PROPRIOCEPTIVE
NEUROMUSCULAR
FACILITATION
IN PRACTICE

Hannah Despain, SPTA
Salt Lake Community College
Objectives

- Define Proprioceptive Neuromuscular Facilitation (PNF)
- Identify proper order of PNF progression
- Name diagnoses that would benefit from PNF
- Understand and apply information from PNF case studies to clinical practice
  - Active, Passive & PNF Stretching for TKA
  - Static & PNF Stretching on Muscle Strength & Power Output
- Identify different patterns that are used in diagonals and total body patterns

Click on this button at any time during the slide show to return to this page.
PNF Definition

- **Proprioceptive**: Having to do with any of the sensory receptors that give information concerning movement and position of the body.
- **Neuromuscular**: Involving the nerves and muscles.
- **Facilitation**: Making easier.

- Methods of promoting the response of the neuromuscular mechanism through stimulation of the proprioceptor.
PNF Progression

Progressions within PNF techniques follow that of the developmental sequence and progresses through the stages of motor control.

**Stages of Motor Control**
- Mobility
- Stability
- Controlled mobility
- Skill

**PNF Techniques**
- Rhythmic initiation (RI)
- Repeated Contractions (RCs)
- Slow reversal (SRs)
- Rhythmic stabilization (RS)
Beneficial Diagnoses

- Neurological
  - Strokes
  - Multiple Sclerosis
- Traumatic
  - Amputations
- Orthopedic
  - Total joint replacements
  - Post fractures
- Even athletes
PNF Stretching Techniques

- **Hold relax**
  - End-range isometric contraction of tight muscle before it is passively lengthened

- **Contract relax**
  - After tight muscle has been passively lengthened, the client performs a concentric isotonic contraction of the tight muscle against resistance before the muscle is elongated.

- **Hold-relax with agonist contraction**
  - Pre-stretch isometric contraction of the tight muscle followed by a concentric contraction from the opposite muscle resulting in relaxation of the tight muscle.

- **Agonist contraction**
  - Contraction of muscle opposite tight muscle causing tight muscle to relax
Active, passive & PNF stretching are comparable in improving the knee flexion range in people with total knee replacement: a randomized controlled trial

- 117 pts recruited, 100 completed study
  - 100 females, 117 males
- TKA 2° to osteoarthritis, BMI < 30, PROM in knee flexion pre-op >80, intra-op >90, post-op <110
- 3 randomly assigned groups
  - Active stretching group
  - Passive stretching group
  - PNF stretching group
Case Study Treatments

- All subjects received a rehab program according to protocols of the hospital
  - Pain relief, knee mobs & strengthening, balance, transfer & mobility training.

- 1 hour each day for 2 weeks

- Stretches held 20 seconds followed by 10 seconds rest (Myers pain rating scale ≤ 3)
Case Study Results & Limitations

- Significant improvements in active & passive ranges were demonstrated after the 1st stretching session & also at the end of the whole study period in all groups.
- No significant difference between group in both active & passive knee ranges either measured immediately after stretching or at the end of the 2-week interval.
- No control group.
- Details of exercises were not described.
- Exact dosage & type of pain medications were not analyzed.
- Outcome measure was limited to knee flexion range.
Acute Effects of Static & PNF Stretching on Muscle Strength & Power Output

- 19 pts
  - 10 female, 9 male
  - Healthy & recreationally active (1-5 hrs of regular physical activity/week)
  - No current or recent knee-, hip- or ankle-related injuries
  - No apparent limits in knee ROM

- Each subject experienced both the static & PNF stretching protocol, in random order.
Case Study Treatments

- 2 laboratory visits, approx. 1 hour
- 6 activities per visit
  - Warm-up (stationary cycle ergometer)
  - Prestretching isokinetic assessments
  - Prestretching ROM measurement
  - Static or PNF (hold-relax) stretching procedure
    - Hold 30 sec, rest 20 sec – 4 reps
  - Poststretching ROM measurement
  - Poststretching isokinetic assessments
Case Study Results & Limitations

- 2.8% decrease in peak torque and 3.2% decrease in mean power output as a result of the static & PNF stretching exercises.
  - Both stretching protocols reduce the force-and power-producing capabilities of the leg extensors during voluntary maximal concentric isokinetic muscle actions at 60 and $300^\circ \cdot s^{-1}$.

- AROM & PROM increased from prestretching to poststretching in response to both the static & PNF stretching.

- Only used a truncated portion of the ROM (middle 30°) to calculate mean power output.

- Only tested one particular muscle group (hip extensors)

- Tested on only healthy subjects
Diagonal Patterns

UPPER EXTREMITY PATTERNS

D2F
- Shoulder Flexion
- Supination
- Wrist Radial Deviation
- Scapular Posterior Elevation

DIF
- Shoulder Flexion
- Supination
- Wrist Radial Deviation
- Scapular Anterior Elevation

Abduction
- Wrist Extension

Adduction
- Wrist Flexion

SHOULDER

Shoulder Extension
- Pronation
- Wrist Ulnar Deviation
- Scapular Posterior Depression

Internal Rotation

LOWER EXTREMITY PATTERNS

D2F
- Hip Flexion
- Foot Dorsi Flexion

DIF
- Hip Flexion
- Foot Dorsi Flexion

Posterior
- Tilt

Adduction
- External Rotation
- Foot Inversion

Abduction
- Internal Rotation
- Foot Eversion

D2E
- Hip Extension
- Foot Plantar Flexion

D1E
- Hip Extension
- Foot Plantar Flexion

Anterior
- Tilt

D2E
- Hip Extension
- Foot Plantar Flexion
Diagonal Patterns

Scapular Patterns

1. Anterior Elevation - manual contact is on anterior acromion.
   Posterior Depression - manual contact is on spine of scapula or lateral inferior angle of scapula.

2. Anterior Depression - manual contact is on coracoid process.
   Posterior Elevation - manual contact is on posterior acromion.

Pelvic Patterns

1. Anterior Elevation - manual contact above the ASIS.
   Posterior Depression - manual contact on ischial tuberosity.

2. Anterior Depression - manual contact below ASIS and on greater trochanter.
   Posterior Elevation - manual contact above the PSIS.
Total Body Patterns

Slow Reversals in quadruped with diagonal weight shift

SUPINE ——— ROLLING ——— PRONE

BRIDGING

SUPINE TO SIT

SITTING

SIT TO STAND

STANDING

PRONE ON ELBOWS

HANDS AND KNEES

KNEELING

HALF KNEELING
The use of PNF in physiotherapy practice

- **ROM**
  - Existing literature supports increase in ROM as a benefit of PNF. Contract-relax and agonist contract-relax were the most commonly used techniques in the studies reviewed.

- **Functional Rehabilitation**
  - Support for the effectiveness of PNF techniques in improving functional ability with elderly, neuropathological and chronic low back pain patient groups.

- **Implication of PNF patterns**
  - Effectiveness of PNF in terms of motor evoked potential and maximal torque (positioning and patterns)
Therapist’s perspectives

61% of respondents deemed PNF to be appropriate in current clinical practice with respondents agreeing that PNF is a useful range of techniques where appropriate and can be ‘used on a variety of diagnoses across the whole remit of physiotherapy’. (small UK study)

Only 47% of physiotherapists felt there was a place for PNF in the future of physiotherapy in Sweden. (n=200)
WHAT DO YOU THINK?


References


