**PNF-Techniques**

**Definition: PNF- Techniques**

A sequenced method of facilitation, which targets improvement of body function, body structure and/or activities within the context of a treatment goal.

**Overview**

*(The subgroups are only made for didactic reasons)*

**- Agonistic Techniques**: Involve one muscle group/muscle chain, with focus in one direction.

Rhythmic Initiation

Combination of Isotonics or Agonistic Reversal

Repeated Stretch from Beginning of Range

Repeated Stretch through Range

Replication

**- Relaxation and/or Stretching Techniques:**

Contract - Relax

Hold - Relax

**- Antagonistic Techniques**: Involve agonists and antagonists with focus in both directions

Dynamic Reversals

Stabilizing Reversals

Rhythmic Stabilization

**Rhythmic Initiation**

**Core teaching points:**

* **Four phases: passive, assisted, resisted and independent (optional)**
* **Continuous rhythmic movements**
* **Return motion passive**
* **Smooth change from one phase to the next**
* **No interruption of rhythm**

**Definition**:

Repeated rhythmic, unidirectional movement through a desired range of motion. Includes 4 phases:

 1. Passive

 2. Active assisted

 3. Resisted

 4. Independent (optional)

**Description**:

- Passively perform the desired movement

- Give verbal stimulation/explanation only for the agonistic pattern

- Ask the patient to begin to actively assist in the desired direction of motion

- Move the patient passively through the return motion

- When the patient begins to learn the movement in the desired direction, gradually increase resistance

- Optional: take your hands off and allow the patient to repeat the movement independently

**Purpose:**

**- Teach a desired movement or pattern**

**- Assist in initiation of motion**

**- Normalize muscle tension**

**- Influence muscle tone**

**- Normalize the velocity of motion**

**- Improve coordination and kinesthetic awareness**

**Points to remember**:

- Verbal commands set the velocity of movement

- Return motion is always passive

- During the independent phase (4) consider the type of muscle activity recruited during resisted motion versus the type of muscle activity recruited with patient’s independent motion (Influence of gravity)

 **Combination of Isotonics/**

 **Agonistic Reversal**

**Core teaching points:**

* **Concentric, eccentric and static muscle contractions**
* **No relaxation between types of muscle contraction**
* **Variable range of movement**

**Definition**:

A technique which combines ***concentric*,** ***eccentric***and ***isometric*** contractions of a synergistic muscle group **without** relaxation

**Description:**

- Depending on the treatment goal and the patient's experience, start with a concentric or static muscle contraction.

- At the end of the desired motion, ask the patient to hold the position against resistance.

* When increased recruitment is attained, resist the patient’s slow controlled eccentric return toward the beginning of the pattern.
* A static contraction may again be performed

- Verbally cue the change to another type of contraction

* Repeat the sequence as appropriate to achieve the treatment goal

- End with any of the three types of muscle contractions

**Purpose:**

**- Increase power and muscular endurance over time**

**- Improve coordination and active control of motion**

**- Improve movement control within a functional activity (especially effective for eccentric control)**

**- Functional training for many Activities of Daily Living (ADL)**

**- Teach a pattern (find the groove)**

**Points to remember**:

* Depending on the treatment goal, the range of motion can vary between small and full
* There is no relaxation between different types of muscle activity
* Hands remain on the same surface
* A static/isometric contraction may be performed at any part within the eccentric and/or concentric motion where an emphasis on greater neuromuscular recruitment is desired

**Repeated Stretch from Beginning of Range**

**(Repeated Initial Stretch)**

**Core teaching points:**

* **Passive elongation of muscle chain to bring the muscles under tension**
* **Quick stretch (quick additional stretch stimulus)**
* **Dynamic verbal command**
* **Resisted muscle contraction after stretch stimulus through available range**

**Definition**:

Repeated use of the basic principle of quick stretch (stretch stimulus combined with patient’s voluntary effort) on muscles under the tension of elongation

**Description**:

- Passively elongate the muscles

- Provide a quick stretch synchronized with a verbal command cueing an active response from the patient

- Resist the patient’s resultant muscle contraction throughout the available active range of motion

- Repeat the procedure several times as necessary

**Purpose:**

**- Facilitation of a muscle contraction**

**- Facilitate initiation of motion**

**- Recruit more motor units**

**- Increase strength**

**- Increase active range of motion**

**- Delay muscle fatigue**

**- Re-direct the desired direction of motion**

**- Normalize abnormal muscle tone**

**Points to remember:**

- Appropriate resistance immediately follows the quick stretch through available active range of motion

- As soon as the muscle contraction ceases, the sequence is repeated from beginning of range

- Repetitions should increase muscle recruitment and thereby increase active range of motion

- At the end of the patient’s active range of motion, the limb may be assisted through the full range of motion

***Take caution with pain, neck patterns, unstable fractures, risk of fractures, soft tissue damage, peripheral nerve damage etc.***

**Repeated Stretch through Range**

**(Old name: Repeated contractions)**

**Core teaching points:**

* **Restretch superimposed on contracting muscles**
* **Dynamic verbal command**
* **Must be repeated**
* **No relaxation or voluntary eccentric muscle contraction of patient**

**Definition:**

Repeated use of quick stretch (stretch stimulus combined with patient’s voluntary effort) on contracting muscles

**Description:**

* Therapist resists all components of a movement pattern
* While patient is actively contracting muscles through range, therapist superimposes a quick stretch on the contracting musculature by slightly elongating the contracting tissues

**-** This “re-stretch” is synchronized with a verbal command cuing a stronger muscle contraction

* All components of pattern/movement must be re-stretched and resisted without patient relaxation

**Purpose:**

**- Recruit motor units**

**- Increase muscle power**

**- Increase active range of motion**

**- Delay fatigue /increase endurance**

**- Emphasize functionally important ranges in a pattern**

**- Re-direct motion to the desired direction during a pattern or movement**

**- Normalize abnormal muscle tone**

**Points to remember:**

- The patient must have the intent to continuously move through desired range of motion

- The patient must not relax or reverse direction voluntarily during the re-stretch

- Appropriate resistance immediately follows the quick stretch through available active range of motion

***Take caution with pain, neck patterns, unstable fractures, risk of fractures, soft tissue damage, peripheral nerve damage etc.***

**Replication**

**Core teaching points:**

* **Patient is placed in desired end position (target position)**
* **Patient holds the target position while the therapist resists the hold**
* **Therapist brings patient out of the position**
* **Patient actively returns to the target position against resistance or independently.**
* **The range to return to the target position is sequentially and gradually increased with repetitions.**

**Definition**:

Unidirectional technique characterized by a hold at a desired end position (target position), followed by passive partial movement back into the opposite direction with resisted or independent return to the target position. The return distance is progressively increased to approach a full active independent or resisted return to the target position.

**Description:**

- Place the patient in the desired end position or target position of the activity.

* Cue the patient to perform a static contraction against resistance.
* Have the patient relax.
* Move the patient a short distance away from the target position.
* Ask the patient to return to the previously established position under appropriate resistance or on his own, independently without resistance
* Repeat the procedure.
* For each repetition of the movement, start incrementally farther away from the end position

- Ask the patient at the end to repeat the movement independently (optional).

**Purpose:**

**- Teach the route to the end position (outcome) of the desired pattern or functional movement.**

**- Assess the patient’s ability to sustain a contraction at the end of the desired pattern or functional movement.**

**- Assess the patient’s ability to return to a pre-determined end position from various points further away from the end position**

**- Improve coordination**

**- Improve body awareness**

**- Improve ADLs (daily life activities)**

**Points to remember:**

- Teaching the outcome of a movement or activity is important for functional work and self-care activities.

 **Contract-Relax**

**Core teaching points:**

* **Take patient to point of limitation**
* **Activate shortened (tight) muscle(s) dynamically (direct Contract Relax)**
* **Block the movement with resistance**
* **Have patient relax**
* **Have patient move into new range**

**Definition:**

Resisted ***isotonic*** contraction opposed by enough resistance to prevent motion, followed by relaxation and subsequent movement into new range of motion

 - **Direct Contract-Relax:** Contraction of restricted muscle groups

- **Indirect Contract-Relax :** Contraction of muscles opposing the restricted muscle groups

**Description:**

**Direct Contract-Relax** (using the restricted muscle group):

- Move body segment to the end of available range of motion; this can be done passively or actively

* Without losing this position, ask the patient for a smooth, coordinated *isotonic* contraction of the restricted muscles or group of muscles in pattern. Block the movement with resistance. Pay special attention to the rotational component. Some motion may occur.
* Once the patient has maintained this contraction for several seconds, ask to relax
* Move the body segment to the end of the new range of motion; this can be done passively or actively. Repeat this sequence until no further range of motion gains are made and re-train the newly gained ROM with other techniques

**Indirect Contract-Relax** (advanced course level)

- Same sequence as with the direct method. However, ask the patient for a smooth, coordinated muscular contraction of the muscle groups *opposite* to the restricted muscles or pattern. Block the movement with resistance. Pay special attention to the rotational component. Some motion may occur.

* Once the patient has maintained this contraction for several seconds, ask to relax
* Move the body segment to the end of the new range of motion; this can be done passively or better actively. Repeat this sequence until no further range of motion gains are made and re-train the newly gained ROM with other techniques

**Purpose :**

**- Relaxation and/or stretching of muscles**

**- Increase ROM**

**Points to remember:**

- The therapist asks the patient to relax and subsequently moves into the new range actively or passively

- For re-education, the therapist can facilitate an active hold, or other training technique, in the direction of gained range of motion.

**Hold-Relax**

**Core teaching points:**

* **Take patient to limitation of range or before pain limit**
* **Activate shortened, tight muscle(s) statically/ isometrically (direct Hold-Relax)**
* **Resist these muscle(s) and use a static command**
* **Have patient relax**
* **Have patient move into new range**
* **Repeat procedure until no further range of motion is gained**

**Definition:**

Resisted ***isometric*** contraction which is facilitated by a matching force, followed by relaxation and subsequent movement into new range of motion

 -**Direct Hold Relax:** Contraction of restricted muscle groups (“Post-isometric relaxation”)

 -**Indirect Hold-relax:** Contraction of muscles opposing the restricted muscle groups (“antagonistic inhibition”)

**Description:**

**Direct Hold-Relax: (**usingthe restricted muscle group)

- Move body segment to the end of available range of motion; this can be done passively or actively

* Without losing this position, ask the patient for a smooth, coordinated *isometric* contraction of the restricted muscles or group of muscles in pattern. Pay special attention to the rotational component. No motion should occur and there is no intent to move.
* Once the patient has maintained this contraction for several seconds, ask to relax
* Move the body segment to the end of the new range of motion; this can be done passively or actively. Repeat this sequence until no further range of motion gains are made and re-train the newly gained ROM with other techniques

**Indirect Hold-Relax**: (advanced course level)

- Same sequence as with the direct method. However ask the patient for a smooth, coordinated isometric muscular contraction of the muscle groups *opposite* to the restricted muscles or pattern. Pay special attention to the rotational component. No motion should occur and there is no intent to move.

* Once the patient has maintained this contraction for several seconds, ask to relax
* Move the body segment to the end of the new range of motion; this can be done passively or better actively. Repeat this sequence until no further range of motion gains are made and re-train the newly gained ROM with other techniques

**Purpose:**

**- Relaxation and/or stretching of muscles**

**- Increase ROM**

**- Decrease pain**

**Points to remember:**

- If the end position is painful, move the patient slightly to a pain free position

- Resistance is applied and removed much more slowly than with Contract Relax

- Use breathing to enhance relaxation

- Hold Relax is the technique of choice with pain problem

**Dynamic Reversals**

**Core teaching points:**

* **Resisted dynamic concentric muscle contractions**
* **Muscle work performed concentrically in one direction followed by concentric muscle work in the opposite direction**
* **No pause**
* **No relaxation in between**

**Definition:**

Resisted concentric motion changing from one direction to the opposite direction without pause or relaxation

**Description:**

- Resist the patient moving in one direction (usually the stronger direction)

* As the end of the desired range of motion approaches, reverse the manual contact while giving a preparatory verbal cue
* At the end of the desired range of motion, a verbal command initiates a change in direction of ~~the~~ movement without relaxation

- Resist this opposite direction of movement

- Repeat the reversal of direction as appropriate toward the treatment goal

**Purpose:**

**- Increase muscle power and endurance**

**- Increase active range of motion**

**- Improve ability to coordinate change of direction**

**- Reduce fatigue**

**- Normalize tone**

**Points to remember:**

- A change of direction can be used to emphasize a particular range of motion

- Speed used in one or both directions can be varied

- With using extremity patterns make sure to initiate the opposite direction distally first

- Try to use this technique functionally if possible

**Stabilizing Reversals**

**Core teaching points:**

* **Alternating static muscle contractions**
* **Contractions may alternate between agonist/antagonist and/or various body parts**
* **Change manual contacts one at a time**
* **No relaxation as manual contacts change**

**Definition:**

Alternating static contractions opposed by enough resistance to facilitate stability in a specific position with changing manual contact.

**Description:**

* In the desired position, resist the patient starting in the strongest direction allowing little or no movement
* A static verbal command should be used to “hold” the position
* When increased recruitment is attained, the therapist moves one hand and begins to give resistance in another direction
* As the patient responds appropriately to the new resistance, the therapist moves the other hand to resist a new direction

- Continue to change the direction of resistance as appropriate toward the treatment goal

- The patient remains active (no relaxation) as the therapist is changing directions

**Purpose:**

**- Increase stability**

**- Improve postural control**

**- Improve coordination**

**- Maintain a position**

**- Teach (re-educate) a new position or ROM**

**- Increase muscle power and endurance**

**Points to remember:**

* Approximation and/or traction may be used to facilitate smooth transition between changes in direction of resistance

- Change from one diagonal/direction to others is allowed

 **Rhythmic Stabilization**

**Core teaching points:**

* **No change of manual contacts**
* **Alternating static/isometric muscle activity of agonists and antagonists**
* **No relaxation as direction of resistance changes**

**Definition:**

Alternating isometric contractions against resistance without relaxation and without change of manual contacts

**Description:**

 - Place your manual contacts on the patient such that you can give resistance for the agonistic and the antagonistic muscle groups without changing your manual contacts

- Start with the stronger direction and slowly provide increasing resistance to all components (isometric muscle activity)

- Add approximation or traction as appropriate

- Change the direction of resistance slowly to prevent a loss of tension.

- Use a static command: "Stay here" or "Don't let me move you!"

- Continue to change the direction of resistance

- Repeat this procedure rhythmically

- The resistance may vary depending on your goals and the patient ability to perform isometric contractions

**Purpose:**

**- Increase stability looking for co-contraction**

**- Improve postural control and balance**

**- Improve coordination**

**- Maintain a position**

**- Teach (re-educate) a new position or ROM**

**- Increase static muscle power and endurance**

**- Promote relaxation**

**Points to remember:**

* Patient and therapist have no intent to move,
* The patient has to match the therapist’s resistance
* As the speed of the reversal increases, muscular co-contraction can be achieved

- Instead of approximation for the change between the patterns, traction may be used if it is more appropriate

- Change from one diagonal/direction to others is allowed

**Test yourself:**

How many phases do we have in Rhythmic Initiation? Please name them and describe.

What are the therapeutic goals of using Combination of Isotonics?

List the advantages of using techniques with Stretch. What is happening to the muscle when you apply Stretch Stimulus?

Can you describe the Technique Replication?

What are the similarities between Hold- Relax and Contract-Relax?

What are the differences between Hold- Relax and Contract-Relax?

Explain the purposes of the Technique Dynamic Reversals. Please provide clinical examples.

Name the therapeutic goals of using Stabilizing Reversals and Rhythmic Stabilization. What are the differences between them?

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**Stretch through range**

**Stretch at beginning of range**

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**Stabilizing reversals + Rhythmic stabilization**

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