joint being treated should be positioned in a symptom free way

• oscillations in mobilization should be applied smoothly and even

• so that changes between the on and off pressure cannot be detected
Accessory Movements

• Pressure is applied through the thumb or pisiform

• The amplitude of the movement should be as large as possible without causing any pain.

• As symptoms improve, then the amplitude of the movements can increase gradually
Central Posterior to Anterior Mobilization CPA

- Shum, G.L., Archive of Physical Medicine and Rehabilitation, 2012.11.020

- evidence suggests immediate pain relief following treatment, and an increased (ROM) of lumbar extension
Linked Potential mechanisms of this neurophysiological effect

• Pain gating - c afferent nociceptive override at the spinal cord

• Descending Pathways - activation of pain inhibitory pathways that originate in the midbrain and travel down the spinal cord - the descending pathways

• Adaptations - a decrease in the level of neural input from the painful site

• Creep - improving soft tissue elongation and thus ROM in the short term

• Anti-inflammatory response - through sympathetic ANS stimulation
Direction

• PA mobilization promotes extension

• During flexion, the superior vertebral body and its inferior facet joints move relatively anteriorly and superiorly on the inferior vertebral body and its superior facet joints.

• PA mobilization on the segment above promotes flexion
Passive Accessory Intervertebral Mobilization Principals

Pt slides toward side of PT

Straight Arms and produce force with body

For Testing do 2-3 times per motion segment grade 3-4

For treatment (Maitland) 8-10 reps of 20-30 second oscillations at desired grade per segment

(MDT) grade 2 pause, into gr 3 pause, then into gr 4 pause at hypomobile segment 8-10 reps
PAIVM Posterior to Anterior Mobilization

Pisiforms on transverse processes of the same vertebral level

Hands at 90 degrees

apply force through straight arms assess each segments mobility

Assess for patients mobility and concordant sign
Central Vertebral Pressure (CVP) for Extension

With Golf Grip Interlace 5th and 2nd fingers

Pisiforms or thumbs on Spinous Process

Apply posterior to anterior force through straight arms

Asses segmental mobility and for concordant sign
Unilateral PA (UPA) for Rotation and Side Bending
Vertebral Pressure (TVP) for rotation and side bending - thumb over thumb on spinous process
Treatment Mobilization with Prepositioning

**UPA** with Side Bending

**UPA** with flexion Ipsilateral Leg Straight
MDT Lumbar PA Glide In Extension mobilization at the segment producing the best symptomatic response
Passive Range of Physiological Movements of Single Intervertebral Segments

PPIVMs
PPIVMs

- examination movements are performed at a slower speed than treatment
- are taken to the end of the available range
- then overpressure is applied to assess end feel
- to use for treatment stabilize one (superior) vertebral segment to create gr1-4 mobilization force at the (inferior) hypomobile level
Physiological Movements

• Any movements should be in the painless direction, in a large, slow, smooth manner, stopping before the onset of any discomfort.

• As the patient’s symptoms and ROM improve, the technique can be taken into a controlled degree of discomfort.
Motion Palpation

Place one fingertip between each spinous process in interspinous space
PPIVM Rotation

Lacing the arm through the elbow

Palpate underneath spinous process

Rotate the torso posteriorly assessing segmental rotation mobility from L1-2 downward to L5-S1
T11-S1 Flexion/Extension

- Pt side laying with hips and knees in a flexed position allowing a neutral spinal posture
- Use pillow to prevent lateral flexion with large hips
- PT facing Pt with thighs resting on PTs thighs, PTs caudal hand around thighs
- PT uses ribs and forearm to stabilize the pts thorax thigh and runs forearm down the spine
- PTs pad of middle finger is placed in the interspinous space at the level to be assessed
PPIVM Flexion

feel the spinal motion segment mobility at each level as you move the legs one segment at a time anteriorly working from L5-S1 segmentally to L1-2
PPIVM Extension

feel the spinal motion segment mobility at each level

as you move the legs one segment at a time posteriorly

working from L5-S1 segmentally to L1-2
PPIVM Flexion and Extension
T11-S1 Lateral Flexion

- Pt side laying with hips and knees in a flexed position allowing a neutral spinal posture
- Use pillow to prevent lateral flexion with large hips
- Facing Pt caudal hand around pelvis grasping ischial tuberosity
- PT uses ribs and forearm to stabilize the pts thorax and runs forearm down the spine
- PTs pad of middle finger is placed in the interspinous space at the level to be assessed
Side Bending PPIVM

place fingers underneath spinous processes as you pull legs upward for side bending toward upside
Side Bending and Rotation
T11-S1 Rotation

- Pt side laying with hips and knees in a flexed position allowing a neutral spinal posture

- Use pillow to prevent lateral flexion with large hips

- PT facing Pt caudal hand over the greater trochanter

- PT uses ribs and forearm to stabilize the pts thorax and runs forearm down the spine

- PTs pad of middle finger is placed in the interspinous space at the level to be assessed
PPIVM Rotation L1-3

lacing the arm through the elbow

Palpate underneath spinous process

rotate the torso posteriorly assessing segmental rotation mobility from L1-2 downward to L5-S1
L3-S1 Rotation

Rotate the spine by pulling the pelvis forward causing the top knee to slide over the bottom knee.

Feel the distal SP move into rotation.
Lumbar Gapping Mobilization

contact top side of upper segmental SP and rotate with thorax backward

while contacting bottom side of the SP of the lower SP and rotate with the hips forward

Provide desired mobilization force
Grade 5 Thrust Manipulation

Hypomobile side up isolate the lower segment with flexion PPIVM technique

- Patient grabs your elbow, now pull into flexion and right side bending to upper segment

- Finger tips under SP of lower segment and blocking up side of upper segment

- Rotate to end range hold return, obtain consent

- As patient exhales produce a grade 5 thrust through pelvis and leg