Physiotherapy Bases

Practical Lessons

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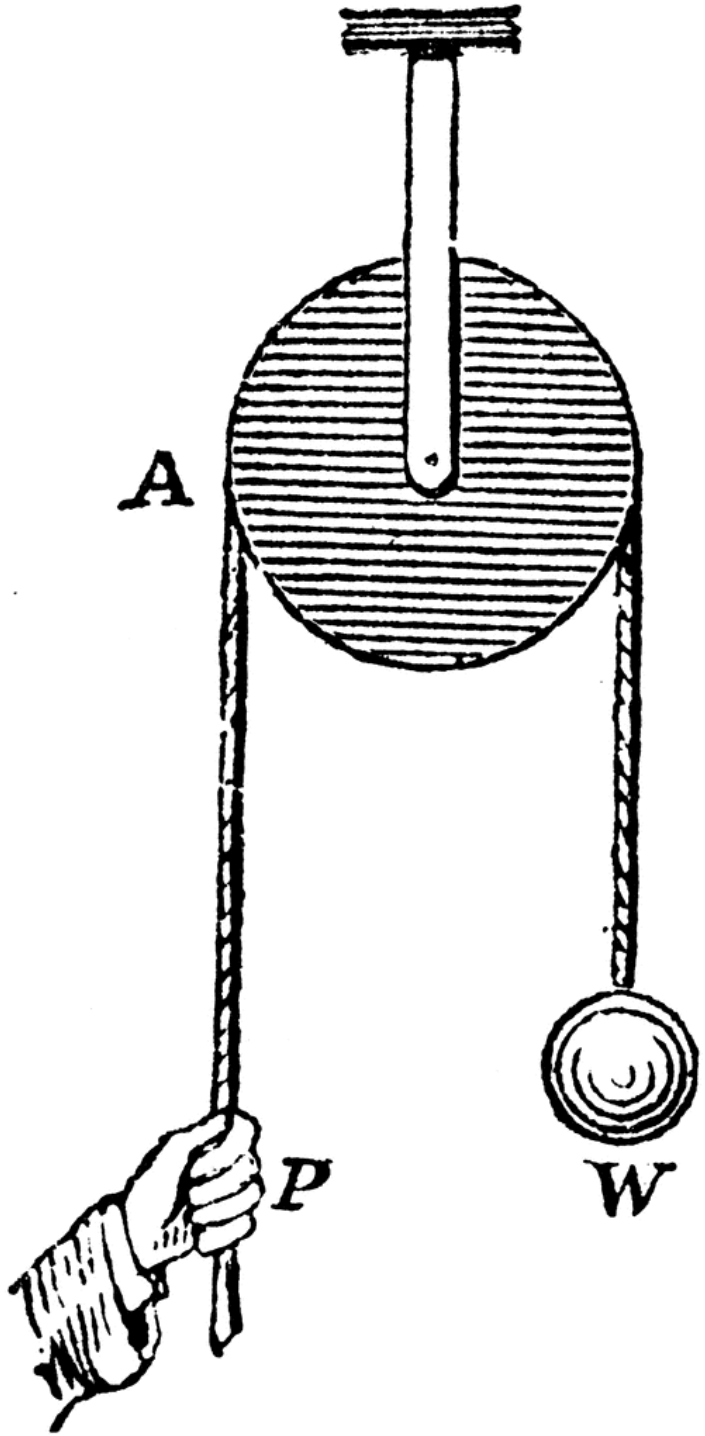
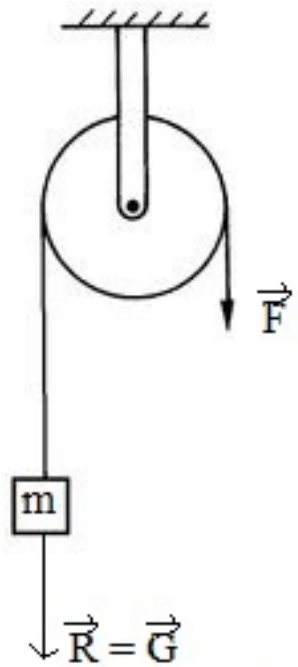
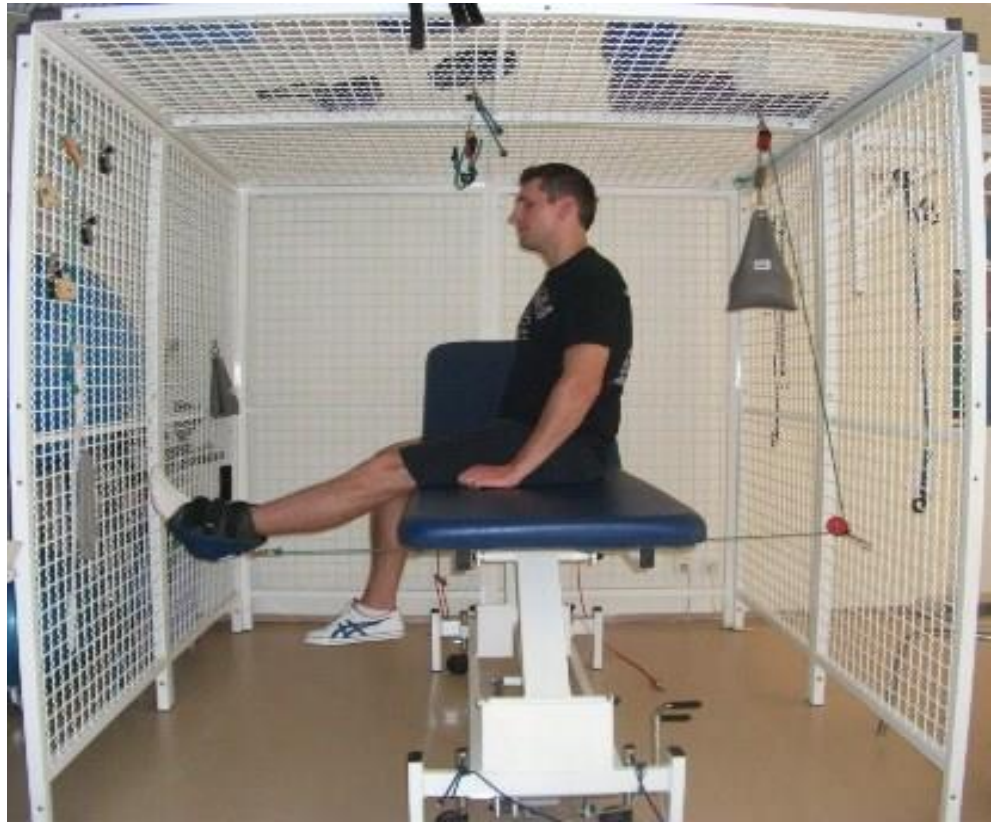


Voluntary active kinetic techniques

Pulley exercises





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• *I.P*: Pacient sitting; a system of two pulleys oriented in the sagittal plane, the pulleys-weighing back-up to the patient, the transmission pulleys back-down, the rope attached to the ankle.

• T1: Knee extension – CC quadriceps.
• T2*:* Slowly returning from extension - EC quadriceps.

I.P: Pacient ventral decubitus; a system of two pulleys oriented in the sagittal plane, the pulleys-weighing cranial-up to the patient, the transmission pulleys above the pacient, the rope attached to the ankle.

T1: Knee extension – CC quadriceps.
T2*:* Slowly returning from extension - EC quadriceps.

I.P: Pacientul în orthostatic position; a system of two pulleys oriented in the frontal plane, contralateral to the pacient, the pulleys-weighing contralateral-up to the patient, the transmission pulleys contralateral-down, the rope attached to the ankle.

T1: Thigh ABD on the pelvis – CC middle gluteus
T2: Slowly returning from ABD - EC middle gluteus.

I.P: Pacient dorsal decubitus with the arm anducted 90º and external rotated and the elbow flexed 90º; a system of two pulleys oriented in the sagittal plane, cranial to the pacient, holding the handles of the pulleys in the hand.

T1: Shoulder IR- CC shoulder internal rotators.
T2: Slowly returning from IR – EC shoulder internal rotators.

Stretching

Stretching the flexor muscles of the shoulder and elbow

PI. Sitting, with the back to a table, the arm extended, the forearm resting on the table.

T1. Trunk flexion

T2. Maintaining for 20 seconds

The elastic band exercise

Objective: Toning the middle gluteus

PI. The subject in orthostatic position, contralateral to the espalier or to the fixed, secure object; an elastic band oriented in the transverse plane towards the patient, band looped around the distal third of the calf and the handles onto the espalier.

T1. Hip ABD Abducția șoldului – Concentric contraction for middle gluteus

T2. Maintaining – Isometric contraction for middle gluteus

T3. Hip ADD – Eccentric contraction for middle gluteus

The elastic band exercise

Objective: Toning the posterior deltoid

IP. Orthostatic position with the arm horizontal adducted over the medial line, heterolateral to a fixed ladder, with one of the endings of the elastic band in the contralateral hand to the fixed ladder and the other ending of the band fixed on the scale at the level of the shoulders.

T1. Arm horizontal abduction - concentric contraction of posterior deltoid

T2. Maintaining the position - isometric contraction of posterior deltoid

T3. Arm horizontal adduction until it’s over the medial line - eccentric contraction of posterior deltoid.

DYNAMIC KINESIOLOGICAL TECHNIQUES
– Passive Movement –

- are done with the help of an external force, the subject does not perform muscular mechanical work.

- is used only in therapeutic and recovery kinesiology (not in prophylaxis - than in recovery after effort, to promote relaxation).

Passive Movement – Neck flexion and rotation, from dorsal decubitus

Passive Movement – Neck extension and rotation, from ventral decubitus

Extensia pasivă a gâtului pe trunchi, din DV.

Rotația pasivă a gâtului pe trunchi, din DV.

Passive Movement – Neck rotation and lateral flexion, from sitting

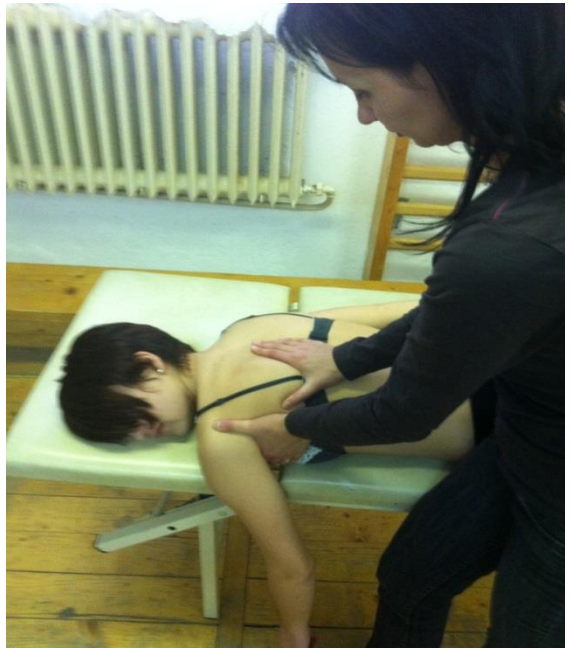
Scapula (shoulder blade) passive movement

Scapula elevation – depression, from sitting

Scapula abduction with up rotation, from sitting

Scapula elevation – depression, from ventral decubitus

Scapula (shoulder blade) passive movement



Scapula abduction with up rotation, from ventral decubitus

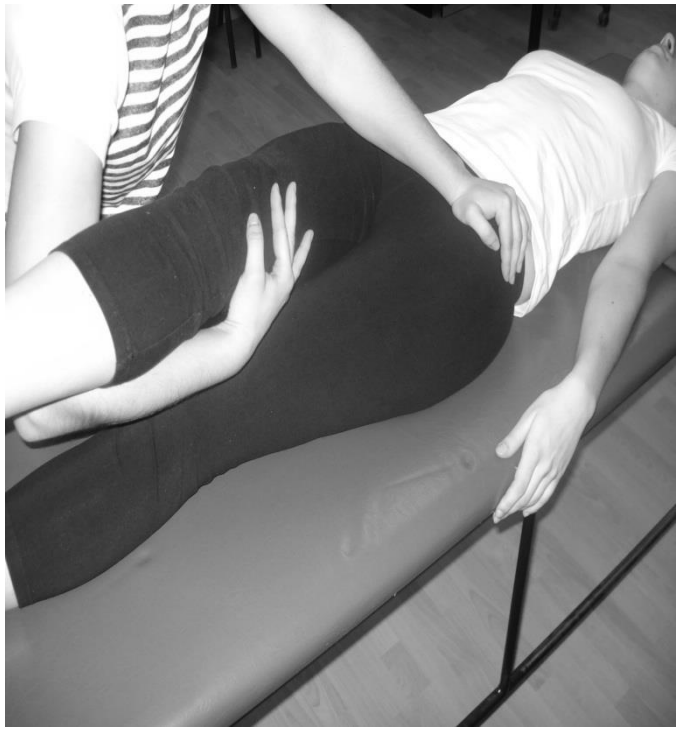
Scapula passive movement from lateral decubitus

Passive tilt movement of the scapula from lateral decubitus

Passive movement – hip internal / external rotation

Passive movement – knee extension / flexion, from dorsal decubitus

Passive movement – hip flexion and hip adduction, from dorsal decubitus



Proprioceptive Neuromuscular Facilitation (PNF) Techniques

Slow Reversals (SR)

Dynamic reversal

- concentric contraction of the antagonist
followed immediately by an
- concentric contraction of the agonist,
without pause or relaxation.

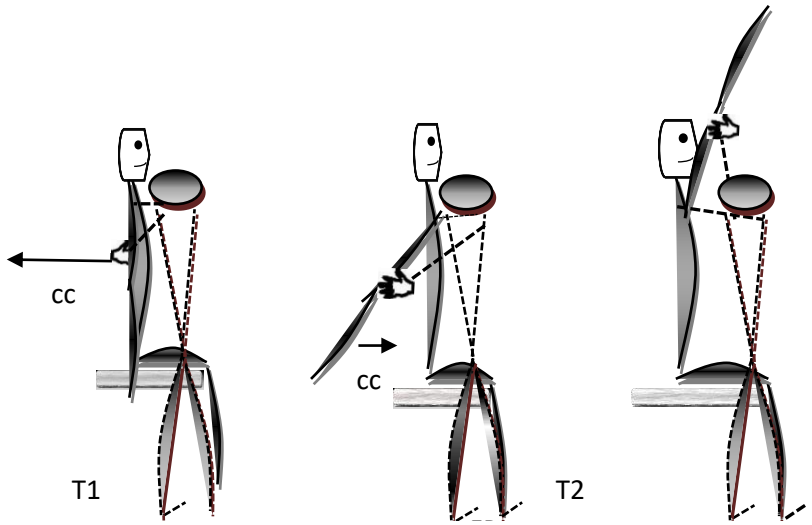
Neurophysiological bases:

- Sherrington's principle of successive induction;
- Golgi tendon reflex - for antagonist;
- Renshaw Circuit – for antagonist;
- Static Myotatic reflex – during antagonist concentric contraction, the agonist stretching progressively => excites the Ruffini receptor and sends facilitatings impulses to the alpha motoneuron;
- Gamma Loup – for agonist.

SR for anterior deltoid

- Initial position: *Patient* in sitting. *Physiotherapist*, ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the posterior face.
- *The technique starts on the antagonist (on the shoulder).*

T	Movement	Verbal command	Technique
T1	Shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T2	Shoulder flexion (Mobilizing hand switches on the anterior face of the arm)	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid



SR technique for anterior deltoid
(cc = concentric contraction, FP = final position)

Slow Reversals Hold (SRH)

- isotonic contraction of the agonist

followed immediately by an

- isometric contraction

and folowed by an

- concentric contraction of the antagonist
- isometric contraction

without pause or relaxation.

- Increase strength of weaker muscles
- Develop coordination
- Balancing agonist-antagonist tone
- Increase stability

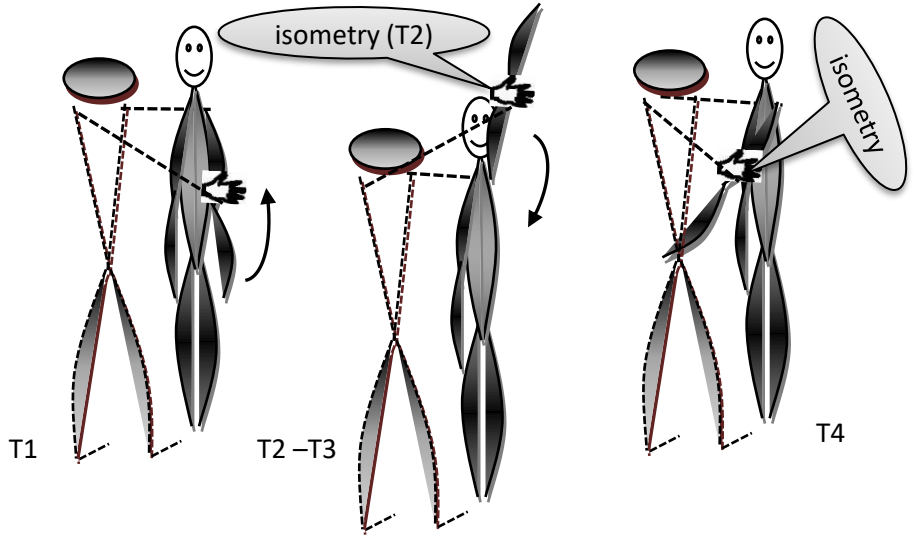
Neurophysiological bases:

- Gamma Loup – for agonist.
- Golgi tendon reflex - for antagonist;
- Renshaw Circuit – for antagonist;
- Static Myotatic reflex – Ruffini receptor – facilitate agonist contraction.

Slow Reversals Hold (SRH) – for middle deltoid

- Initial position: *Patient* in orthostatic position. *Physiotherapist*, ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the lateral face.

T	Movement	Verbal command	Technique
T1	Shoulder abduction	Push in my hand! (Do arm abduction on the trunk!)	CC of the middle deltoid
T2	Maintaining	Push in my hand!	IC of the middle deltoid
T3	Shoulder adduction (Mobilizing hand switches on the medial face of the arm)	Push in my hand! (Do arm adduction on the trunk!)	CC of the shoulder adductors
T4	Maintaining	Push in my hand!	IC of the shoulder adductors



SRH technique for middle deltoid

Repeated Contraction (RC)

For F2, F3:

- Concentric contraction of the agonist against maximal resistance
- Short, repeated and fast Stretch in differents points of ROM

For F1:

- short and fast Stretch in a long position of muscle

For F4 - 5:

- Concentric contraction of the agonist against maximal resistance
- isometric contraction in the weakness point
- short and fast Stretch

- is based on stretch reflex

- increase strength of weaker muscles
- increase active range of motion

Repeated Contraction (RC)

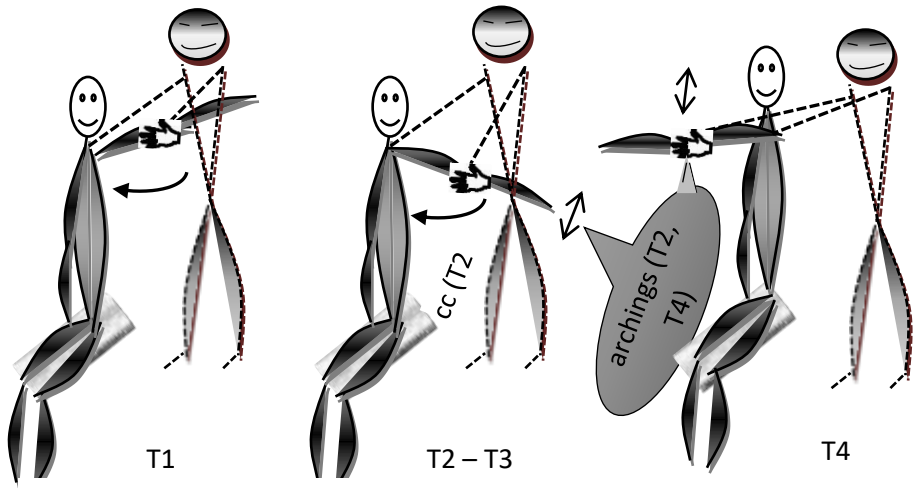
Neurophysiological bases:

- Stretch reflex;
- Gamma Loup;
- Verbal commands - influences the cortex; have a exciting role for the hypotonic muscle tone.

Repeated Contraction (RC) – for pectoralis major

- For strength 2-3: Initial position: *Patient* sitting with the shoulder horizontally abducted. *Physiotherapist* behind the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the anterior face. The patient's forearm rests on the physiotherapist's forearm.

T	Movement	Verbal command	Technique
T1	20º arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	CC of the pectoralis major
T2	Archings (repeated short stretches of the pectoralis major)	Continue to adduct your arm horizontally on your trunk!	Passive movement
T3	40º arm horizontal adduction on the trunk	Push in my hand!	CC of the pectoralis major
T4	Archings	Continue the horizontal adduction!	Passive movement
T5	It is continued on the entire range of motion.		



RC technique for pectoralis major - For strength 2 – 3
(cc = concentric contraction)

Timing for Emphasis (TE)

- Isometric contraction of the healthy muscle
- isotonic contraction of the agonist (the isometric contraction of the healthy muscle is maintained)

- increase strength of weaker muscles

- develop coordination

Neurophysiological bases:

- the transmission of the super-impulse from the healthy muscle to the weaker muscles;
- Gamma Loup.

Ischiogambieri - SI – tehnica unilaterală (Secvențialitate pentru întărire)

Hamstrings - TE –unilateral variant (Timing for emphasis)
Unilateral variant → we use the strong muscle from the main movement scheme

What is the action of the hamstrings and from what muscles are they formed?

Hamstrings - Hypotonic or hypertonic?

Initial position: Patient …….. , with ……..

PT …….. to the patient, with one mobilizing hand

on the …….. and other mobilizing hand

…… …… …….

Hamstrings - TE –unilateral variant (Timing for emphasis)

Moving times	Movement	Verbal Command	Technique
T1			
T2			

Neurophysiological explanations:

➔ Isometry what applies to the ..... muscle create a ……..…… with the ……

(*excitatory or inhibitory*?) effect …….. on the ……. muscle.

➔ Resistance what applies to the ..... muscle during the ……..

activate the ……..…… with the …… (*excitatory or inhibitory*?)

effect …….. on the muscle.

Pectoral Mare - SI – tehnica bilaterală (Secvențialitate pentru întărire)
Pectoralis Major - TE –bilateral variant (Timing for emphasis)
Bilateral variant → we use the strong muscle from the opposite site

Main action of the pectoralis major ……. ?

Pectoralis major - Hypotonic or hypertonic?

Initial position: Patient …….. , with ……..

PT …….. to the patient, with mobilizing hands

…… …… …….

Pectoralis Major - TE –bilateral variant (Timing for emphasis)

Moving times	Movement	Verbal Command	Technique
T1			
T2			

Neurophysiological explanations:

➔ Isometry what applies to the ..... muscle create a ……..…….

with the …… (*excitatory or inhibitory*?) effect …….. on the ……. muscle.

➔ Resistance what applies to the movement during the ……..

activate the ……..……. with the …… (*excitatory or inhibitory*?)

effect …….. on the muscle.

Agonistic Reversals (AR)

- Concentric contraction of the agonist
- Eccentric contraction of the agonist – in a short range of motion
- Concentric contraction of the agonist
- Eccentric contraction of the agonist – in a longer ROM but not complete
- …

➔ The eccentric contraction is made progressively.

- ***Increase strength of weaker muscles***
- ***Increase endurance of weaker muscles***
- ***Increase active range of motion***

Agonistic Reversals (AR)

Neurophysiological bases:

- is based on the stretch of the extrafusal fibers during the eccentric contraction – which enhance the immediately concentric contraction;
- Gamma Loup;
- Verbal commands - influences the cortex; have a exciting role for the hypotonic muscle tone.

Fesier mijlociu - IA (Inversare agonistică)
Middle Gluteus - *AI – Agonistic reversals*

Main action of the middle gluteus ……. ?

Middle gluteus - Hypotonic or hypertonic?

Initial position: Patient ……..……with the ipsilateral hip .....……..

PT …….. to the patient, with mobilizing hand

…… …… …….

and stabilizing hand …… …… .

Middle Gluteus - *AI – Agonistic reversals*

Moving times	Movement	Verbal Command	Technique
T1			
T2			
T3			
T4			

Neurophysiological explanations:

➔ Resistance what applies to the movement during the …….. activate the

…….…… with the …… (*excitatory or inhibitory*?) effect …….. on the muscle.

➔ Resistance what applies to the movement during the …….. promotes

…….. …… which increases the …… …… having

thus …….. (*excitatory or inhibitory*?) effect on the muscle.

Hold-relax Active Movement (HRAM)

- Isometric contraction of the agonist in the middle range of motion
- Relax + fast passive movements in a longer position
- Fast repeated stretch
- Concentric contraction of the agonist

- ***Increase strength of weaker muscles***
- ***Increase active range of motion***
- ***Motion initiation***

Hold-relax Active Movement (HRAM)

Neurophysiological bases:

- Stretch reflex;
- Ruffini receptors excited by a fast passive movements in a longer position;
- Coactivation phenomenon - simultaneous facilitation of alpha and gamma motoneurons triggered by isometric contraction in the short zone => increases the contraction force of the muscle performing the movement;
- Gamma Loup;
- Verbal commands - influences the cortex; have a exciting role for the hypotonic muscle tone.

Hold-relax Active Movement (HRAM) – for shoulder extensors

- Initial position: *Patient* in contralateral decubitus. *Physiotherapist*, behind the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the posterior face, by grabbing underneath, supporting the patient's forearm on their forearm position.

T	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Shoulder flexion (The physiotherapist quickly takes the patient's arm in flexion)	Relax!	Passive movement
T3	Flexions - extensions on low range of motion (archings) (The physiotherapist performs short repeated stretches of the shoulder extensors)	Relax!	Passive movement
T4	Shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors

Resisted Progression (RP)

- During the locomotion, tracking resistance is applied manually to facilitate pelvic motion and progression.

- the level of resistance is light so as to not disrupt the patient's momentum, coordination and velocity.

- RP can also be applied using elastic band resistance.

Indications: Impaired timing and control of lower trunk/pelvic segments during locomotion.

Neurophysiological bases: Gamma loup

Isometric contraction in a short zone (ICS)

- Alternative isometric contractions (for agonist and antagonist), close to the point where the muscles are maximally shortened,

  =► *on each direction of a joint movement.*

- ***it is intended to restore the sensitivity of the muscular spindle to the short range.***
- ***increase strength of weaker muscles in a short zone.***

Isometric contraction in a short zone (ICS)

Neurophysiological bases:

- When the muscle is short, the muscle spindle is short and the Ruffini receptors send the inhibition signal to alfa motoneurons for inhibite the muscle.

→ thus, when a voluntary contraction of the shortened muscle is generated, the facilitatory impulses from the cortex with the fusale inhibitory impulses ***"will compete"***.

PNF Techniques with inhibitory character

1.Rhythmic Rotation (RR) (***RR***)

2.Hold-Relax (HR) (***RO***)

- antagonist (by applying the technique on hyperton muscle)

- agonist (by applying the technique on the muscle which make the limitation motion)

3. Contract-Relax (CR) (***RC***)

4. Rhythmic Stabilization (RS) (***SR***)

- *+ Slow Reversals and Slow Reversals Hold (SR and SRH)* ***(IL and ILO)***

Rhythmic Rotation (RR)

- slow, repeated rotation of a limb at a point where limitation is noticed
- As muscles relax the limb is slowly and gently moved into the new range.
- As a new tension is felt, RR is repeated.

- We start RR passively and after that the patient can use active movements.

Indications Relaxation of excess tension in the muscles (hypertonia).

Increase active range of motion

Rhythmic Rotation (RR)

Neurophysiological bases:

- Verbal commands - influences the cortex; have a inhibitive role for the hypertonic muscle tone;
- Joints mechanoreceptors - excited by rotation cause inhibition of alpha motoneurons and periarticular muscles.

Hold-Relax (HR)

- isometric contraction of the restricted muscle at a limitation point

followed by

- passive stretch

Repeats this procedure in a new range

Effects:

- lengthening the restricted muscle
- increase ROM
- facilitation of opposite muscle

Is based on autogenic inhibition, which relaxes a muscle after a sustained contraction has been applied to it.

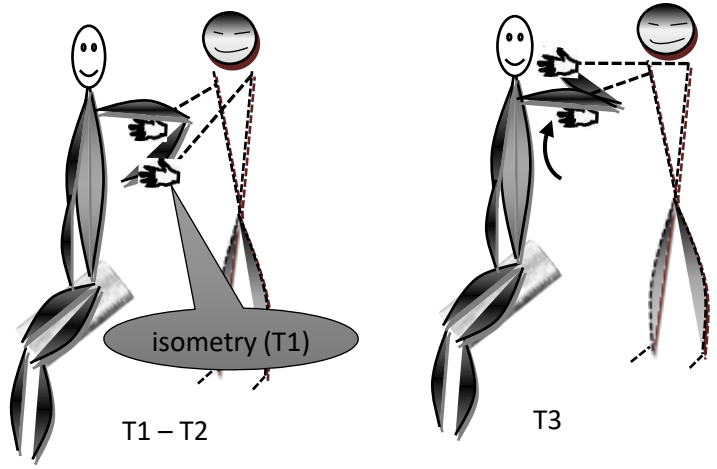
Neurophysiological bases:

- autogenic inhibition phenomenon, which relaxes a muscle after a sustained contraction has been applied to it.
- fatigue of motor units
- Golgi tendon reflex;
- Renshaw Circuit.

Hold-Relax (HR) – for shoulder internal rotators

• Variant: Antagonist HR: Initial position: *Patient* sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder externally rotated at the point of mobility limitation. *Physiotherapist* behind - ipsilateral to the patient, stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it and the mobilizing hand on the distal third of the forearm, the medial face

T	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators
T2	Maintaining	Relax!	Relaxation
T3	Arm external rotation on the trunk	Relax! (The physiotherapist tries to overcome the initial point of mobility limitation)	Passive stretch of the shoulder internal rotators
T4 – T6	Repeat times 1 - 3.		



HR technique for shoulder internal rotators

Hold – relax – contraction (HR - C)

- Isometric contraction of the restricted muscle (*HR antagonist*) or of the hipotonmuscle (*HR agonist*) in a limitation point

followed by

- Concentric contraction of the agonist (activ stretching of the antagonist).

- *Repeats this procedure in a new range.*

Effects:

- lengthening the restricted (hyperton) muscle
- increase ROM
- facilitation of opposite muscle

Contract-Relax (CR)

- isometric contraction of the restricted muscle in a limitation point

with

- slow, repeated rotation of a limb

Effects:

- increase ROM
- facilitation of opposite muscle
- lengthening the restricted muscle

Neurophysiological bases:

- fatigue of motor units
- Golgi tendon reflex;
- Renshaw Circuit;
- Joints mechanoreceptors - excited by rotation cause inhibition of alpha motoneurons and periarticular muscles.

Contract-Relax (CR) – for wrist extensors

• Initial position: *Patient* in sitting with the forearm in prono supine position, resting on a support and the wrist in flexion at the point of mobility limitation. *Physiotherapist* ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the posterior face, and mobilizing hand grasping the patient's hand on the dorsal side of the hand, at the level of the metacarpals.

T	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand, towards extension!	Isometric contraction of the wrist extensors
T2	Maintaining flexion wrist position + wrist pronation	Extend the wrist and let me rotate your hand!	Isometric contraction of the wrist extensors + wrist pronation passive movement
T3	Maintaining flexion wrist position + wrist supination	Extend the wrist and let me rotate your hand!	Isometric contraction of the wrist extensors + wrist supination passive movement
T4	Maintaining flexion wrist position + wrist pronation	Extend the wrist and rotate the hand with the palm down with me!	Isometric contraction of the wrist extensors + wrist pronation passive-active movement
T5	Maintaining flexion wrist position + wrist supination	Extend the wrist and rotate the hand with the palm up with me!	Isometric contraction of the wrist extensors + wrist supination passive-active movement

Rhythmic Stabilization (RS)

- an isometric contraction of the agonist followed quickly by an isometric contraction of the antagonist.

Or

We can use a two-*joint* muscle for simultanly isometric contraction of the agonist and antagonist muscles.

- ***Promoting cocontraction***
- *Relaxation of the hypertonic muscle*
- *strengthen joint musculature*
- *improve proprioception*
- *Improve stabilization, control and balance*.

Neurophysiological bases:

- Reciprocal inhibitory reflex – isometry of the agonist muscle;
- Fatigue of motor units - isometry of the antagonist muscle;
- Golgi tendon reflex;
- Renshaw Circuit.

PNF Techniques with general character

1. Rhythmic Initiation (RI) (***IR***)
2. Alternating Isometrics (AI) (***IzA***)
3. Normal Timing (NT) (***Sn***)

Rhythmic Initiation (RI)

- Slow, passive movements

progressing to

- active assisted

and

- active resisted movements.

- ***Improve initiation of movement***
- ***Relaxation of rigid muscle***
- ***Balancing agonist-antagonist tone***

Neurophysiological bases:

- Verbal commands - influences the cortex; have a inhibitor role for the hypertonic muscle tone;
- Balancing agonist-antagonist tone
- Ruffini receptors excited by a the passive movements in a longer position; the agonist stretching progressively => facilitatings impulses to the alpha motoneuron

Alternating Isometrics (AI)

- isometric contractions rhythmically, in every point of ROM, for agonist and antagonist, *with no relaxation occurring between contractions.*

Alternative isometric contractions are made in all directions of joint movement

- This technique encourages stability of the joint

Neurophysiological bases:

- Cocontraction leads to facilitation of alpha and gamma motoneurons;
- Joints mechanoreceptors – with a role in the stability of the loading postures (telescoping).

Normal Timing (NT)

- Performed a task in a distal to proximal sequence.
- Proximal components are restricted until the distal components are activated and initiate movement.

- improve coordination of all components of a task.
- Repetition of the pattern produces a coordinated movement of all components.

Neurophysiological bases:

- learning correct motion engrams involves learning and repeating movements from the distal to the proximal;
- Gamma loup.