PNF STRETCHING - It’s Role in Rehabilitation LOWER BODY

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Stretching

- any therapeutic manoeuvre designed to increase mobility of soft tissue and subsequently improve ROM

- elongating structures that have adaptively shortened and have become hypomobile over time
Proprioceptive Neuromuscular Facilitation

- Originally used for neuromuscular re-education in stroke victims in the 40’s and 50’s by Knott and Voss.
- Later clinically useful for rehab in children with cerebral palsey (Levine et al 1954)
- Leading to wide ranges of orthopedic conditions

Development of PNF

- PNF was modified by therapists such as Robert McAtee & Charland 1999.
- PNF started its origin by use of diagonal patterns of movement under resistance
- The technique has been modified away from the diagonal pattern to stretch isolated muscles in patients with musculoskeletal disorders by stretching in anatomical planes or opposite the line of pull of specific muscle groups
Development of PNF and MET for Rem therapists

- MET was formed as a gentle more general way to treat any hypertonic muscle by the use of Reciprocal inhibition and post isometric relaxation by Liebenson (1996) and Lewit (1992).
- The force applied is 25% maximum and therefore more applicable if the patient has pain with reduced ROM.

Physiology of the Stretch Reflex

- It is a monosynaptic reflex arc.
- Lowers the antagonist tone (reduces motor stimulation) as the result of a neurological loop where the muscle spindle of the agonist is stimulated and sends an afferent signal to the CNS.
- Operates as a feedback mechanism to control muscle length by causing muscle contraction.
Physiology of the Tendon Reflex

- Operates as a feedback mechanism to control muscle tension by causing muscle relaxation.
- Golgi tendon organs detect and respond to changes in muscle tension.
- Protects tendons and their associated muscles from excessive tension thereby reducing muscle damage.

Indications for Use

- ROM ↓ due to adhesions, contractures, and scar tissue formation.
- Restricted motion ⇒ structural deformities.
- Muscle weakness and shortening of opposing tissue.
- As part of a total fitness program.
- Prior to and after vigorous exercise.
- Stiff shortened muscles make you sluggish.
**Contraindications to Stretching**

- Joint motion ↓ by a bony block
- Recent fracture
- Acute inflammatory or infectious process
- Hematoma or other tissue trauma
- Shortened soft tissues ↑ joint stability
- Shortened soft tissues ↑ functional abilities
- Hypermobility – stiffy’s flippy’s floppy’s

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**Types of stretching**

- Passive or assisted
- **Neuromuscular Inhibition Techniques**
- Self-stretching
- Joint mobilization/manipulation
- Soft Tissue Mobilization and Manipulation
- **Neural Tissue mobilization**
Proprioceptive Neuromuscular Facilitation

- Includes contract-relax and antagonist contract (CRAC)
- Stretches which are passive or passive assisted followed by the use of strong isometric contractions
- Utilizes the Reciprocal Inhibition of a muscle where reflex relaxation occurs after isometric contraction of the agonist—a neurological loop

The benefits of PNF include:

- Develops muscular strength and endurance, facilitate stability, mobility, neuromuscular control and coordinated movements
- Useful throughout the rehabilitation from the early phase of tissue healing when isometric techniques to end stage activities
- Lays a foundation for the restoration of function
Types of PNF Stretches

- Contract relax – pre-stretch, end-range, isometric contraction 10 sec followed by postisometric relaxation of the tight muscle
- Agonist contraction – concentric contraction of the muscle opposite the range limiting muscle ↑ ROM (used where pain in stretch is present)
- Control-relax with agonist contraction - pre-stretch isometric contraction followed by a concentric contraction

Elements of stretching

- Include alignment and stabilization
- Intensity, speed, duration, frequency and mode of stretch
- Neuromuscular inhibition and functional activities
**Frequency of stretch**

- Number dependant upon
  - underlying cause
  - quality and level of healing
  - chronicity and severity of contracture
  - patients age
  - use of corticosteroids
  - previous response to stretch

**Specific Techniques associated with PNF**

- Used to further stimulate weak muscles and enhance movement or stability
  - Rhythmic initiation
  - Repeated contractions
  - Reversal of antagonists
  - Rhythmic stabilization
  - Alternating isometrics
Active Isolated Stretching

- Similar to repeated contractions
- Using the Mattes method it utilizes brief (2-3 sec) repeated stretches of a muscle or joint, combined with a similar brief voluntary contraction of the agonist muscle.
- Elicits a neural inhibitory response relaxing it further
- Avoids disadvantages with static stretches of blood flow reduction, neural compression and unwanted stretch reflexes

Muscles treated with PNF

- Adductors (supine/seated)
- Hamstring - CRAC (supine)
- Hamstring fascia - repeated contractions (supine)
- Gastrocnemius & Soleus - repeated contractions (supine)
Muscles treated with PNF

- Quadriceps (prone)
- Piriformis – internal (prone) & external + femoral traction (supine)
- Gluteus maximus + GOGO’s (supine)
- Quadratus Lumborum (supine)

Stretch or strengthen?

- **Stretch weakness** - muscles habitually kept in stretch tend to test weaker because of a shift in the length-tension curve

- **Tight weakness** - muscles kept in a habitually shortened position tend to lose their elasticity, they are strong only in the shortened position but become weak as they are lengthened
Whether to stretch or strengthen

- Gluteus Medius (strength reciprocally to ipsilateral side)
- Psoas need to be strengthened to get length adequate for home stretching

Lateral shift correction

- Correct lateral shifting of the spine prior to flex/ext treatment for LBP
- Standing on the side of the thoracic shift with the therapists hands clasped around the contralateral iliac crest and the shoulder against the patients elbow. Simultaneously pull the pelvis towards you while pushing the patient’s thorax away. Continue with the lateral shifting if the curvature is reduced until normal curve is present.
Lateral shift correction

- Correct lateral shifting of the spine prior to flex/ext treatment for LBP
- Standing with the leg opposite the shift on a chair so the hip is in about 90 degrees of flexion. The leg on the side of the lateral shift is kept extended. Have the patient then flex the trunk onto the raised thigh and apply pressure by pulling on the ankle. Recheck the alignment and continue till pain reduction is greatest.

Lumbar stretching techniques

- Increase lumbar flexion
- Assisted stretching – cross-sitting. Patient lace the hands behind the neck, adduct the scapulae, and extend the thoracic spine. This locks the thoracic vertebrae. Have the patient then lean the thorax forward onto the pelvis, flexing only at the lumbar spine. Stabilize the pelvis by pulling back on the anterior-superior iliac spines.
Straight Leg Raise with Ankle Dorsiflexion

- Once the position that places tension on the involved neurologic tissue is found, maintain the stretch position, and then move one of the joints a few degrees in and out of the stretch position, such as ankle plantar and dorsiflexion, or knee flexion and extension.
- Ankle dorsiflexion with eversion places more tension on the tibial tract
- Ankle dorsiflexion with inversion places tension on the sural nerve

Ankle dorsiflexion with eversion places more tension on the tibial tract.

Ankle dorsiflexion with inversion places tension on the sural nerve.

Adduction of the hip while doing SLR places further tension on the nervous system because the sciatic nerve is lateral to the ischial tuberosity; medial rotation of the hip while doing SLR also increases tension on the sciatic nerve.

Passive neck flexion while doing SLR pulls the spinal cord cranially and places the entire nervous system on a stretch.
**Prone Knee Bend Stretch**

- Prone neutral spine
- Knee and hips extended to 0 degree
- Flex knee to the point of resistance and symptom reproduction

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**Prone Knee Bend Stretch (continued)**

- Pain in the low back or neurological signs are considered positive for upper lumbar nerve roots and femoral nerve tension
- Thigh pain could be rectus femoris tightness
- Do not hyperextend the spine (avoid confusion with facet or compression pain)
- Flex and extend the knee a few degrees to apply and release tension.
**Conclusion**

- A body that is maintained in a flexible balanced state feels “lighter, freer, more energetic”

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