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It's Not Just Diagonals - Incorporating PNF into Acute Care Practice

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Disclosures

Financial

- Dr. Hickman teaches continuing education courses in PNF

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Agenda

Acute Care Physical Therapy

Introduction to Proprioceptive Neuromuscular Facilitation (PNF)

PNF Interventions

Integration of PNF Interventions into Practice

Summary

Q&A

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Course Objectives

After this course, participants will be able to…

- Describe PNF Philosophy and Basic Principles
- Recognize common reasons for physical therapy referral in acute care setting
- Describe impact of PNF treatments on body function/structure deficits and activity limitations
- Describe typical trunk responses to upper and lower extremity PNF patterns/diagonals
- Identify and describe intervention strategies incorporating PNF for common body function/structure deficits and activity limitations in the acute care setting

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Acute Care Physical Therapy

ACUTE CARE PT RESPONSIBILITIES
WHAT IS ACUTE CARE PHYSICAL THERAPY
WHO ARE THE PATIENTS?
SYSTEMS ANALYSIS

5

Main Responsibilities

Mobilization

Discharge Planning

6

Acute Care PT Responsibilities

Extensive evidence demonstrating benefit of (early) mobilization
- Reduce comorbidities associated with hospitalization and immobility (Disuse atrophy, pneumonia, delirium, etc..)

Early mobilization promotes shorter length of stay, reduced readmission rates, improved outcomes
- Average hospital length of stay 5.5 days in 2014 (National Center for Health Statistics 2016)

Functional status predicts 3, 7, and 30 day readmission rates from inpatient rehabilitation in patients after stroke (Slocum et al 2015)

Patients 2.9x more likely to be readmitted when PT discharge recommendations were not followed and/or recommend follow-up services were lacking (Smith, Fields, Fernandez 2010)

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What is Acute Care Physical Therapy?

"…to foster excellence in acute care practice, in all settings, in order to enhance the health and functioning of patients and clients."

Academy of Acute Care Physical Therapy Mission Statement

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Who are the patients?

Characteristics	Percentage of total patients seen
Age (41-60 y/o)	28.3%
Age (61-80 y/o)	40.7%
Age (81+ y/o)	20.5%
Diagnosis Type (Med/Surg)	35.9%
Diagnosis Type (Orthopedic)	22.4%
Diagnosis Type (Cardiovascular)	19.5%
Diagnosis Type (Neurological)	16.6%
Diagnosis Type (Pulmonary)	4.4%

(Jette et al 2009)

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Who are the patients?

Systems	% of patients having a given system examined
Musculoskeletal	86.3%
Functional Ability	86.3%
Neuromuscular	85.0%
Cardiovascular/Pulmonary	82.1%

Interventions	% of patients receiving a given intervention
Functional Ability	82.2%
Education	79.7%
Neuromuscular	62.4%
Cardiovascular/Pulmonary	59.7%
Musculoskeletal	46.8%

(Jette et al 2009)

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Diseases/Disorders Causing System Dysfunction

Is Pulmonary system limited?
- COPD
- Acute Respiratory Failure
- Pneumonia

…Neuromuscular?
- Stroke
- SCI
- Acquired and congenital brain injury

…Musculoskeletal?
- Joint replacement
- Spinal Surgery
- Trauma
- Amputation

…Cardiovascular?
- Coronary Artery Disease
- Myocardial Infarction
- Hyper/hypotension
- Heart failure

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What Are Implications of System Dysfunction?

Is Pulmonary system limited?
- Decreased activity tolerance

…Neuromuscular?
- Decreased strength
- Decreased motor control

…Musculoskeletal?
- Decreased strength
- Decreased ROM

…Cardiovascular?
- Decreased activity tolerance

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What Are Possible Impairments Causing System Dysfunction?

Pulmonary system
- Decreased strength
- Decreased motor control
- Decreased coordination
- Decreased ROM

Neuromuscular
- Decreased strength
- Decreased motor control
- Decreased initiation
- Decreased coordination

Musculoskeletal
- Decreased strength
- Decreased ROM

Cardiovascular
- Decreased strength
- Decreased motor control

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Pulmonary System

Lungs are where gas exchange occurs, but it is the musculoskeletal system that drives the lungs
- Thoracic cage (Sternum, ribs, clavicles, thoracic spine)
- Muscular system (Diaphragm, intercostals, abdominals, accessory muscles, etc..)

Limitations in musculoskeletal system may limit effectiveness/efficiency of movement necessary for the pulmonary system to work effectively/efficiently.

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Pulmonary System

Lungs are where gas exchange occurs, but it is the musculoskeletal system that drives the lungs

- Thoracic cage (Sternum, ribs, clavicles, thoracic spine)
- Muscular system (Diaphragm, intercostals, abdominals, accessory muscles, etc..)

Limitations in musculoskeletal system may limit effectiveness/efficiency of movement necessary for the pulmonary system to work effectively/efficiently.

Motor Control **Strength** **Range of Motion**

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Neuromusculoskeletal Impairments Limiting Pulmonary Function

Skeletal muscle weakness is known result of COPD (Berry 2013)

Post-stroke pneumonia is typically associated with impaired cough from respiratory muscle weakness, not dysfunction of the glottis (Kulnik 2014)

People with Parkinson's have been shown to have "…involvement of upper airway musculature and resultant airflow limitation (secondary to increased resistance), progressive declines in respiratory muscle strength and diaphragmatic instability and tremor." (Silverman 2016)

In patients with acute respiratory failure, a standardized rehabilitation program resulted in improved physical function at 6 months than a conventional therapy program (Morris 2016)

Forward head posture caused reduced vital capacity (Han 2016)

Cervical joint mobilization improved respiratory function in individuals with forward head posture (Kim 2015)

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Cardiovascular System

Cardiovascular system delivers necessary oxygen to body and removes waste (Malone 2006)

Tissues in use require more oxygen and produce more waste

More efficient neuromotor and musculoskeletal systems, less demand on cardiovascular and pulmonary systems

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Cardiovascular System

Cardiovascular system delivers necessary oxygen to body and removes waste (Malone 2006)

Tissues in use require more oxygen and produce more waste

More efficient neuromotor and musculoskeletal systems, less demand on cardiovascular and pulmonary systems

Motor Control **Strength** **Range of Motion**

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Introduction to PNF

HISTORY
PHILOSOPHY
BASIC PRINCIPLES
PNF PATTERNS
PNF TECHNIQUES

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What is PNF?

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History of PNF

Originally developed by Dr. Herman Kabat and Maggie Knott in the 1940s

Further expanded in 1947 when Dr. Kabat at Ms. Knott moved to the Kaiser Hospital in Vallejo, California

Patients with Multiple Sclerosis and polio were main type of patients being treated at this time, but slowly the benefits of PNF were seen with a wide variety of diagnoses

A residency program at Kaiser Vallejo was created to train therapists

Currently 3-, 6-, and 9- month long residencies are available for physical therapists

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PNF Philosophy

1. Everyone has potential
2. An integrated approach that addresses whole person
3. A positive approach that focuses on what the patient/client **CAN** do
4. Interventions must be toward a specific functional goal
5. Incorporates the use of stronger body parts to strengthen weaker ones
6. Faciliatate a maximal response
7. Use repetition to promote motor learning
8. An intensive program is required to promote the best outcome
9. Optimize function

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What is PNF?

A method to assess and improve the efficiency and effectiveness of human movement and function

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How is PNF performed?

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PNF Basic Principles

1. Patient Position
2. Manual Contacts (Lumbrical Grip)
3. Therapist Position/Body Mechanics
4. Appropriate "resistance"
5. Traction and Approximation
6. Quick Stretch
7. Irradiation
8. Normal Timing
9. Patterns of Facilitation
10. Visual Input
11. Verbal Input

These are tools used to enhance a treatment

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PNF Basic Principles

PATIENT POSITION

Consider affect of gravity

Consider treatment goal

MANUAL CONTACTS

Lumbrical grip – "Mitten hands"

Allows for comfortable, specific contact

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PNF Basic Principles

THERAPIST POSITION

Place body in the line of the movement

Maintain good body mechanics

Must move with the patient through the desired movement

APPROPRIATE RESISTANCE

Amount of resistance that results in a smooth, coordinated movement or motor response

Can use concentric, eccentric, isometric contractions

Sometimes the appropriate resistance is **ASSISTANCE**

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PNF Basic Principles

TRACTION

Facilitates movement

Helps reduce fatigue during anti-gravity movements

Traction Video

APPROXIMATION

Facilitates stability

Used with pushing or weight bearing activities

Approximation Video

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PNF Basic Principles

Quick Stretch

- Used to initiate or increase motor activation during a movement
- Can be performed on elongated tissue, or actively contracting tissue

Quick Stretch on Contracting Tissue Video Quick Stretch on Elongated Tissue Video

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PNF Basic Principles

Irradiation

- Creates an overflow over motor recruitment into areas not directly being used
- Allows for use of one body part/segment to recruit another
- Using a stronger body part to influence a weaker one

Irradiation Video

- (Reznik 2015, Hendy 2012)

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PNF Basic Principles

Normal Timing

- Consider how a movement should be performed
- Proximal stability develops before distal
- In open chain, adults normally initiate movements distally to proximally
- In closed chain, proximal segments initiate over distal

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PNF Basic Principles

VISUAL INPUT

Use of vision on target helps to integrate head/trunk

Provides cues to direction of movement

Increases motor response

VERBAL INPUT

Can modulate voice to adjust a response

- Quick/fast command vs slow/quiet

Use of a preparatory command

Use of positive feedback

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PNF Techniques

Rhythmic Initiation

Replication

Dynamic Reversals

Combination of Isotonics

Stabilizing Reversals

Quick Stretch

- On Contracting Tissue
- On Elongated Tissue

Used to teach or enhance a movement or pattern

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PNF Techniques

RHYTHMIC INITIATION

Used to teach a pattern or movement

Passive -> Active Assisted -> Active -> Resisted

Start at beginning of range, moving towards end of range

Indications

- Teaching the pattern/movement
- Helping patient relax
- Improving coordination of movement/pattern

REPLICATION

Used to teach the pattern

Start at end of range with a hold

After hold, patient will relax and is moved towards beginning of pattern

Move in small increments each repetition to beginning of pattern

Indications

- Teach the pattern/movement
- Assess strength at end range of pattern/movement

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PNF Techniques

RHYTHMIC INITIATION

Rhythmic Initiation Video

REPLICATION

Replication Video

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PNF Techniques

DYNAMIC REVERSALS

Movements are performed against resistance in both directions of a task without stopping

Indications

- Decrease fatigue of particular muscle group
- Improve strength

Speed and amount of resistance can change at any time based on need

COMBINATION OF ISOTONICS

Combines concentric and eccentric components of a pattern or movement

Agonist is always active

Indications

- Improve strengthening
- Improve coordination
- Improve endurance

Careful – this technique is very demanding on both therapist and patient

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PNF Techniques

DYNAMIC REVERSALS

Dynamic Reversals Video

COMBINATION OF ISOTONICS

Combination of Isotonics Video

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PNF Techniques

Stabilizing Reversals

- Alternating muscle contractions against resistance at a generally stable position

Indications

- Promote stability and strength
- Improve coordination

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PNF Patterns

What are D1 and D2?

Patterns are named for the position they end in

Each diagonal has two patterns associated with it

Upper and Lower Extremity Patterns

Scapular and Pelvis Patterns

Remember typical trunk responses!

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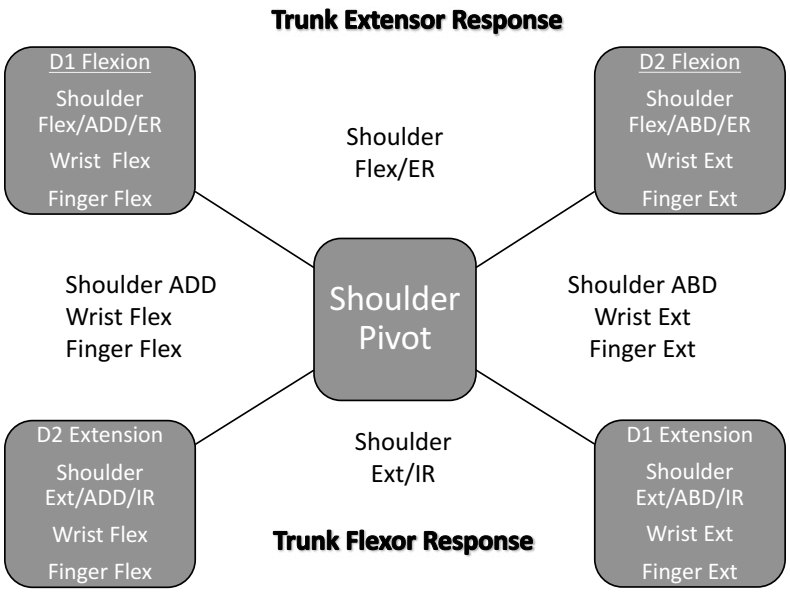

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Upper Extremity Patterns

FLEXION-ABDUCTION-EXTERNAL ROTATION
ENDING POSITION

EXTENSION-ADDUCTION-INTERNAL ROTATION
ENDING POSITION

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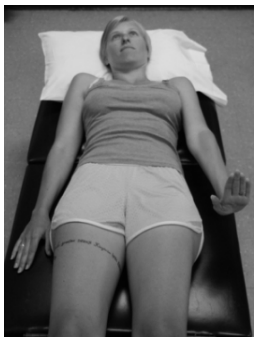
Upper Extremity Patterns

FLEXION-ADDUCTION-EXTERNAL ROTATION
ENDING POSITION

EXTENSION-ABDUCTION-INTERNAL ROTATION
ENDING POSITION



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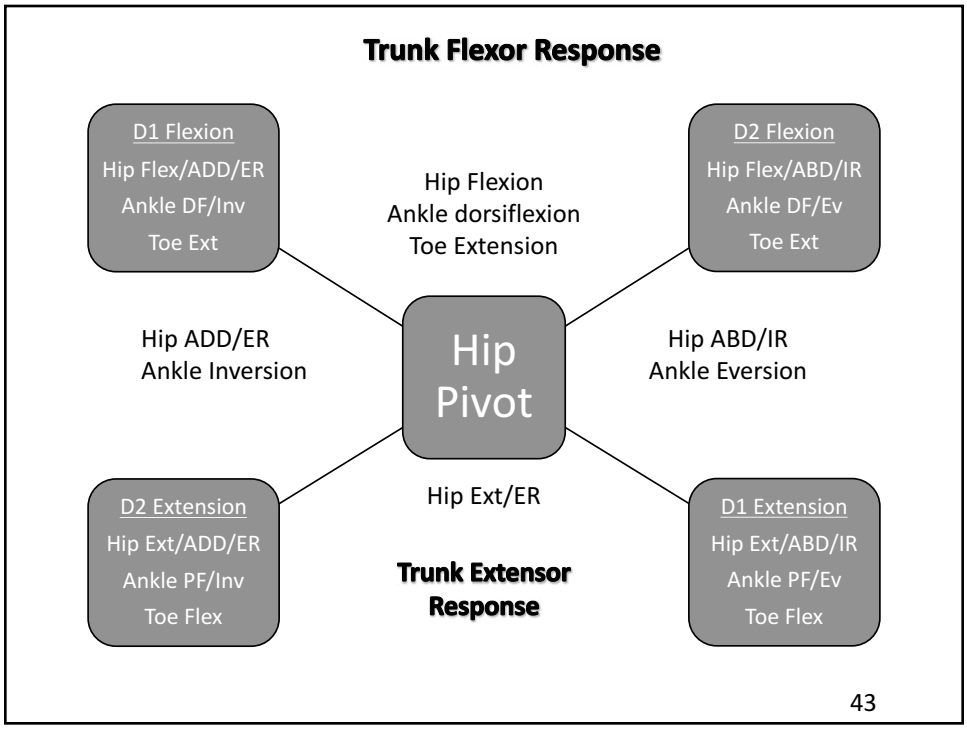

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Lower Extremity Patterns
Paired Patterns

FLEXION-ADDUCTION-EXTERNAL ROTATION
ENDING POSITION

EXTENSION-ABDUCTION-INTERNAL ROTATION
ENDING POSITION

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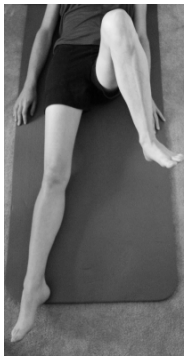
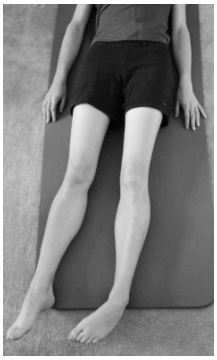
Lower Extremity Patterns
Paired Patterns

FLEXION-ABDUCTION-INTERNAL ROTATION
ENDING POSITION



EXTENSION-ADDUCTION-EXTERNAL ROTATION
ENDING POSITION



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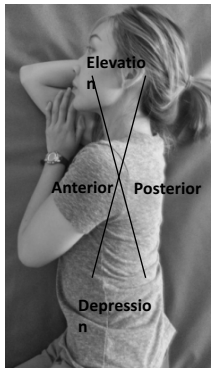
Scapular Patterns

Scapular patterns named for position they end in
- Anterior-Posterior to midline
- Elevation-Depression from neutral

Patterns will always cross midline

Scapular Clock
- Usually diagonals are close to midline
  - 11:00 <-> 5:00
  - 1:00 <-> 7:00

Are connected with Upper Extremity Patterns



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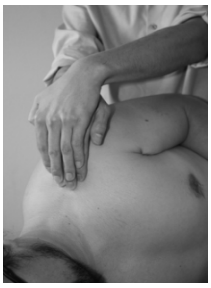
Scapular Patterns

ANTERIOR-ELEVATION

Functional Applications

- Rolling
- Trunk elongation
- Very good for upward rotation of scapula for overhead reaching

UE Pattern: Flex-Add-ER

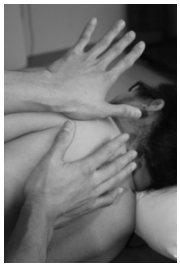


POSTERIOR-DEPRESSION

Functional Applications

- Weight bearing stability for UEs
- Trunk shortening
- Trunk extensor activation
- Sit to stand
- Eccentric during overhead activity to control scapula

UE Pattern: Ext-Abd-IR



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Scapular Patterns

ANTERIOR-DEPRESSION

Functional Applications

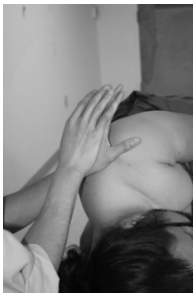
- Very strong connection to trunk flexors
- Trunk shortening
- Trunk Stability
- Flexion Rolling

UE Pattern: Ext-Add-IR

POSTERIOR-ELEVATION

Functional Applications

- Overhead reaching
- Trunk elongation
- Strong connection to trunk extensors



UE Pattern: Flex-Abd-ER

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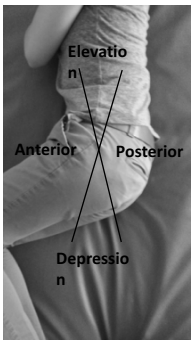
Pelvic Patterns



- Exactly the same as Scapular Patterns
- Named for position they end in
  - Anterior-Posterior to midline
  - Elevation-Depression from neutral
- Patterns will always cross midline
- Scapular Clock
  - Usually diagonals are close to midline
    - 11:00 <-> 5:00
    - 1:00 <-> 7:00
- Pelvis is a fixed structure
  - Ex: Elevation on one side will cause depression on opposite
- Connected with LE Patterns

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Pelvic Patterns

Anterior-Depression and Posterior-Elevation Patterns are much more rarely used, but same principles apply

ANTERIOR-ELEVATION

Functional Applications

- Swing phase of gait
- Flexion Rolling
- Trunk shortening
- Trunk flexor activation

Manual contact

- Anterior iliac crest superior to ASIS

LE Pattern: Flex-Add-ER

POSTERIOR-DEPRESSION

Functional Applications

- Stance stability
- Trunk elongation
- Contralateral trunk shortening

Manual contact

- Ischial tuberosity

LE Pattern: Ext-Abd-IR

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PNF Interventions

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PNF Breathing

Inspiratory and Expiratory training

Manual Contacts
- Sternal
- Bilateral Rib Cage
- Abdominal

Consider what aspect of movement is impaired
- Bucket handle
- Pump handle
- Excessive accessory activation

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PNF Breathing: Sternal Contact

Manual Contact
- Palm of one hand on sternum (NOT XIPHOID)

Instruction
- Tell patient to inhale, exhale in normal timing of breathing (1:2 Inspiration to Expiration)

Resistance can be provided during inspiration

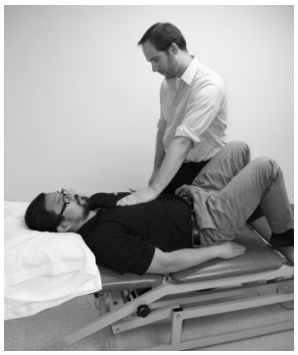
Force can be applied to increase range during inspiration

Can use stretch to initiate inspiration or facilitate increased response during inspiration (quick stretch)

Patient position: Supine, seated, reclined, etc.

Consider "Pump Handle" mechanism

Indications
- Poor timing/control of inspiration
- Impaired breathing



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PNF Breathing: Bilateral Rib Cage

Manual Contact
- Heels of hands on lower margin of rib cage

Instruction
- Tell patient to inhale, exhale in normal timing of breathing (1:2 Inspiration to Expiration)

Resistance can be provided during inspiration

Force can be applied to increase range during inspiration

Patient position: Supine, seated, reclined, etc.

Consider "Bucket Handle" mechanism

Indications
- Poor timing/control of inspiration
- Impaired breathing

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PNF Breathing: Abdominal

Manual Contact:

- Make circle around navel with hands

Resistance can be applied during inspiration

Pressure is applied up and under the rib margin

Indications

- Increasing diaphragm activation
- Forced expiration (Assisted cough)

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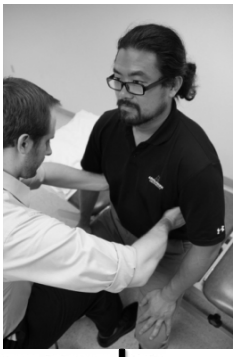

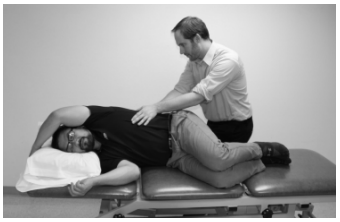

Interventions can be performed in a variety of positions

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Mass Flexion

Manual Contacts

- Anterior shoulder near coracoid process
- Anterior-superior pelvis (above ASIS)

Patient Position

- Sidelying

Action

- Trunk shortening and flexion

Indications

- Increasing trunk flexor activation
  - Forced expiration (Coughing)
- Forwards Rolling
- Coordinating upper and lower aspects of trunk

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Mass Flexion

Mass Flexion Video

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Mass Extension

Manual Contacts

- Posterior superior shoulder
- Ischial tuberiosity

Patient Position

- Sidelying

Action

- Elongation and extension of trunk

Indications

- Increased trunk extensor activation
  - Expiration
- Thoracic extension
- Backwards Rolling

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Mass Extension

Mass Extension Video

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Hooklying Stabilizing Reversals

Stabilizing Reversals
- Can be performed on any body part, segment, pattern, or movement
- Alternating direction of resistance against a static position

Indications
- Activating trunk stabilizers
- Bilateral activation
- Irradiation
  - Stronger side to weaker
  - Proximal activation (neck pain)

Hooklying Stabilizing Reversals Video

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Seated Stabilizing Reversals

Manual Contacts
- Anterior contact on coracoid process
- Posterior contact on inferior angle of scapula

Indications
- Irradiation to LEs
- Trunk stability
- Proximal stability prior to movement

Posterior Contacts: Inferior Angle of Scapula

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Seated Stabilizing Reversals

Seated Stabilizing Reversals Video

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Resisted Low Trunk Rotation

Can be performed via TRACTION or APPROXIMATION
- APPROXIMATION will facilitate trunk stability
- TRACTION will facilitate trunk movement

Can be performed thru full or partial range

Can use PNF Techniques to modify task
- Dynamic Reversals
- Combination of Isotonics

Indications:
- Activating lower trunk and LE musculature
- Rotation
- Rolling

Resisted Low Trunk Rotation Video

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Seated Resisted Trunk Rotation

Expansion on seated stabilizing reversals
- Adds isolated movement onto stable trunk

Rotation helps to build coordination

Indications
- Reinforce postural mobility while maintaining stability
- Rotation
- Dynamic balance
- Trunk mobilization

Resisted seated rotation video

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Resisted Trunk Flexion and Extension

Indications
- Trunk strengthening
- Irradiation LEs
- Preparation for sit to stand
- Fear of falling

Can perform with various techniques
- Dynamic Reversals
- Combination of Isotonics

Resisted Trunk Flexion-Extension Video

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Facilitated Sit to Stand

One of the most important functional movements

Success limited by
- Weakness
- Limited forward flexion
- Fear of falling
- Poor timing

Setup is critical!
- Seat Height
- Foot Position
- Pelvis Position

Many patients will need more assistance than resistance

Sit to Stand Video

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Integrating PNF into Practice

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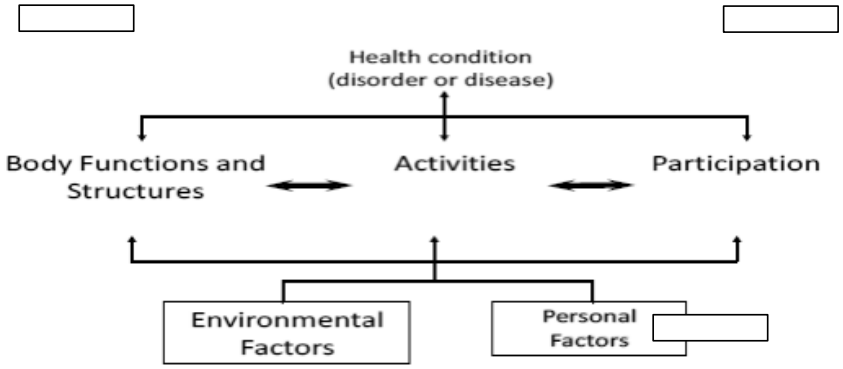
ICF Model



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APTA Vision Statement for the Physical Therapy Profession

"Transforming society by optimizing movement to improve the human experience"

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PNF Philosophy

1. Everyone has potential
2. An integrated approach that addresses **whole person**
3. A positive approach that focuses on what the patient/client **CAN** do
4. Interventions must be toward a **specific functional goal**
5. Incorporates the use of **stronger body parts to strengthen weaker ones**
6. Faciliatate a maximal response
7. Use repetition to promote motor learning
8. An **intensive program** is required to promote the best outcome
9. **Optimize function**

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What is the goal?

What are the activity limitations?

What are the body function/structure deficits

What CAN the patient do?

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WHY?

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Example

78 y/o male presented to ED 3 days prior with altered mental status, shortness of breath, and difficulty walking. Found to have dehydration and pneumonia.

Examination:

- Vitals: At rest HR 86 bpm; RR 18 with excessive accessory muscle usage; BP 134/84; SaO2 97% on RA
- Cognition: AOx4, follows simple and complex commands
- Posture: Forward head, thoracic kyphosis, posterior pelvic tilt. Can correct partially with cues.
- Strength: Grossly 3+/5 –> 4/5 except 2+/5 in bilateral hip extensors and abductors
- Functional Movements:
  - Supine to sit: Mod I, but difficult
  - Sit to stand: SBA with FWW. Early knee extension, braces legs against edge of bed. Flexed trunk throughout
  - Gait: 80' with FWW, SBA. Limited 2/2 fatigue. Flexed trunk, excessive UE weight bearing.

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What are possible interventions?

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Interventions

MOVEMENT DEVIATIONS	PNF INTERVENTIONS
Decreased thoracic extension ◦ Accessory muscle use ◦ Flexed posture	◦ Sternal Breathing ◦ Bilateral Rib Cage Breathing ◦ Mass extension ◦ Resisted seated trunk extension
Poor timing for sit to stand ◦ Early knee extension ◦ Posterior pelvic tilt causing limited anterior weight shift	◦ LE Extension-Abduction-Internal Rotation ◦ Facilitated sit to stand

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Example

25 y/o male was brought to ED after a MVA 5 days ago. Sustained C7-T2 fractures and cord contusion. Underwent surgery for stabilization C5-T4. Currently C7 AIS B and wearing an Aspen Collar.

Examination:

- Pain: 6/10
- Vitals: HR 76; BP 110/72; RR 20; SaO2 100%
- Cognition: AOx4. Quiet voice, difficulty clearing throat
- Strength: Tricep 3/5, Grip 2+/5; Bicep 5/5; Shld Flex/Abd/IR/ER 5/5
- Functional Movement:
  - Rolling: Total A
  - Supine to sit: Total A
  - Sitting balance: Poor, requires constant assistance

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What are possible interventions?

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Interventions

MOVEMENT DEVIATIONS	PNF INTERVENTIONS
Poor diaphragm usage, weak abdominals ◦ Vocal quality ◦ Difficulty clearing throat	◦ Abdominal breathing ◦ Bilateral rib cage breathing ◦ Sternal breathing
UE and trunk weakness ◦ Poor mobility ◦ Poor sitting balance	◦ UE Extension-Adduction-Internal Rotation ◦ UE Extension-Abduction-Internal Rotation ◦ UE Flexion-Adduction-External Rotation ◦ UE Flexion-Abduction-External Rotation ◦ Scapula Posterior Depression

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Example

57 y/o female with history of 9 years of R knee pain underwent elective TKA 1 day prior. Also has 4 year history of L knee pain, 25 year history of back pain.

Examination:

- Pain: R knee 4/10 at rest, 10/10 with movement; L knee no complaints; no back pain at rest
- Observation: Moderate edema and bruising around knee joint, especially posteriorly
- Strength: B UEs 5/5; R knee ext 2/5; R hip abd/ext 3+/5; L knee ext 3+/5, limited by pain; L hip abd/ext 3+/5, onset of back pain with hip extension
- L LE A/PROM WFL; R knee Flex PROM (12° flex->51° flex); R knee Ext PROM (12° Flex -> 8° Flex)
- Functional Movement
  - Supine to sit: Mod A 2/2 R knee and back pain
  - Sit to stand: SBA with FWW. Limited R LE weight bearing; early L knee extension followed by lumbar extension; c/o back pain
  - Gait: 110' with FWW, supervised. Excess R knee extension throughout gait cycle; shortened R stance time; Increased lordosis and c/o back pain; Heavy UE use.

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What are possible interventions?

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Interventions

MOVEMENT DEVIATIONS

Pain Avoidance
- Limited R LE weight bearing during sit to stand and gait

Muscle guarding
- Knee extended throughout gait cycle

Poor lumbar stabilization
- Pain during all functional movements
- Excess lumbar lordosis during gait

PNF INTERVENTIONS

- R/L LE Extension-Abduction-Internal Rotation
- Resisted Seated Trunk Flexion/Extension
- Facilitated Sit to Stand
- R/L LE Flexion-Adduction-External Rotation
- R/L Mass Flexion
- R/L Pelvic Anterior-Elevation

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Summary

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Acute Care Physical Therapy

May be performed in a variety of settings

Consider the neuromusculoskeletal contributions or involvement in systems dysfunction

In the hospital setting time is limited so you must be efficient with your interventions

Gait speed, strength, fall rates, length of stay, return to function, reduced readmission can all be improved via PT intervention in the hospital setting

- PNF may provide a more efficient way of targeting both impairments in body structure/function and activity limitations

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PNF Philosophy

1. Everyone has potential
2. An integrated approach that addresses whole person
3. A positive approach that focuses on what the patient/client **CAN** do
4. Interventions must be toward a specific functional goal
5. Incorporates the use of stronger body parts to strengthen weaker ones
6. Faciliatate a maximal response
7. Use repetition to promote motor learning
8. An intensive program is required to promote the best outcome
9. Optimize function

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PNF Basic Principles

1. Patient Position
2. Manual Contacts (Lumbrical Grip)
3. Therapist Position/Body Mechanics
4. Appropriate "resistance"
5. Traction and Approximation
6. Quick Stretch
7. Irradiation
8. Normal Timing
9. Patterns of Facilitation
10. Visual Input
11. Verbal Input

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Using the Patterns and Techniques

Patterns can be done in isolation or in combination with movements
- Ex: UE Ext-Add-IR with rolling

Patterns can be done in multiple positions
- Ex: UE Flex-Abd-ER in supine vs seated
- Ex: LE Ext-Abd-IR in supine vs sidelying

Use PNF techniques to teach, modify, increase demand, or emphasize a functional activity
- Ex: Rhythmic initiation or replication to teach a movement or pattern
- Ex: Dynamic reversals for Pelvic Ant-Elev and Post-Dep to mimic gait cycle

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Typical Trunk Responses

- UE Extension -> Trunk Flexion
- UE Flexion -> Trunk Extension
- LE Extension -> Trunk extension
- LE Flexion -> Trunk flexion
- Scapular Elevation -> Trunk Lengthening
- Scapular Depression -> Trunk Shortening
- Pelvic Elevation -> Ipsilateral Shortening; Contralateral Elongation
- Pelvic depression -> Ipsilateral Elongation; Contralateral Shortening

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What can you do with PNF?

Analyze and improve the efficiency and effectiveness of human movement and function

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Thank you!

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Questions?

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References

Jette DU, Brown R, Collette N, Friant W, Graves L. Physical Therapists' Management of Patients in the Acute Care Setting: An Observational Study. *Phys Ther.* 2009;89(11):1158-1181.

About Us. Academy of Acute Care Physical Therapy Web site. http://www.acutept.org/?page=A2. Accessed July 10, 2017.

Malone DJ, Lindsay KLB. Physical Therapy in Acute Care: A Clinician's Guide. Thorofare, NJ: SLACK Incoporated; 2006.

National Center for Health Statistics. Health, United States, 2016: With Chartbook on Long-term Trends in Health. Hyattsville, MD. 2017: 30.

Smith BA, Fields CJ, Fernandez N. Physical therapists make accurate and appropriate discharge recommendations for patients who are acutely ill. *Phys Ther.* 2010;90(5):693-703.

Slocum C, Gerrard P, Black-Schaffer R, et al. Functional status predicts acute care readmissions from inpatient rehabilitation in the stroke population. *PloS One.* 2015;10(11):1-10.

Berry MJ, Morris PE. Early exercise rehabilitation of muscle weakness in acute respiratory failure patients. *Exerc Sport Sci Rev.* 2013;41(4):208-215.

Kulnik ST, Rafferty GF, Birring SS, Moxham J, Kalra L. A pilot study of respiratory muscle training to improve cough effectiveness and reduce the incidence of pneumonia in acute stroke: a study protocol for a randomized controlled trial. *Trials.* 2014;51(123).

Silverman EP, Carnaby-Mann G, Singletary F, Hoffman-Ruddy B, Yeager J, Sapienza C. Measurement of voluntary cough production and airway protection in Parkinson Disease. *Arch Phys Med Rehabil.* 2016;97(3)413-420.

Morris PE, Berry MJ, Files DC, et al. Standardized rehabilitation and hospital length of stay among patients with acute respiratory failure: a randomized clinical trial. *JAMA.* 2016;315(24):2694-2702.

Han J, Park S, Kim Y, Choi Y, Lyu H. Effects of forward head posture on forced vital capacity and respiratory muscles activity. *J Phys Ther Sci*. 2016;28:128-131.

92

References

Kim SY, Kim NS, Kim LJ. Effects of cervical sustained natural apophyseal glide on forward head posture and respiratory function. *J Phys Ther Sci.* 2105;27:1851-1854.

Reznik JE, Biros E, Bartur G. An electromyographic investigation of the pattern of overflow facilitated by manual resistive proprioceptive neuromuscular facilitation in young healthy individuals: a preliminary study. *Physiother Theory Pract.* 2015;31(8):582-586.

Hendy AM, Spittle M, Kidgell DJ. Cross education and immobilization: mechanisms and implications for injury rehabilitation. *J Sci Med Sport.* 2012;15(2)94-101.

Moreira R, Lial L, Teles MG, et al. Diagonal Movement of the upper limb produces greater adaptive plasticity than sagittal plane flexion in the shoulder. *Neurosci Lett.* 2017;643:8-15.

Seo K, Cho M. The effects on the pulmonary function of normal adults proprioceptive neuromuscular facilitation respiration pattern exercise. *J Phys Ther Sci.* 2014;26(10):1579-1582.

Ellison JB, Drummond M, Dickinson JM, McGaugh JM, Paddon-Jones D, Volpi E. Short-term intensive rehabilitation induces recovery of physical function after 7 days of bed rest in older adults. *J Acute Care Phys Ther.* 2016; 7(4):156-163.

Quittan M. Aspects of physical medicine and rehabilitation in the treatment of deconditioned patients in the acute care setting: the role of skeletal muscle. *Wein Med Wochenschr.* 2016; 166(1-2):28-38.

Youdas JW, Arend DB, Exstrom JM, Helmus TJ, Rozeboom JD, Hollman JH. Comparison of muscle activation levels during arm abduction in the plane of the scapula vs proprioceptive neuromuscular facilitation upper extremity patterns. *J Strength Cond Res.* 2012; 26(4):1058-1065.

Ribiero TS, Silva EMGS, Silva WHS, et al. Effects of a training program based on the proprioceptive neuromuscular facilitation method on post-stroke motor recovery: a preliminary study. *J Bodyw Mov Ther.* 2014;18:526-532.

Youdas JW, Adams KE, Bertucci JE, Brooks KJ, Steiner MM, Hollman JH. Magnitudes of gluteus medius muscle activation during standing hip joint movements in spiral-diagonal patterns using elastic tubing resistance. *Physiother Theory Pract.* 2015; 31(6):410-417.

Ju SK, Y WG. Comparison of anterior gluteus fiber activation during general exercises and PNF exercises. *J Phys Ther Sci.* 2017;29:476-477.

93

References

Rapp J, Paz JC, McCallum C, Cole J, Steffey L. The effects of a physical therapy triage system on the outcomes of ICU patients with respiratory failure. *J Acute Care Phys Ther.* 2010;1(1):21-29.

Braden JK, Ko M, Bohmfalk M, Hortick K, Hasson S. Gait speed improves during physical therapy in general acute care, skilled nursing, and inpatient rehabilitation – a pilot study. *J Acute Care Phys Ther.* 2013;4(1):20-25.

Padula CA, DiSano C, Ruggiero C, et al. Impact of lower extremity strengthening exercises and mobility on fall rates in hospitalized adults. *J Nurs Care Qual.* 2011;26(3):279-285.

Berney S, Haines L, Skinner EH, Denehy L. Safety and feasibility of an exercise prescription approach to rehabilitation across the continuum of care for survivors of critical illness. *Phys Ther.* 2012;92(12):1524-1535.

Falvey JR, Burke RE, Malone D, et al. Role of physical therapists in reducing hospital readmissions: optimizing outcomes during care transitions from hospital to community. *Phys Ther.* 2016;96(8):1125-1134.

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