Dorina Ianc Anca Deac

Neuroproprioceptive facilitation techniques

Practical applications for the upper limb

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2020

Referenţi ştiinţifici:

Prof. univ. dr. Carmen Șerbescu
Conf. univ. dr. Angela Bucur

ISBN 978-606-37-0902-9

Universitatea Babeş-Bolyai
Presa Universitară Clujeană
Director: Codruţa Săcelean
Str. Hasdeu nr. 51
400371 Cluj-Napoca, România
Tel./fax: (+40)-264-597.401
E-mail: editura@ubbcluj.ro
http://www.editura.ubbcluj.ro/

Content

Proprioceptive neuromuscular facilitation (PNF)

Proprioceptive neuromuscular facilitation (PNF) uses the body's proprioceptive system to ease or inhibit muscle contraction. These techniques are based on Sherrington's reciprocal inhibition, innervation and irradiation principles (1).

PNF techniques were developed in the 1940-1950 and they are the result of Kabat's, Knott's and Voss's work (1, 2). They combine the research of functional movement with theories of motor development, motor control, motor learning and neurophysiological theories (3).

Harman Kabat first used the PNF techniques on young people with cerebral palsy and other neurological disorders (2, 4).

D. Voss defines neuroproprioceptive facilitation as a promotion or acceleration method of the neuromuscular system's response by proprioceptors' stimulation. The muscles must work in synergy in order to achieve the movement. This requires that the muscles should have the reflex capacity of contraction and relaxation to perform the basic movement. The basis of functional training is the ability to create a balance between mobility and stability (5).

PNF techniques are used in many areas of physical therapy and sportive training, except neurological rehabilitation. They can be used to decrease muscle tone, leading to important gains in the range of motion and functionality, as well as in decreasing pain and discomfort (6, 7).

Many PNF techniques can be included in the exercise programs to improve coordination, movement and stability.

PNF is a useful tool which should be understood and used according to the followed objectives by all professionals in sports and physical therapy.

PNF techniques are today an integrated part of the basic formation of physiotherapists from several countries.

In the following chapters, in order to be easier for students and physiotherapists to learn, these techniques were described in a systematized manner on moving times, analytically, on the muscles which act upon the shoulder, elbow and fist. The drawings were made by the author with the attempt to show the technique in the most intelligible scheme as possible.

PNF techniques can be grouped in two wide parts, according to their effect upon muscle tone: PNF techniques for toning and PNF techniques for muscle inhibition. In addition, in this book, the PNF techniques with increasing effect on articular activity were separately emphasized.

The described techniques are:

Slow Reversals (SR)	It consists of concentric contraction on the antagonists and agonists, on the range of motion, without pause between reversals.
Slow Reversals Hold (SRH)	It consists of concentric contraction of the agonist followed by its isometric contraction at the end of the range of motion, after which the same thing is done on the antagonist (concentric contraction on the entire range of motion plus isometric contraction at the end of the movement arch).
Repeated Contraction (RC)	It is applied differently, depending on the muscle strength of the agonist: • when the muscle has a strength of 0 - 1, in the position where the muscle is almost maximally stretched, the physical therapist performs rapid, short, repeated stretches of the muscle; • when the muscle has a strength of 2 - 3, concentric contractions are performed, and every now and then, during the movement, the physical therapist performs rapid, short, repeated stretches of the muscle; • when the muscle has a strength of 4 - 5, but in some points of the range of motion it has a weaker strength (hollow of strength): concentric contraction with resistance is realized until the point where a strength gap is felt; at this point an isometric contraction is performed, followed by relaxation; the physical therapist applies the rapid, short, repeated stretchings of the muscle and continues with concentric contraction with resistance up to a new hollow of strength.
Agonistic Reversals (AR)	It consists of the concentric contraction of the agonist on the entire range of motion, followed by its eccentric contraction on small amplitude; without any pause period, the concentric and eccentric contraction is repeated with the purpose

	of gradually increasing the eccentric contraction amplitude.
Timing for Emphasis (TE)	An isometric contraction is made on the strong muscles from the movement chain it is part of, and the hypotonic muscle, and the concentric contraction of the hypotonic muscle is made on the entire range of motion, maintaining the isometric contraction of the strong muscle.
Hold-relax Active Movement (HRAM)	It consists of the isometric contraction of the hypotonic agonists in the medium towards short range, followed by sudden relaxation; then the physical therapist quickly takes the patient's segment in the long range of the agonists, close to the maximum elongation limit; here, they apply 2 – 3 short, fast, repeated stretches (archings); a concentric contraction follows with resistance of agonists on the entire possible range of motion.
Rhythmic Initiation (RI)	It consists of passive movements of the segment on the entire range of motion, in both movement directions (on agonist and antagonist), followed by passive-active movements and gradually getting to active movements.
Rhythmic Stabilization (RS)	It consists in isometric contractions of agonists and antagonists, without pause between them – to achieve cocontraction.
Rhythmic Rotation (RR)	It consists of rotation movements, the segment being positioned in the movement limitation point; passive internal-external rotation is performed, followed by passive-active rotation movements and gradually getting to active rotation movements.
Hold-Relax (HR)	It consists of the isometric contraction of agonists or antagonists, followed by relaxation, after which the passive stretching of antagonists is performed. The technique is applied in the movement limitation point.
Hold-Relax-Contract (HR-C)	It consists of the isometric contraction of agonists or antagonists, followed by relaxation, after

	which the active stretching of antagonists is performed. The technique is applied in the movement limitation point.
Contract-Relax (CR)	It consists of the isometric contraction of the antagonist (the hypertonic muscle), at the same time with the passive rotation movement, followed by passive-active rotation movements and gradually getting to active rotation movements. The technique is applied in the movement limitation point.
Isometric contraction in a short range (ICS)	It consists of repeated isometric contractions in the point where the muscle is shortened to the maximum and it is performed in turn for all the muscles around the joint.
Alternating Isometrics (AI)	Alternative isometric contractions are made on agonists and antagonists in all the points of the movement arch and in all directions of joint movement.

PNF techniques for toning the Anterior Deltoid

Action: Arm flexion on the trunk (shoulder flexion)
Synergist muscles: Coracobrachialis
Accessory muscles: Middle Deltoid, Pectoralis Major (the clavicular part), Biceps Brachii, Supraspinatus, Serratus Anterior, Trapezius
Other actions: Internal rotation of the arm on the trunk

Fig. 1. Anterior Deltoid muscle (8)

1. ***SR (Slow reversals)***

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 (fig.2).

The technique starts on the antagonist (on the shoulder).

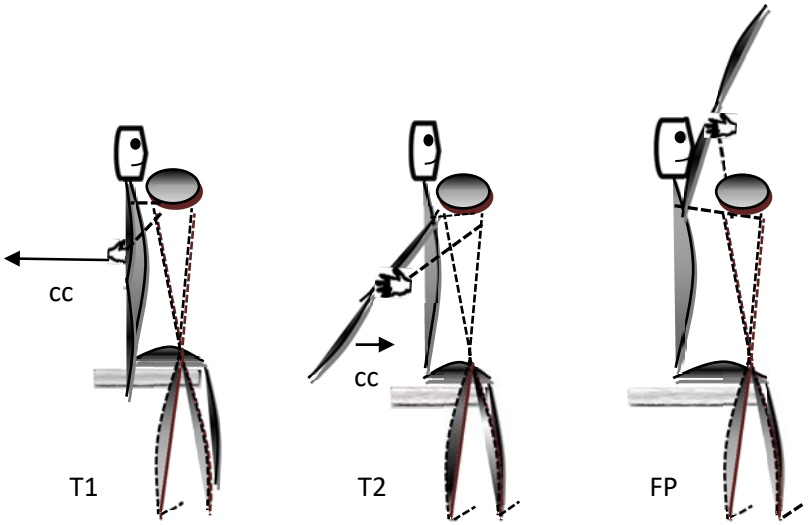

Fig. 2. SR technique for anterior deltoid
(cc = concentric contraction, FP = final position)

Moving times	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

2. ***SRH (Slow reversals hold)***

Initial position:

Patient sitting with the shoulder in extension.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the anterior face (fig. 3).

Moving times	Movement	Verbal command	Technique
T1	Shoulder flexion	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid
T2	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T3	Shoulder extension *(Mobilizing hand switches on the posterior face of the arm)*	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T4	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors

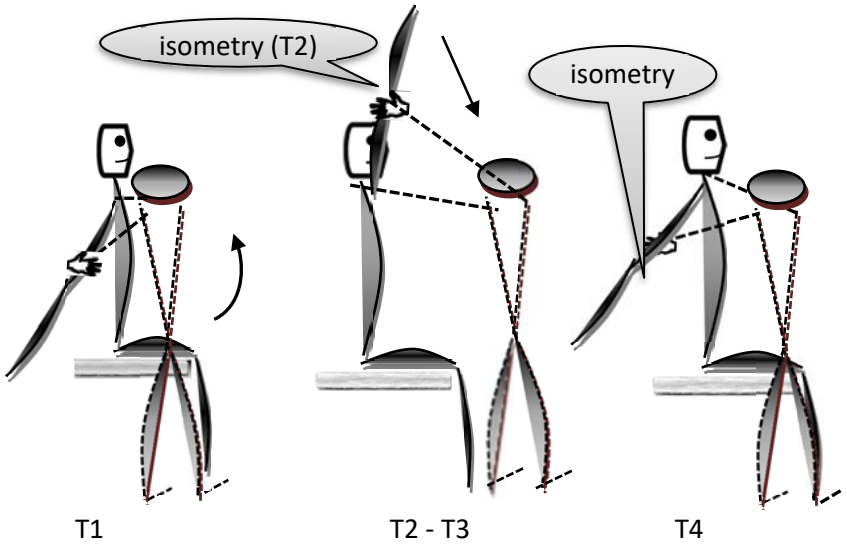

Fig. 3. SRH technique for anterior deltoid

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 4)
Initial position:

Patient in contralateral decubitus with arm extended on the trunk.

Physiotherapist behind the patient, stabilizing hand on the shoulder, mobilizing hand underneath, on the distal third of the arm, the anterior face. The patient's forearm rests on the physiotherapist's forearm.

Moving times	Movement	Verbal command	Technique
T1	Extensions - flexions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the anterior deltoid)*	Relax!	Passive movement
T2	Extensions - flexions on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the anterior deltoid)*	Contract! (Try to flex your arm on the trunk!)	Passive movement

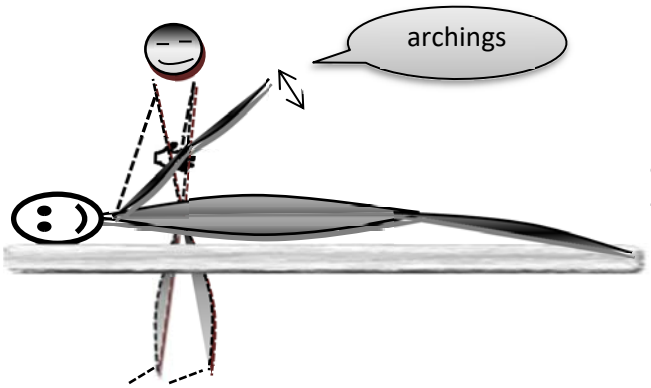

Fig. 4. RC technique for anterior deltoid
- For strength 0 - 1

For strength 2-3 (fig. 5)
Initial position:

Patient in contralateral decubitus with arm extended on the trunk.

Physiotherapist behind the patient, mobilizing hand underneath, on the distal third of the arm, the anterior face, supporting the arm and forearm and stabilizing hand on the shoulder.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	20º arm flexion on the trunk	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid
T2	Short extensions – flexions of the shoulder (archings) *(The physiotherapist performs short, repeated stretches of the anterior deltoid)*	Continue to flex!	Passive movement
T3	20º arm flexion on the trunk	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid

T4	Short extensions – flexions of the shoulder on low range of motion (archings) *(The physiotherapist performs short, repeated stretches of the anterior deltoid)*	Continue to flex!	Passive movement
T5	It is continued on the entire range of motion.		

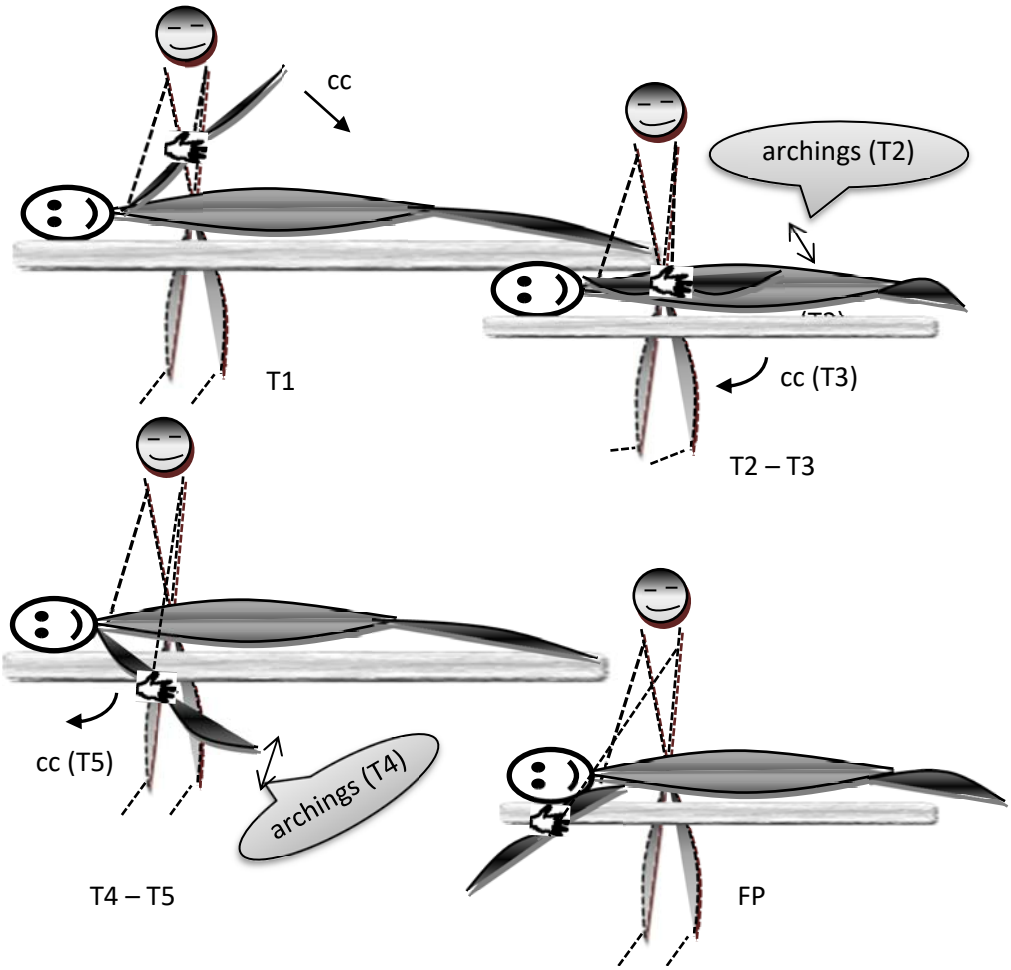

Fig. 5. RC technique for anterior deltoid - For strength 2 – 3
(cc = concentric contraction, FP = final position)

For strength 4-5 (fig. 6)

Initial position:

Patient in sitting.

Physiotherapist, ipsilateral to the patient, mobilizing hand on the distal third of the arm, the anterior face and stabilizing hand on the shoulder.

Moving times	Movement	Verbal command	Technique
T1	Arm flexion on the trunk – to the point where a hollow of strength can be felt	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid
T2	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T3	Maintaining	Relax!	Relaxation
T4	Extensions–flexions on low range of motion (archings) *(The physiotherapist performs short, repeated stretches of the anterior deltoid)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

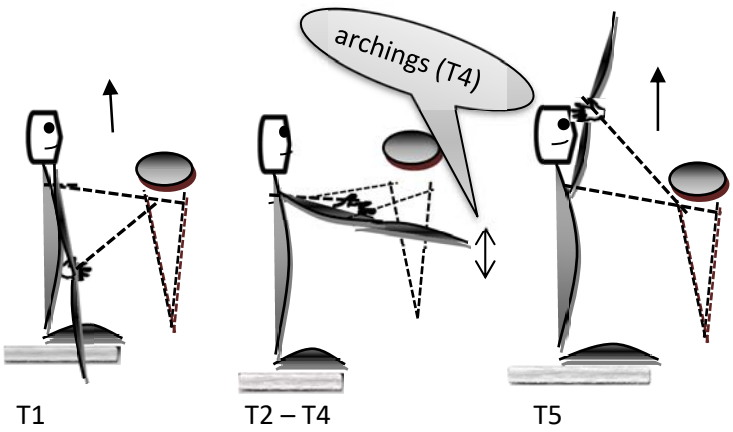

Fig. 6. RC technique for anterior deltoid - For strength 4 - 5

4. ***AR (Agonistic reversal)***

Initial position (fig. 7 a and b):

Patient in sitting.

Physiotherapist, ipsilateral to the patient, mobilizing hand on the distal third of the arm, the anterior face and stabilizing hand on the shoulder.

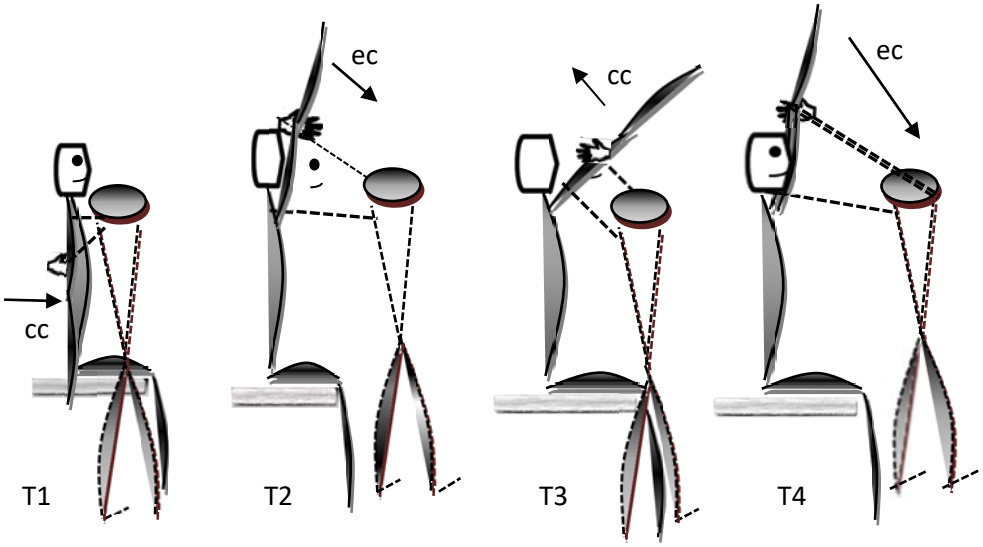

Fig. 7a. AR technique for anterior deltoid: T1 – T4
(cc = concentric contraction; ec = eccentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Arm flexion on the trunk	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid
T2	20° arm extension on the trunk	Hold, do not let me lower your arm!	Eccentric contraction of the anterior deltoid
T3	Arm flexion on the trunk	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid
T4	40° arm extension on the trunk	Hold, do not let me lower your arm!	Eccentric contraction of the anterior deltoid

T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.

Attention: During the entire technique, the mobilizing hand remains on the anterior face of the arm and the patient will try to push towards flexion!

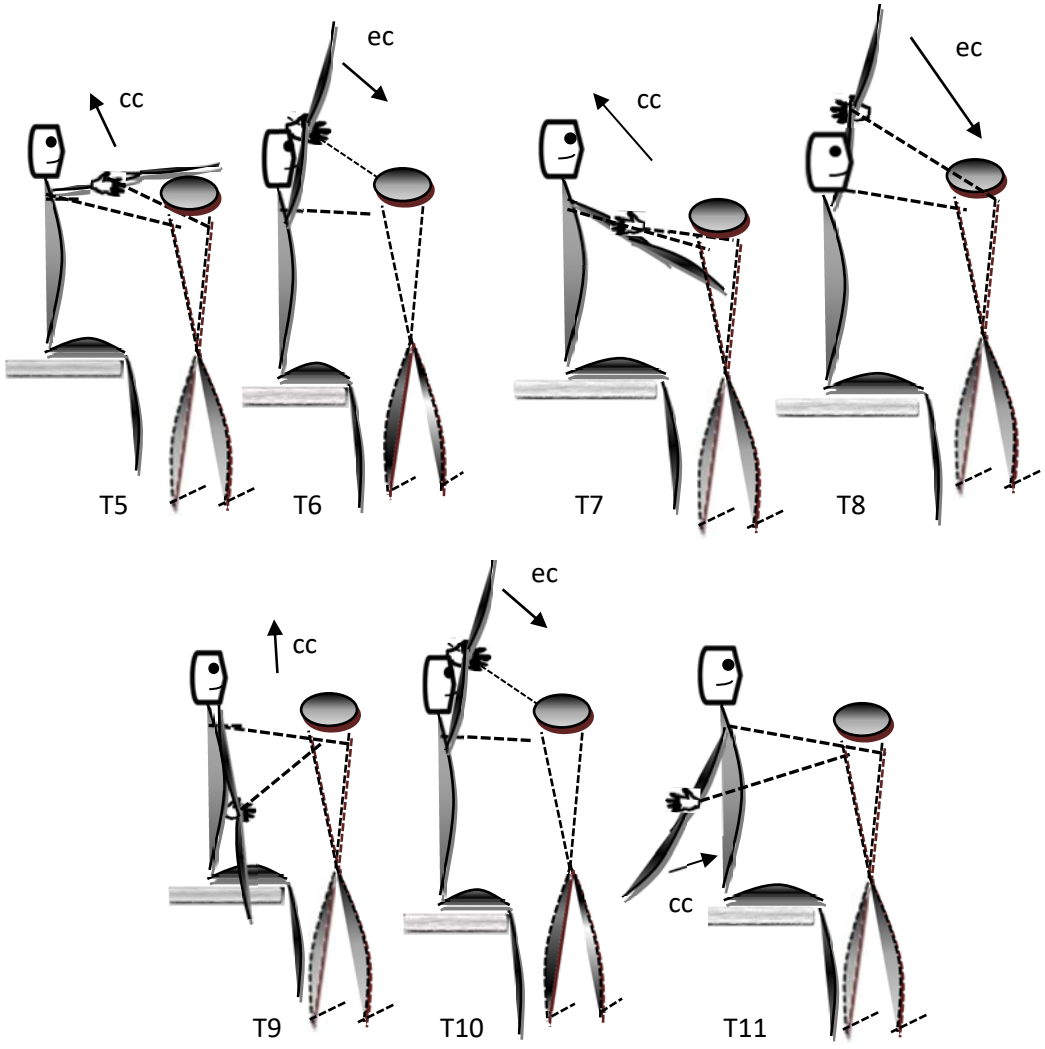

Fig. 7b. AR technique for anterior deltoid: T5 – T11
(cc = concentric contraction; ec = eccentric contraction)

5. *TE (Timing for emphasis)*

Objective: toning the anterior deltoid muscle of the left arm.
Variant 1 (bilateral) (fig. 8)
Initial position:

Patient in sitting, with right arm flexed on the trunk at 90°.

Physiotherapist, in front of the patient, mobilizing hands on the distal third of both arms, the anterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right arm)	Push your right arm in my hand!	Isometric contraction for the right anterior deltoid
T2	Maintaining (right arm) + flexion of left arm on the trunk	Push in my hands! (Maintain right arm in the same position and flex left arm on the trunk!)	Isometric contraction of right anterior deltoid + concentric contraction of the left anterior deltoid

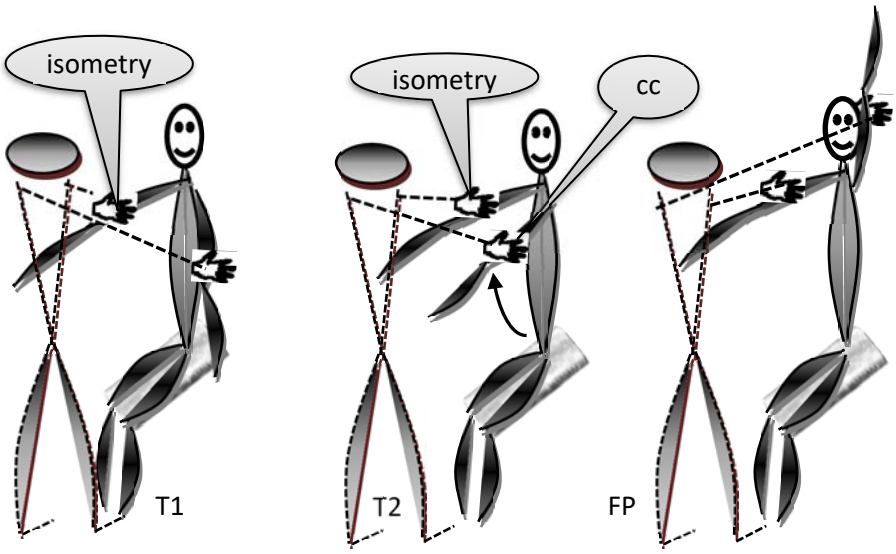

Fig. 8. TE technique for anterior deltoid – variant 1
(cc = concentric contraction; FP = final position)

Variant 2 (unilateral) (fig. 9)
Initial position:

Patient in sitting, with forearm flexed on the arm at 90°.

Physiotherapist, ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the anterior face, and the other mobilizing hand on the distal third of the arm, the anterior face.

We use the biceps brachii muscle which goes into the kinetic chain which makes the Kabat diagonals D1 and D2 of flexion for the upper limbs, together with the anterior deltoid.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position	Push your forearm in my hand!	Isometric contraction for the brachial biceps
T2	Maintaining forearm position + arm flexion on the trunk	Push your forearm and arm in my hands! (Maintain the forearm in the same position and raise your arm!)	Isometric contraction of the brachial biceps + concentric contraction of the anterior deltoid

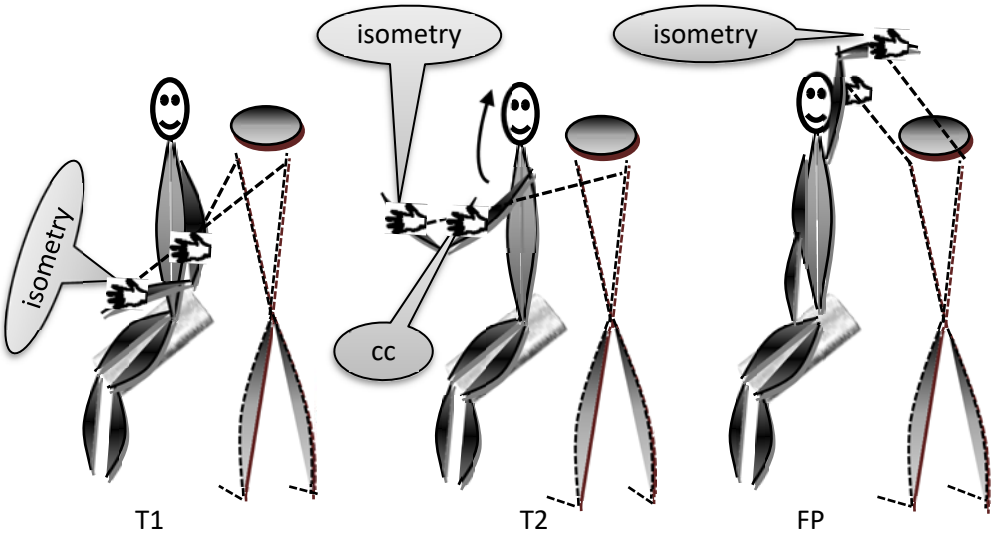

Fig. 9. TE technique for anterior deltoid – variant 2
(cc = concentric contraction; FP = final position)

6. ***HRAM (Hold-Relax Active Movement)***

Initial position:

Patient in contralateral decubitus, with arm flexed on the trunk at 90°.

Physiotherapist, behind the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting the patient's forearm on their forearm (fig.10).

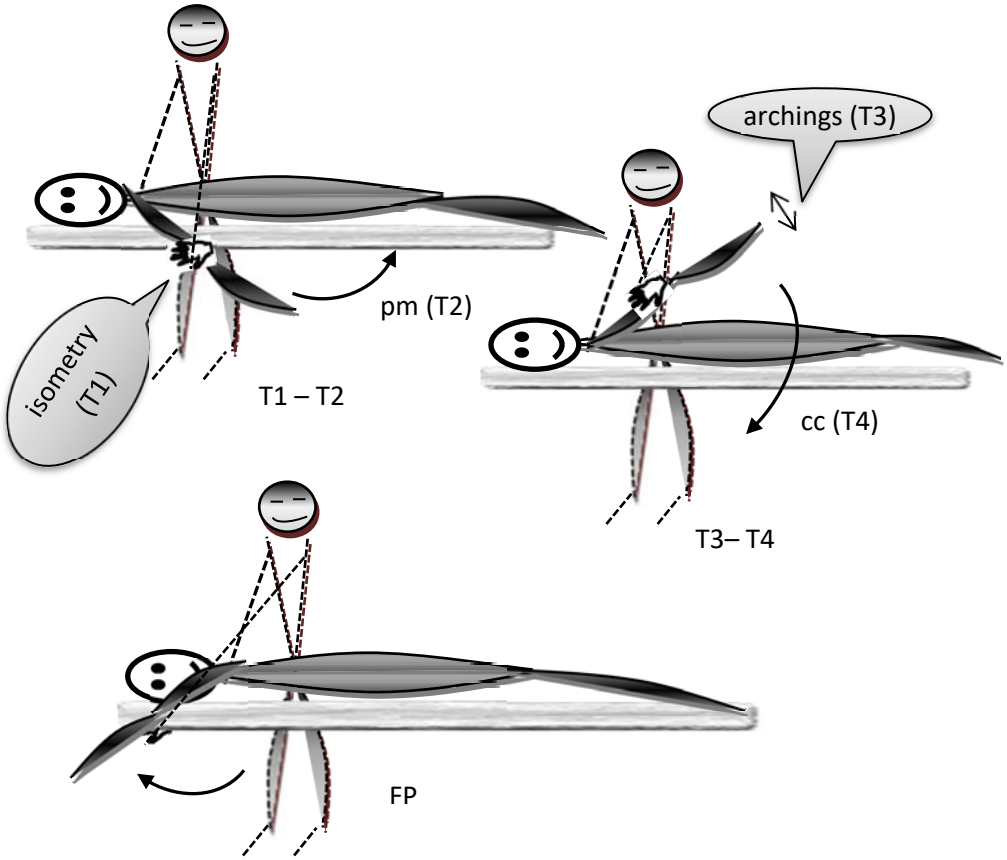

Fig. 10. HRAM technique for anterior deltoid
(pm = passive movement; cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Arm extension on the trunk (*The physiotherapist quickly takes the patient's arm in extension*)	Relax!	Passive movement
T3	Extensions - flexions on low range of motion (archings) *(The physiotherapist performs short repeated stretches of the anterior deltoid)*	Relax!	Passive movement
T4	Shoulder flexion	Push in my hand! (Flex your arm on the trunk!)	Concentric contraction of the anterior deltoid

7. ***RI (Rhythmic initiation)***

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 by grabbing it from the lateral (fig. 11).

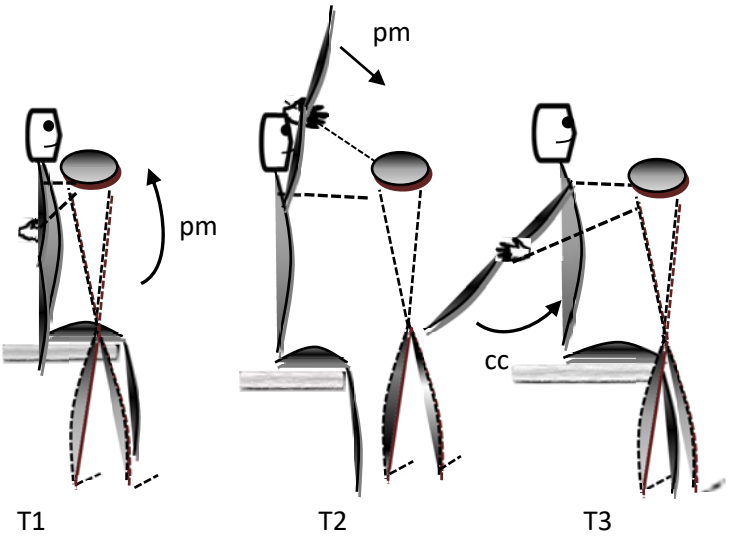

Fig. 11. RI technique for anterior deltoid
(pm = passive movement; cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Arm flexion on the trunk	Relax, let me move your arm!	Passive movement
T2	Arm extension on the trunk	Relax, let me move your arm!	Passive movement
T3	Arm flexion on the trunk	Move your arm together with me!	Concentric contraction of the anterior deltoid – passive-active movement
T4	Arm extension on the trunk	Move your arm together with me!	Concentric contraction of the arm extensors on the trunk – passive-active movement
T5	Arm flexion on the trunk	Flex your arm on the trunk!	Concentric contraction of the anterior deltoid – active movement

T6	Arm extension on the trunk	Extend your arm on the trunk!	Concentric contraction of the arm extensors on the trunk – active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the anterior deltoid, the technique is started with the arm slightly flexed on the trunk, while when we want to obtain its inhibition in order to increase the range of motion in extension, the technique is started in the limitation point of the movement, i.e., with the arm extended on the trunk (fig. 12).

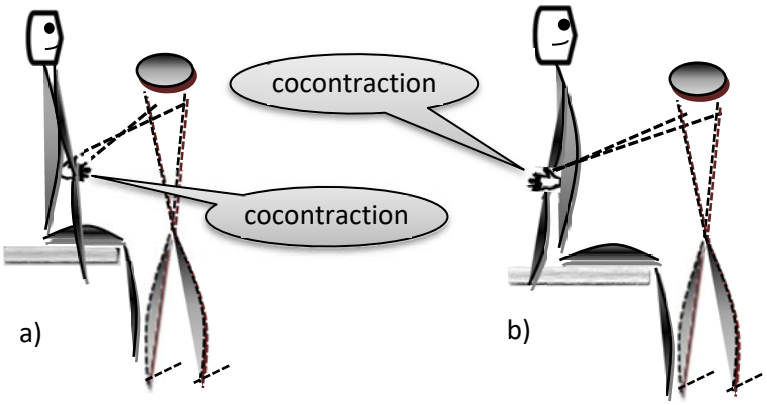

Fig. 12. RS technique for anterior deltoid: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Anterior Deltoid Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the shoulder in extension at the point of mobility limitation and the elbow flexed 90°.

Physiotherapist, ipsilateral to the patient with mobilizing hand on the distal third of the forearm by grasping it and stabilizing hand on the distal third of the arm, supporting it (fig. 13).

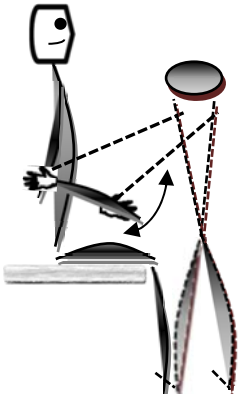

Fig. 13. RR technique for anterior deltoid

Moving times	Movement	Verbal command	Technique
T1	Shoulder Internal Rotation *(The physiotherapist lead the patient's forearm toward the midline, thus making the internal rotation of the shoulder)*	Relax, let me move your arm!	Passive movement
T2	Shoulder External Rotation	Relax, let me move your arm!	Passive movement
T3	Shoulder Internal Rotation	Move your arm with me!	Passive – active movement

T4	Shoulder External Rotation	Move your arm with me!	Passive – active movement
T5	Shoulder Internal Rotation	Rotate the arm internally on the trunk!	Active movement
T6	Shoulder External Rotation	Rotate the arm externally on the trunk!	Active movement

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as is the anterior deltoid in this case*)

Initial position:

Patient in sitting with the shoulder in extension.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the anterior face (fig. 14).

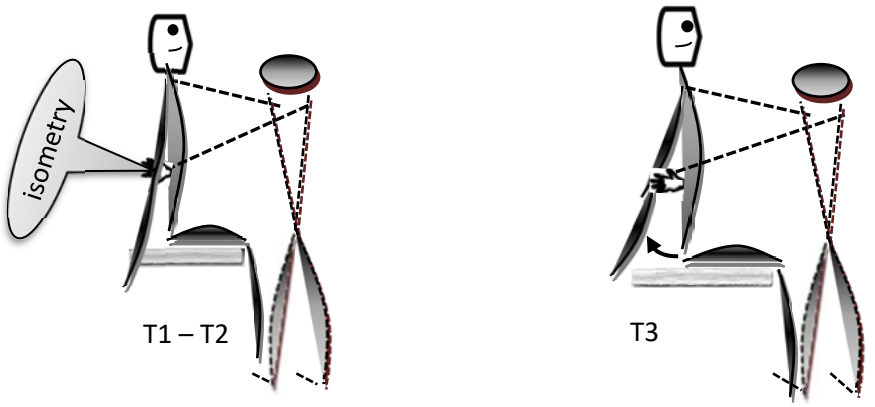

Fig. 14. HR technique for anterior deltoid

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining	Relax!	Relaxation

T3	Shoulder extension	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the anterior deltoid
T4 – T6	Repeat times 1 - 3		

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, as is the shoulder extensors in this case*)
Initial position:

Patient in sitting with the shoulder in extension.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the posterior face (fig. 14).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder extension	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the anterior deltoid
T4 - T6	Repeat times 1 - 3		

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient in sitting with the shoulder in extension.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the anterior face (fig. 14).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining	Relax!	Relaxation
T3	Shoulder extension	Extend your arm on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder extensors (Active Stretching of the anterior deltoid)
T4 - T6	Repeat times 1 - 3		

Version: Agonist HR-C
Initial position:

Patient in sitting with the shoulder in extension.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the posterior face (fig. 14).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder extension	Extend your arm on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder extensors (Active Stretching of the anterior deltoid)
T4 – T6	Repeat times 1 - 3		

CR (Contract - Relax)

Initial position:

Patient in sitting with the shoulder in extension at the mobility limit and the elbow flexed 90°.

Physiotherapist, posterior - ipsilateral to the patient with mobilizing hand on the distal third of the forearm by grasping it and another hand on the distal third of the arm, the anterior face (fig. 15).

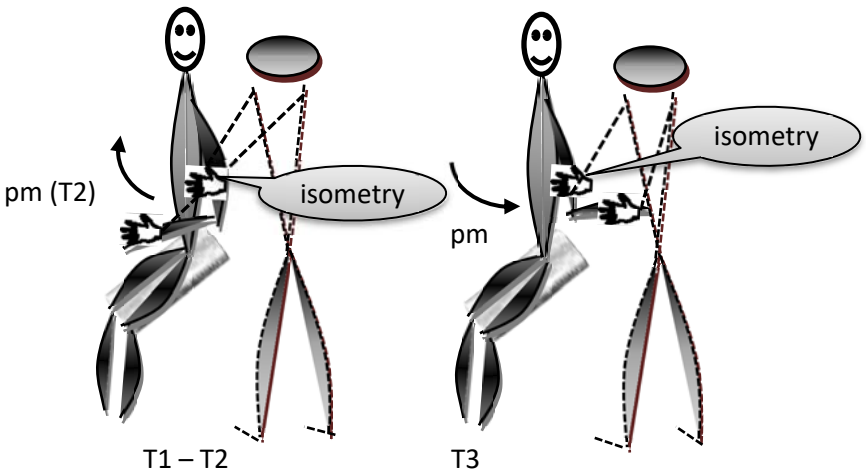

Fig. 15. CR technique for anterior deltoid
(pm = passive movement)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining extension arm position + Internal shoulder rotation	Flex your arm on the trunk and let me rotate your shoulder! *(The physiotherapist*	Isometric contraction of the anterior deltoid + passive movement of internal rotation of the shoulder

		leads the patient's forearm toward the midline, thus making the internal rotation of the shoulder)	
T3	Maintaining extension arm position + External shoulder rotation	Flex your arm on the trunk and let me rotate your shoulder! *(The physiotherapist leads the patient's forearm toward the lateral, thus making the external rotation of the shoulder)*	Isometric contraction of the anterior deltoid + passive movement of external rotation of the shoulder
T4	Maintaining extension arm position + Internal shoulder rotation	Flex your arm on the trunk and do the internal shoulder rotation with me!	Isometric contraction of the anterior deltoid + passive- active movement of internal rotation of the shoulder
T5	Maintaining extension arm position + External shoulder rotation	Flex your arm on the trunk and do the external shoulder rotation with me!	Isometric contraction of the anterior deltoid + passive- active movement of external rotation of the shoulder

5. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 16a)
Initial position:

Patient in sitting with the shoulder in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the arm, in the anterior face and another mobilizing hand on the distal third of the arm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the shoulder extensors
T3	Maintaining *(The physiotherapist pushes the patient's arm toward both flexion and extension, alternating more and more rapidly between the two directions)*	Hold, don't let me move your arm!	Cocontraction for anterior deltoid and shoulder extensors
T4	Maintaining	Relax!	Relaxation

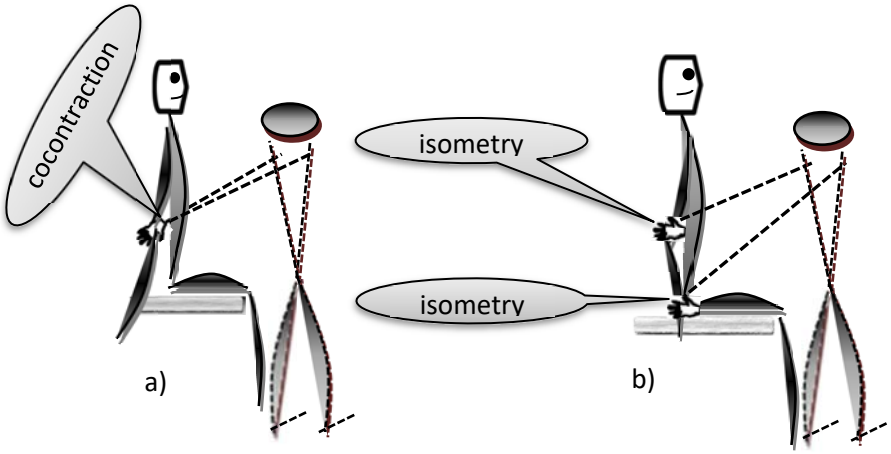

Fig. 16. RS technique for anterior deltoid: a) alternative version; b) simultaneous version

Simultaneous version (fig. 16b)
Initial position:

Patient in sitting with the shoulder in extension at the point of mobility limitation and the elbow slightly flexed.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the arm, the anterior face and another mobilizing hand on the distal third of the forearm, the posterior face.

We use the triceps brachial muscle, biarticular muscle, which realizes the extension of the elbow but also participates in the shoulder extension, thus being an antagonist of the anterior deltoid.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Flex the arm on the trunk and extend the elbow!	Isometric contraction of the anterior deltoid and the triceps brachial (Cocontraction)
T2	Maintaining	Relax!	Relaxation

6. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Shoulder Extensors

Action: Arm extension on the trunk (shoulder extension)
Synergist muscles: Latissimus Dorsi, Posterior Deltoid, Teres major
Accessor muscles: Triceps Brachii – the long head
Other actions: Adduction and internal rotation of the arm on the trunk (Latissimus Dorsi and Teres major); External shoulder rotation (Posterior Deltoid).

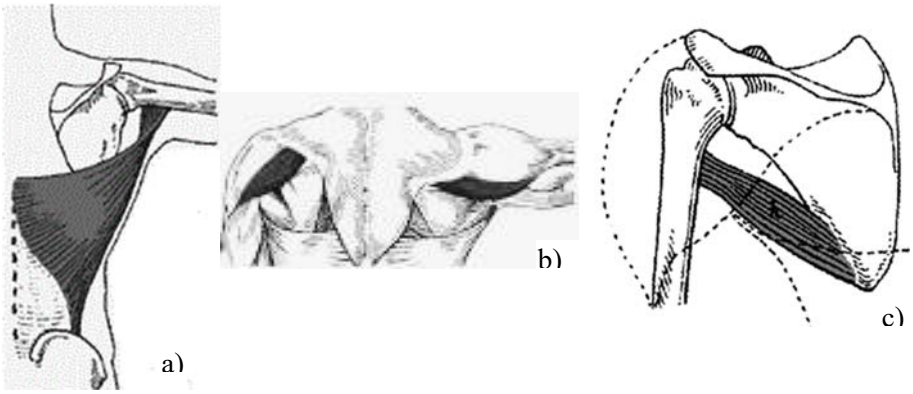

Fig. 17. a) Latissimus Dorsi; b) Posterior Deltoid; c) Teres major (9)

1. ***SR (Slow reversals)***

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 anterior face (fig. 18).

The technique starts on the antagonist (on the anterior deltoid in this case).

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

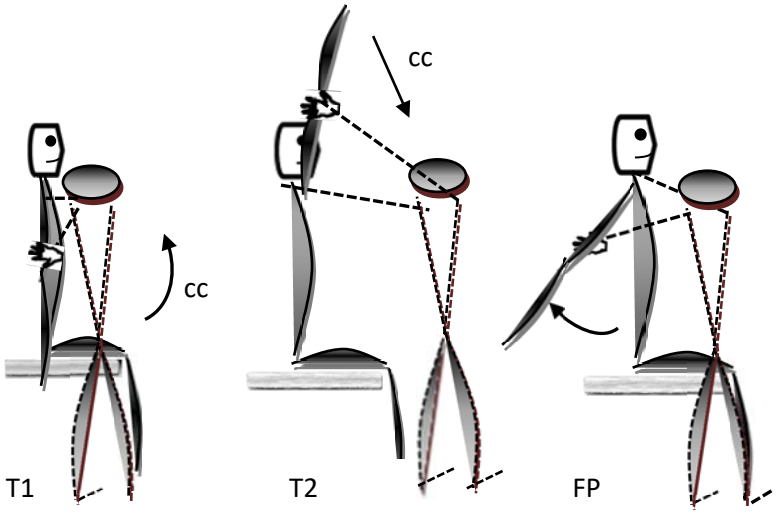

Fig. 18. SR technique for shoulder extensors
(cc = concentric contraction, FP = final position)

2. ***SRH (Slow reversals hold***

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 (fig. 19).

Moving times	Movement	Verbal command	Technique
T1	Shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T3	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
T4	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid

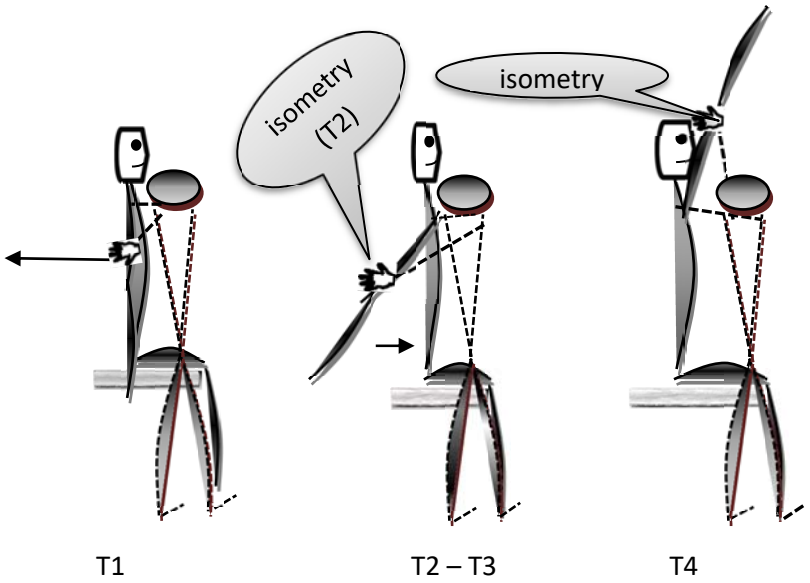

Fig. 19. SRH technique for shoulder extensors

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 20)
Initial position:

Patient in contralateral decubitus with arm flexed on the trunk.

Physiotherapist behind the patient, stabilizing hand on the shoulder, mobilizing hand underneath, on the distal third of the arm, the posterior face. The patient's forearm rests on the physical therapist's forearm.

Moving times	Movement	Verbal command	Technique
T1	Flexions-extensions on small range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder extensors)*	Relax!	Passive movement
T2	Flexions-extensions on small range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder extensors)*	Contract! (Try to extend your arm on the trunk!)	Passive movement

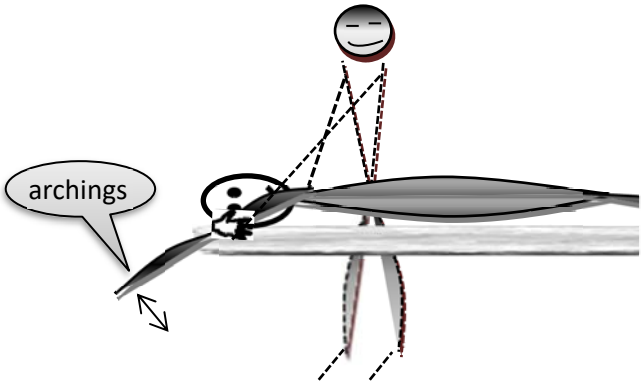

Fig. 20. RC technique for shoulder extensors
- For strength 0 – 1

For strength 2-3 (fig. 21)
Initial position:
Patient in contralateral decubitus with arm flexed on the trunk.

Physiotherapist behind the patient, mobilizing hand underneath, on the distal third of the arm on the posterior face, supporting the arm and forearm and stabilizing hand on the shoulder.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	20º shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T2	Short flexions - extensions of the shoulder (archings) *(The physiotherapist performs short, repeated stretches of shoulder extensors)*	Continue to extend your arm on the trunk!	Passive movement
T3	20º shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T4	Short flexions - extensions of the shoulder (archings) *(The physiotherapist performs short, repeated stretches of shoulder extensors)*	Continue to extend your arm on the trunk!	Passive movement
T5	It is continued on the entire range of motion.		

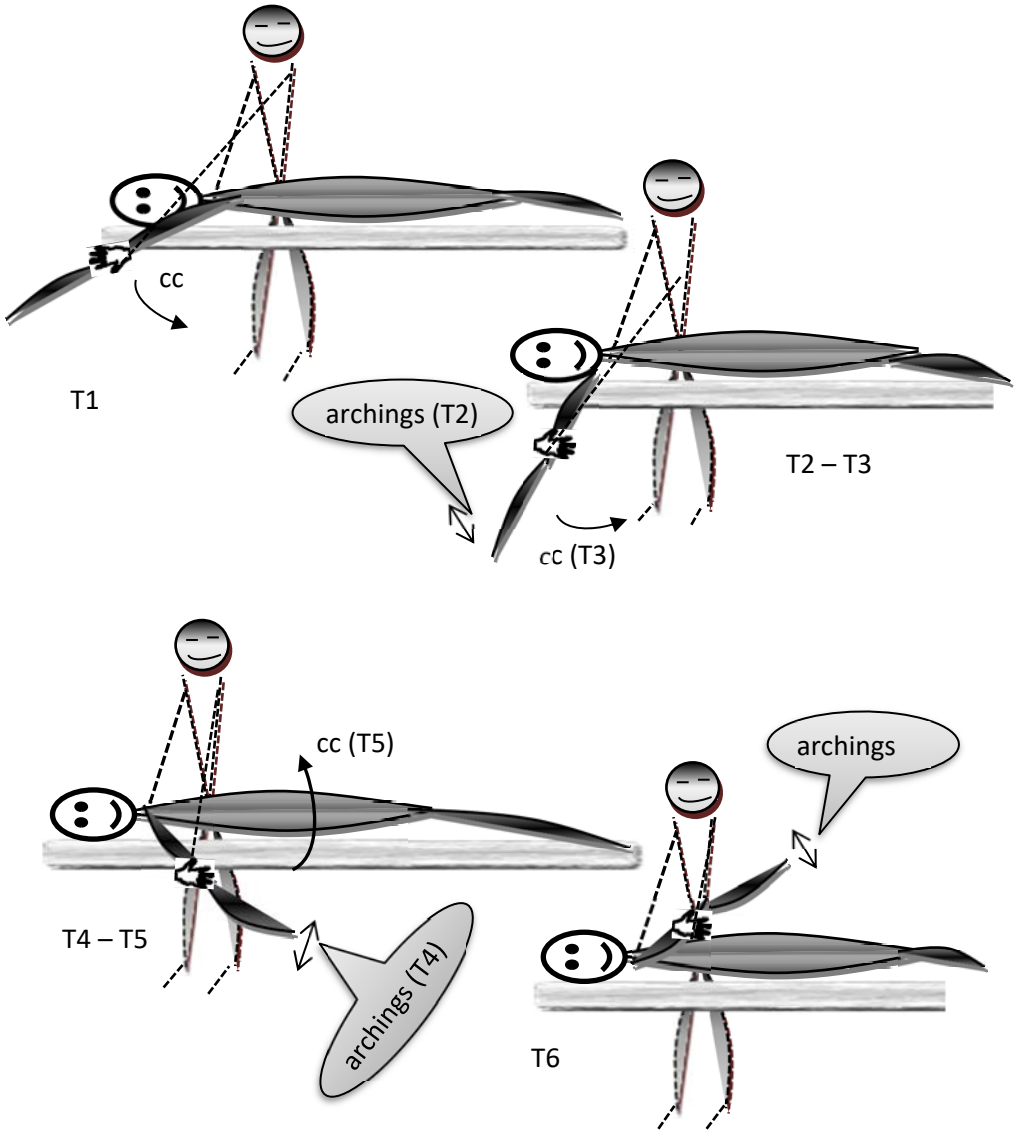

Fig. 21. RC technique for shoulder extensors - For strength 2 – 3
(cc = concentric contraction)

For strength 4-5 (fig. 22)
Initial position:

Patient in sitting.

Physiotherapist, ipsilateral to the patient, mobilizing hand on the distal third of the arm, the posterior face and stabilizing hand on the shoulder.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Shoulder extension - to the point where a hollow of strength can be felt	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T3	Maintaining	Relax!	Relaxation
T4	Flexions-extensions on low range of motion (archings) *(The physiotherapist performs short, repeated stretches of shoulder extensors)*	Relax!	Passive movement
T5 - T8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

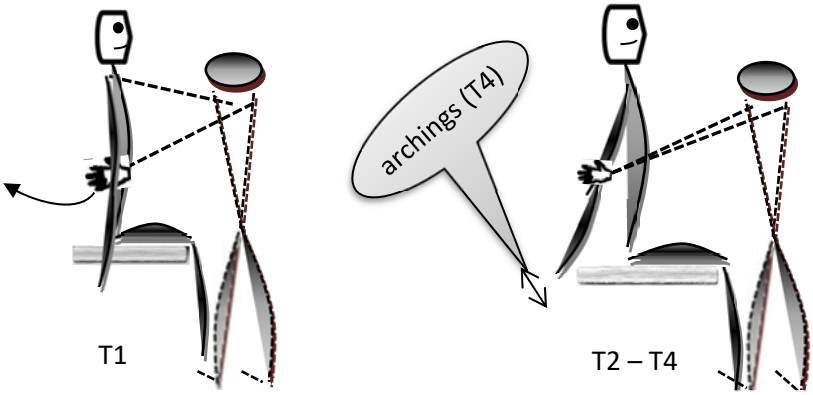

Fig. 22. RC technique for shoulder extensors - For strength 4 – 5

4. ***AR (Agonistic reversal)***

Initial position (fig. 23 a and b)

Patient in sitting.

Physiotherapist, ipsilateral to the patient, mobilizing hand on the distal third of the arm, the posterior face and stabilizing hand on the shoulder.

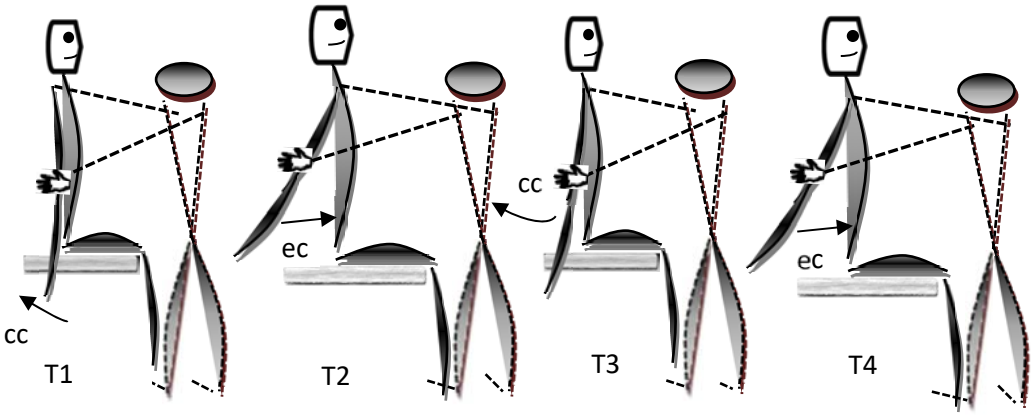

Fig. 23a. AR technique for shoulder extensors : T1 – T4
(cc = concentric contraction; ec = eccentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T2	15° shoulder flexion	Hold, do not let me lower your arm!	Eccentric contraction of the shoulder extensors
T3	Shoulder extension	Push in my hand! (Extend your arm on the trunk!)	Concentric contraction of the shoulder extensors
T4	30° shoulder flexion	Hold, do not let me get your arm forward!	Eccentric contraction of the shoulder extensors
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the posterior face of the arm and the patient will try to push towards extension!

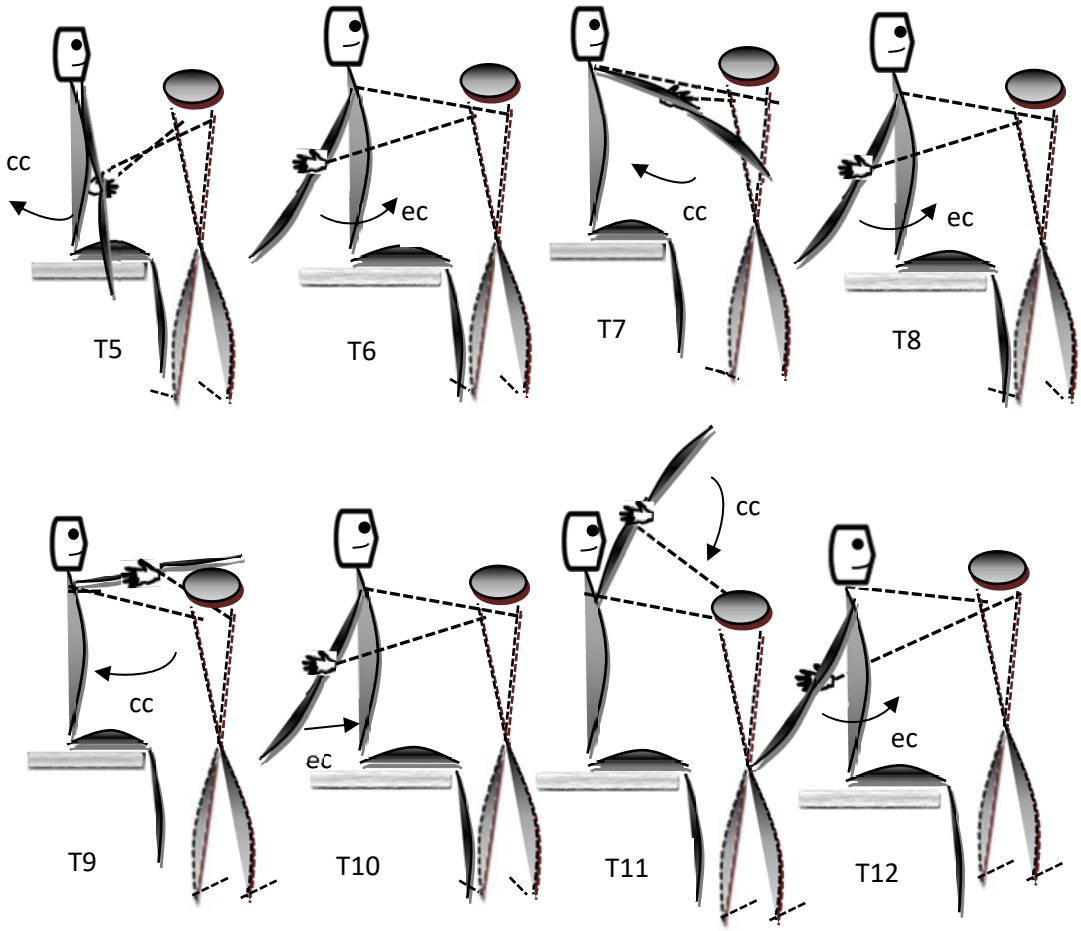

Fig. 23b. AR technique for shoulder extensors: T4 – T12
(cc = concentric contraction; ec = eccentric contraction)

5. *TE (Timing for emphasis)*

Objective: toning the left shoulder extensors.
Variant 1 (bilateral) (fig. 24)
Initial position:

Patient in sitting.

Physiotherapist, posterior to the patient, mobilizing hands on the distal third of both arms, the posterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right arm)	Push your right arm in my hand!	Isometric contraction for the right shoulder extensors
T2	Maintaining (right arm) + extension of left arm on the trunk	Push in my hands! (Maintain right arm in the same position and extend left arm on the trunk!)	Isometric contraction for the right shoulder extensors + concentric contraction of the left shoulder extensors

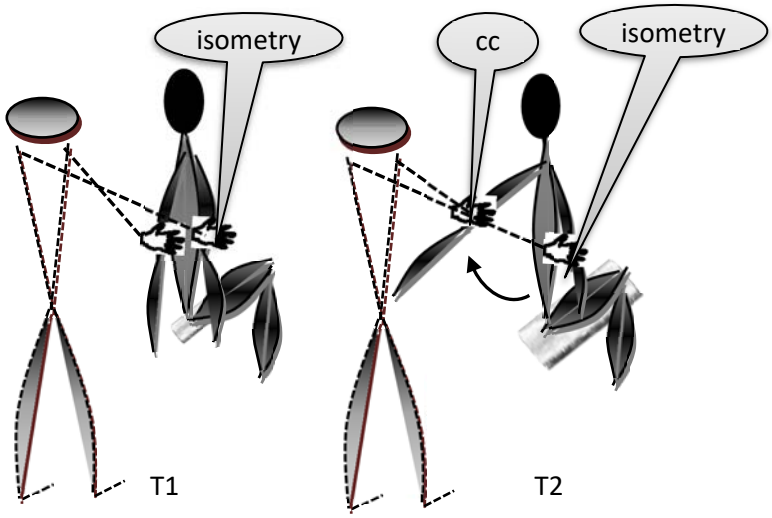

Fig. 24. TE technique for shoulder extensors – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) fig. 25)
Initial position:

Patient in sitting, with forearm slightly flexed on the arm.

Physiotherapist, posterior to the patient, one mobilizing hand on the distal third of the forearm, the posterior face, and the other mobilizing hand on the distal third of the arm, the posterior face.

We use the Triceps Brachii muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of extension for the upper limbs, together with the shoulder extensors.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position slightly flexed the arm	Push your forearm in my hand!	Isometric contraction for the Triceps Brachii
T2	Maintaining forearm position + shoulder extension	Push your forearm and arm in my hands! (Maintain forearm in the same position and extend your arm on the trunk!)	Isometric contraction for the Triceps Brachii + concentric contraction of the shoulder extensors

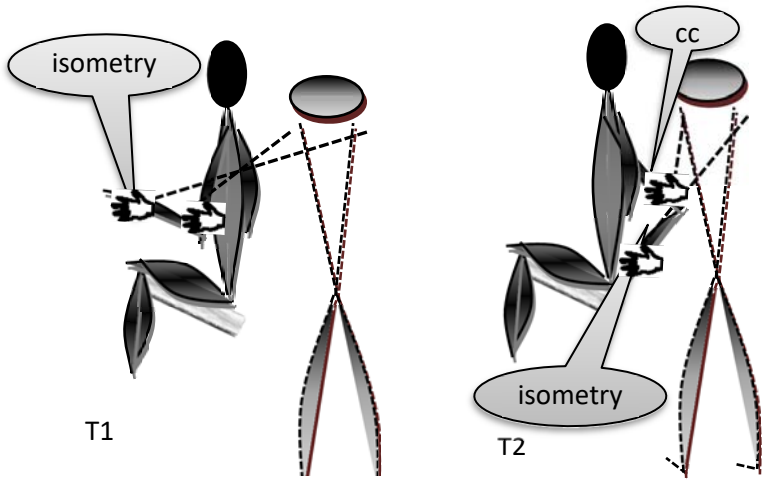

Fig. 25. TE technique for shoulder extensors – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-Relax Active Movement)***

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 (fig. 26).

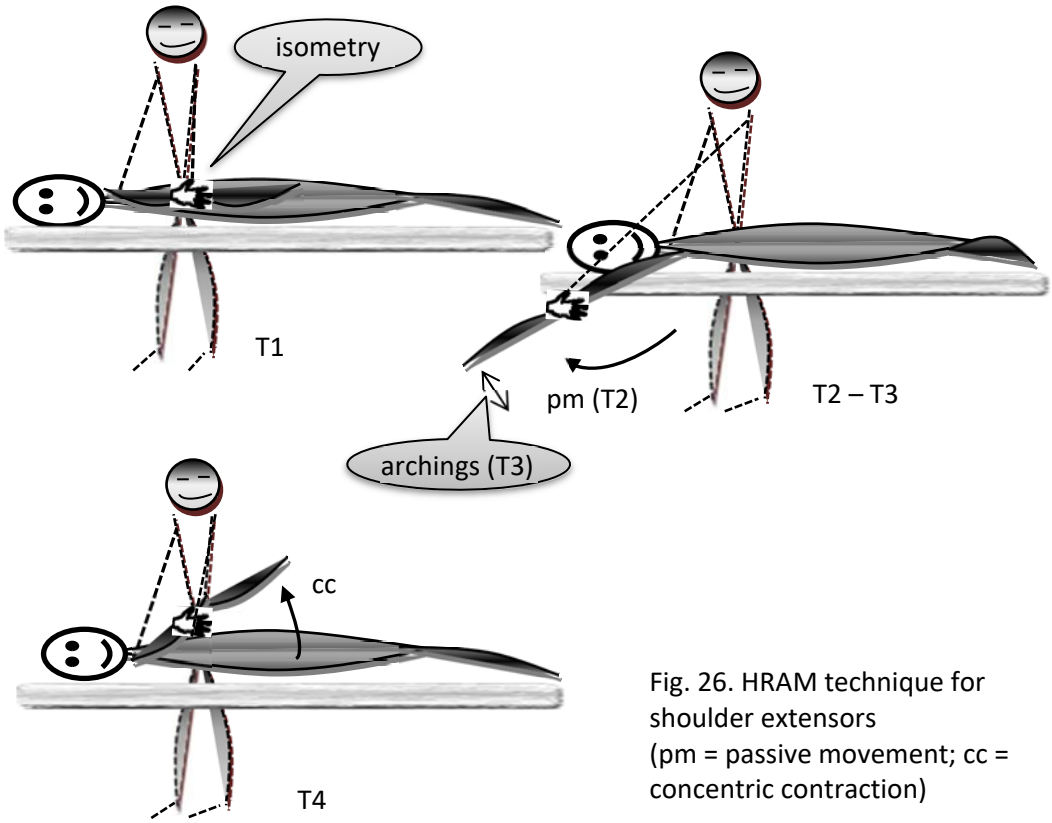

Fig. 26. HRAM technique for shoulder extensors
(pm = passive movement; cc = concentric contraction)

Moving times	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

7. ***RI (Rhythmic initiation)***

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 by grabbing it from the lateral (fig. 27).

Moving times	Movement	Verbal command	Technique
T1	Shoulder flexion	Relax, let me move your arm!	Passive movement
T2	Shoulder extension	Relax, let me move your arm!	Passive movement

T3	Shoulder flexion	Move your arm together with me!	Concentric contraction of the anterior deltoid – passive-active movement
T4	Shoulder extension	Move your arm together with me!	Concentric contraction of the shoulder extensors – passive-active movement
T5	Shoulder flexion	Flex the arm on the trunk!	Concentric contraction of the anterior deltoid – active movement
T6	Shoulder extension	Extend the arm on the trunk!	Concentric contraction of the shoulder extensors – active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

The technique is performed in the same way as for the anterior deltoid.

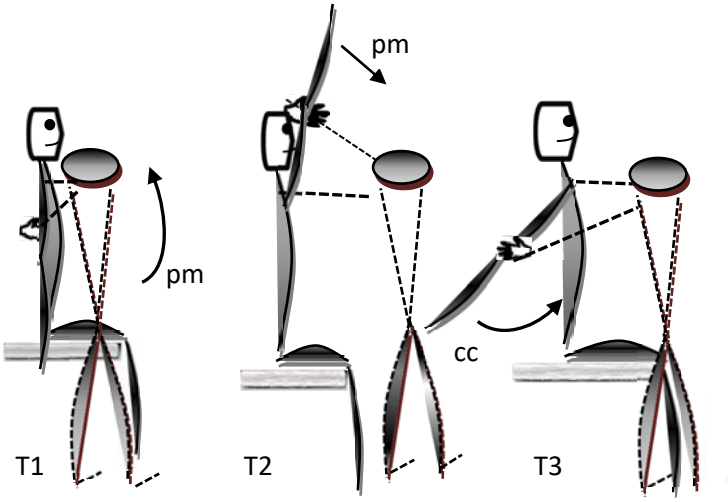

Fig. 27. RI technique for shoulder extensors
(pm = passive movement; cc = concentric contraction)

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of shoulder extensors, the technique is started with the arm slightly extend on the trunk, while when we want to obtain its inhibition in order to increase the range of motion in flexion, the technique is started in the limitation point of the movement, i.e., with the arm flexed on the trunk (fig. 28).

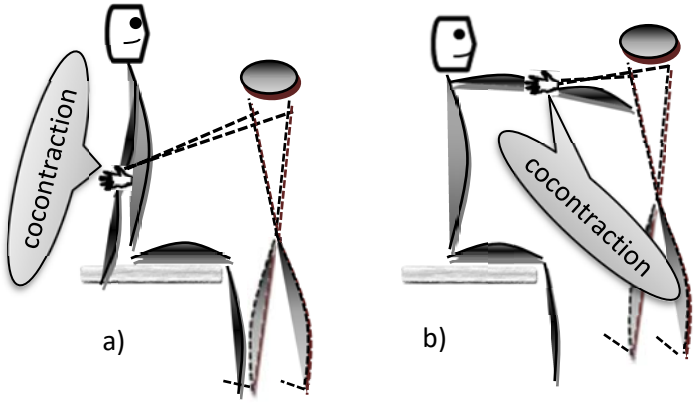

Fig. 28. RS technique for shoulder extensors: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Shoulder Extensors Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient with mobilizing hand on the distal third of the forearm by grasping it and stabilizing hand on the distal third of the arm, supporting it (fig. 29).

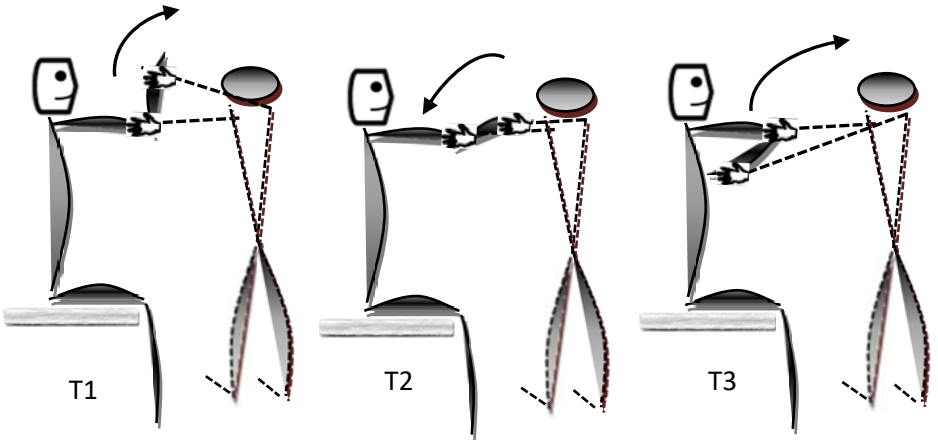

Fig. 29. RR technique for shoulder extensors

Moving times	Movement	Verbal command	Technique
T1	Shoulder Internal Rotation	Relax, let me move your arm!	Passive movement

T2	Shoulder External Rotation	Relax, let me move your arm!	Passive movement
T3	Shoulder Internal Rotation	Move your arm with me!	Passive – active movement
T4	Shoulder External Rotation	Move your arm with me!	Passive – active movement
T5	Shoulder Internal Rotation	Rotate the arm internally on the trunk!	Active movement
T6	Shoulder External Rotation	Rotate the arm externally on the trunk!	Active movement

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, so the shoulder extensors deltoid in this case*)
Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation.

Physiotherapist anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the posterior face (fig. 30).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder flexion	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the shoulder extensors
T4 – T6	Repeat times 1 - 3		

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, so the anterior deltoid in this case*)
Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation.

Physiotherapist anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm in the anterior face (fig. 30).

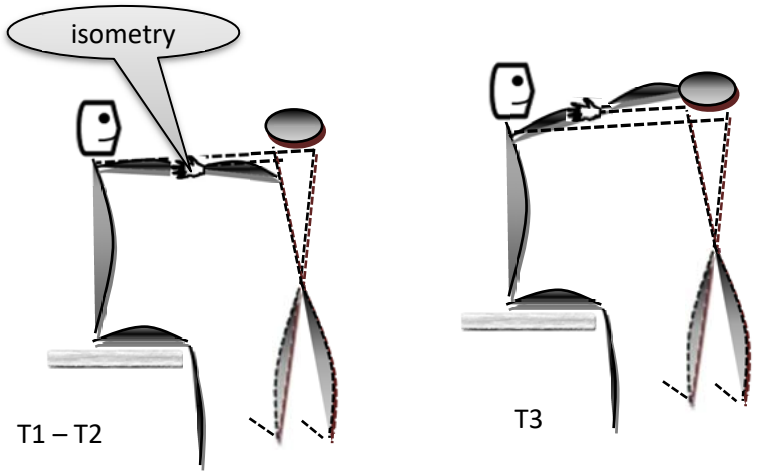

Fig. 30. HR technique for shoulder extensors

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining	Relax! *(The physiotherapist support the arm not to fall)*	Relaxation
T3	Shoulder flexion	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the shoulder extensors
T4 – T6	Repeat times 1- 3		

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation.

Physiotherapist anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm in the posterior face (fig. 30).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder flexion	Flex the arm on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the anterior deltoid (Active Stretching of the shoulder extensors)
T4 – T6	Repeat times 1- 3		

Version: Agonist HR-C
Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation.

Physiotherapist anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm in the anterior face (fig. 30).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining	Relax!	Relaxation
T3	Shoulder flexion	Flex the arm on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the anterior deltoid (Active Stretching of the shoulder extensors)
T4 – T6	Repeat times 1- 3		

5. ***CR (Contract - Relax)***

Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist anterior to the patient with mobilizing hand on the distal third of the forearm by grasping it and the other hand on the distal third of the arm, in the posterior face (fig. 31).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder extensors
T2	Maintaining flexion arm position + internal shoulder rotation	Extend your arm on the trunk and let me rotate your shoulder!	Isometric contraction of the shoulder extensors + passive movement of internal rotation of the shoulder
T3	Maintaining flexion arm position + external shoulder rotation	Extend your arm on the trunk and let me rotate your shoulder!	Isometric contraction of the shoulder extensors + passive movement of external rotation of the shoulder
T4	Maintaining flexion arm position + internal shoulder rotation	Extend your arm on the trunk and do the internal shoulder rotation with me!	Isometric contraction of the shoulder extensors + passive-active movement of internal rotation of the shoulder
T5	Maintaining flexion arm position + external shoulder rotation	Extend your arm on the trunk and do the external shoulder rotation with me!	Isometric contraction of the shoulder extensors + passive-active movement of external rotation of the shoulder

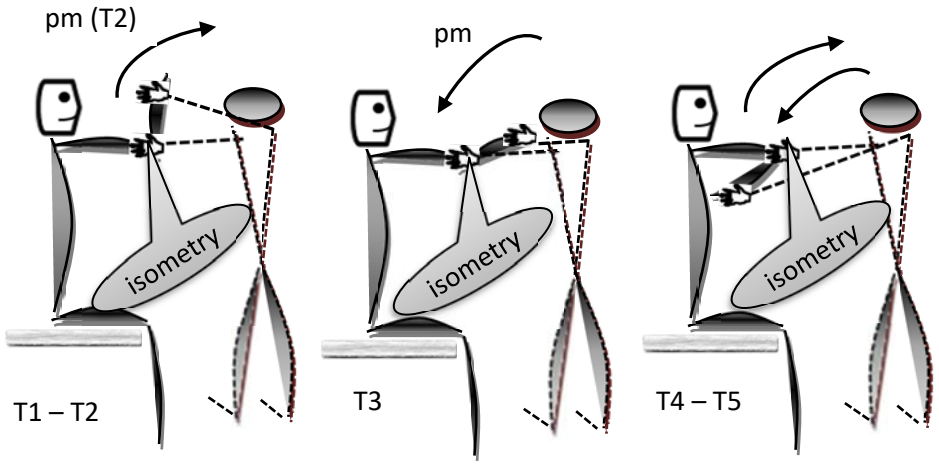

Fig. 31. CR technique for shoulder extensors
(pm = passive movement)

6. ***RS (Rhythmic Stabilization)***

Alternative version
Initial position:

Patient sitting with the shoulder flexed at the point of mobility limitation.

Physiotherapist anterior to the patient with one mobilizing hand on the distal third of the arm, in the anterior face and the other mobilizing hand on the distal third of the arm, in the posterior face (fig. 32a).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the anterior deltoid
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the shoulder extensors

T3	Maintaining *(The physiotherapist pushes the patient's arm toward both flexion and extension, alternating more and more rapidly between the two directions)*	Hold, don't let me move your arm!	Cocontraction for anterior deltoid and shoulder extensors
T4	Maintaining	Relax!	Relaxation

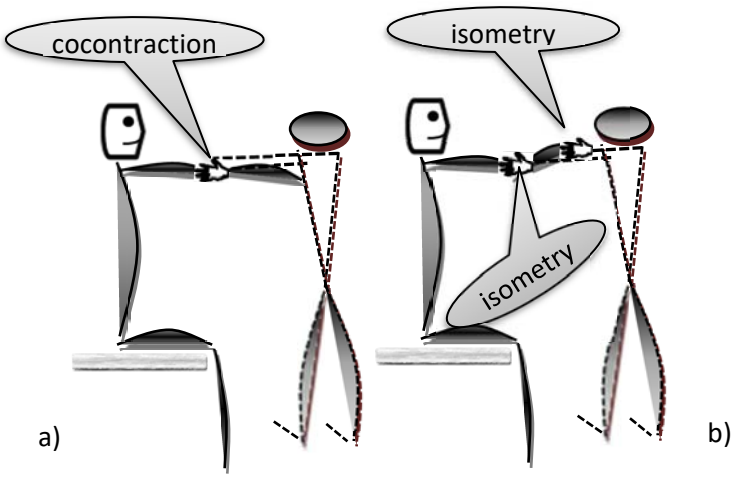

Fig. 32. RS technique for shoulder extensors: a) alternative version; b) simultaneous version

Simultaneous version

Initial position:

Patient sitting with the shoulder in flexion at the point of mobility limitation and the elbow slightly flexed.

Physiotherapist anterior to the patient with one mobilizing hand on the distal third of the arm, in the posterior face and the other mobilizing hand on the distal third of the forearm, in the anterior face (fig. 32b).

We use the biceps brachial, biarticular muscle, which realizes the flexion of the elbow but also participates in the shoulder flexion, thus being an antagonist of the shoulder extensors.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Extend the arm on the trunk and flex the elbow!	Isometric contraction of the shoulder extensors and the biceps brachial (Cocontraction)
T2	Maintaining	Relax!	Relaxation

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Middle Deltoid

Action: Arm abduction on the trunk (shoulder abduction)
Synergist muscles: Supraspinatus, Anterior and Posterior deltoid
Accessory muscles: Brachial Biceps – long head

Fig. 33. Middle Deltoid muscle (10)

1. ***SR (Slow reversals)***

Initial position:

Patient in orthostatic position.

Physiotherapist, anterior to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face (fig. 34).

The technique starts on the antagonist (on the shoulder adductors in this case).

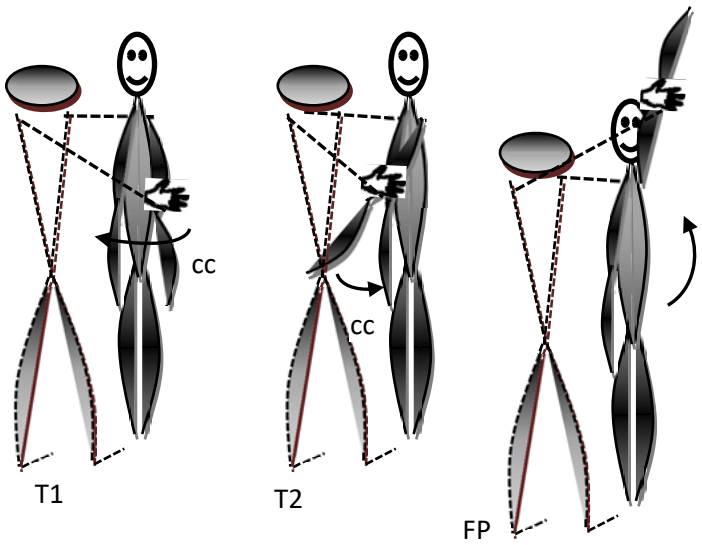

Fig. 34. SR technique for middle deltoid
(cc = concentric contraction, FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Shoulder adduction	Push in my hand! (Do arm adduction on the trunk !)	Concentric contraction of the shoulder adductors
T2	Shoulder abduction *(Mobilizing hand switches on the lateral face of the arm)*	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid

2. ***SRH (Slow reversals hold***

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 (fig. 35).

Moving times	Movement	Verbal command	Technique
T1	Shoulder abduction	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T2	Maintaining	Push in my hand!	Isometric contraction 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!)	Concentric contraction of the shoulder adductors
T4	Maintaining	Push in my hand!	Isometric contraction of the shoulder adductors

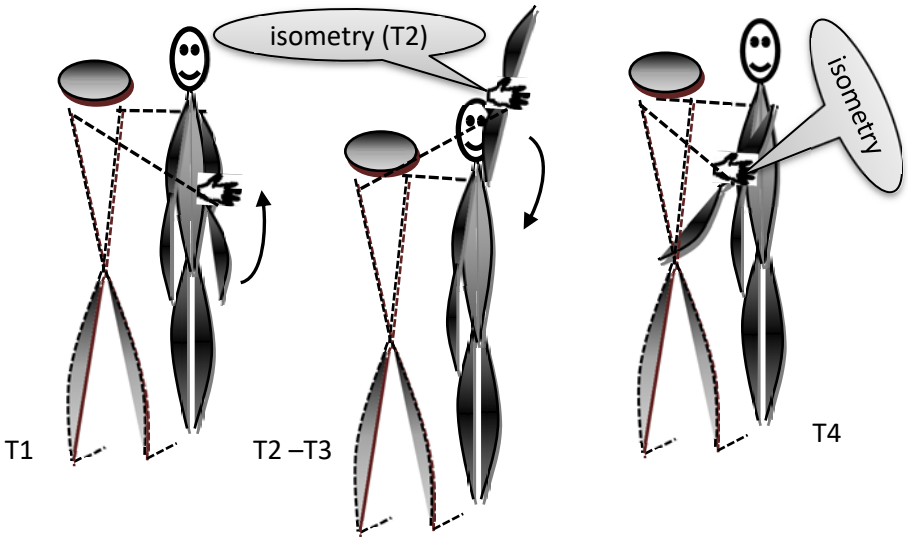

Fig. 35. SRH technique for middle deltoid

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 36)
Initial position:

Patient in dorsal decubitus with arm adducted on the trunk.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the shoulder, mobilizing hand underneath, on the distal third of the arm, the lateral face. The patient's forearm rests on the physiotherapist's forearm.

Moving times	Movement	Verbal command	Technique
T1	Adduction – abduction on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the middle deltoid)*	Relax!	Passive movement
T2	Adduction – abduction on low range of motion (archings)	Contract! (Try to do shoulder abduction!)	Passive movement

	(The physiotherapist makes short, repeated stretches of the middle deltoid)		

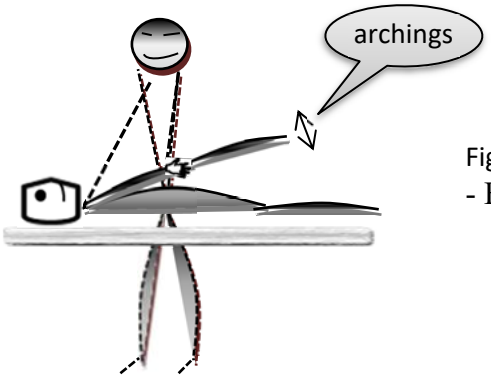

Fig. 36. RC technique for middle deltoid
- For strength 0 – 1

For strength 2-3 (fig. 37)
Initial position:

Patient in dorsal decubitus with arm adducted on the trunk.

Physiotherapist, ipsilateral to the patient, mobilizing hand underneath, on the distal third of the arm, the lateral face, supporting the arm and forearm and stabilizing hand on the shoulder.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	20º arm abduction on the trunk	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T2	Adduction – abduction on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the middle deltoid)*	Do arm abduction on the trunk (Continue to do shoulder abduction!)	Passive movement

T3	20º arm abduction on the trunk	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T4	Adduction – abduction on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the middle deltoid)*	Continue to do shoulder abduction!	Passive movement
T5	It is continued on the entire range of motion.		

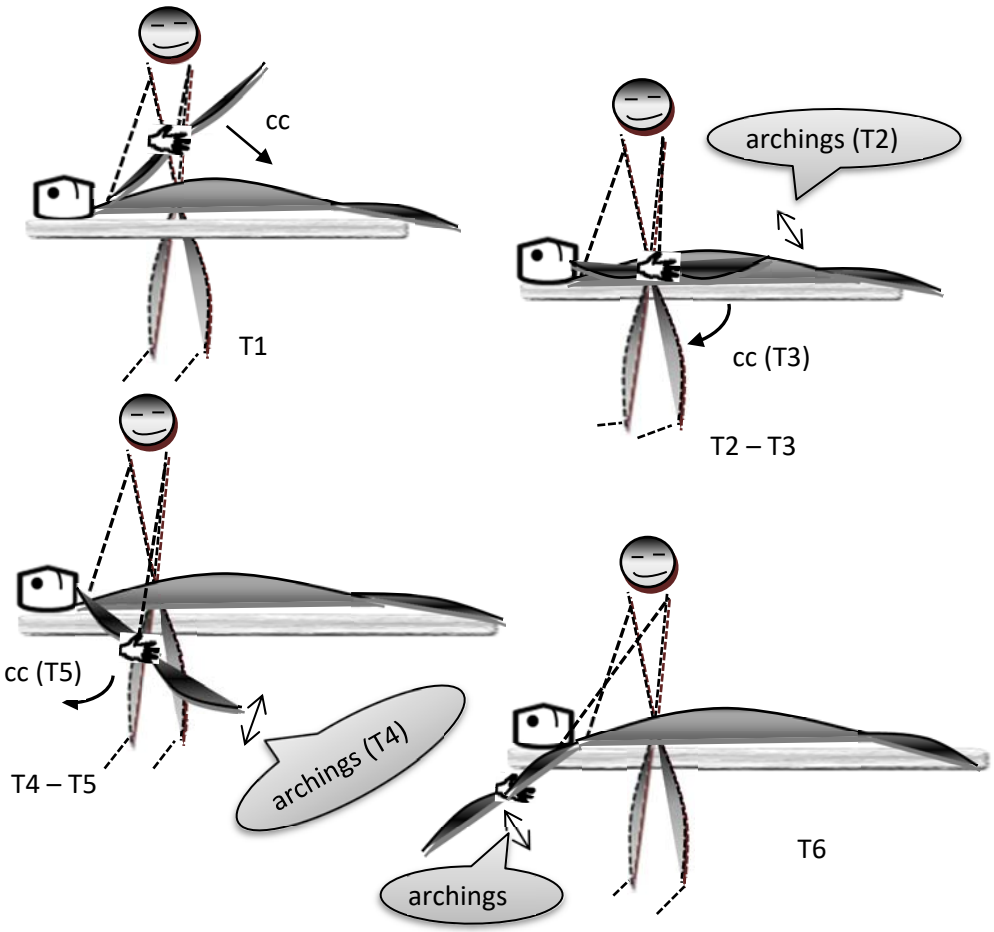

Fig. 37. RC technique for middle deltoid - For strength 2 – 3
(cc = concentric contraction)

For strength 4-5 (fig. 38)
Initial position:

Patient in orthostatic position with the shoulder in adduction.

Physiotherapist, anterior to the patient, mobilizing hand on the distal third of the arm, the lateral face and stabilizing hand on the shoulder.

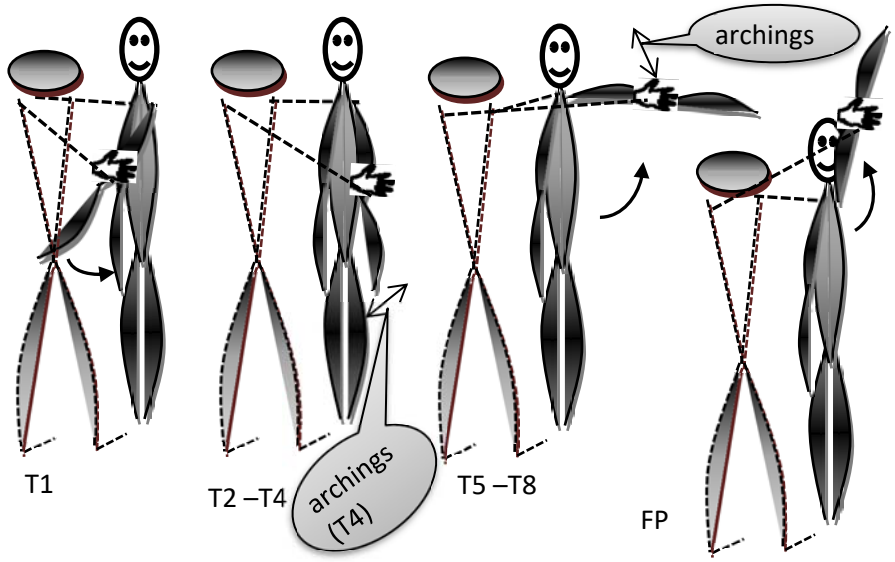

Fig. 38. RC technique for middle deltoid - For strength 4 – 5
(FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Arm abduction on the trunk – to the point where a hollow of strength can be felt	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T2	Maintaining	Push in my hand!	Isometric contraction of the middle deltoid
T3	Maintaining	Relax!	Relaxation

T4	Adduction – abduction on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the middle deltoid)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. ***AR (Agonistic reversal)***

Initial position:

Patient in orthostatic position.

Physiotherapist, anterior to the patient, mobilizing hand on the distal third of the arm, the lateral face and stabilizing hand on the shoulder (fig. 39 a and b).

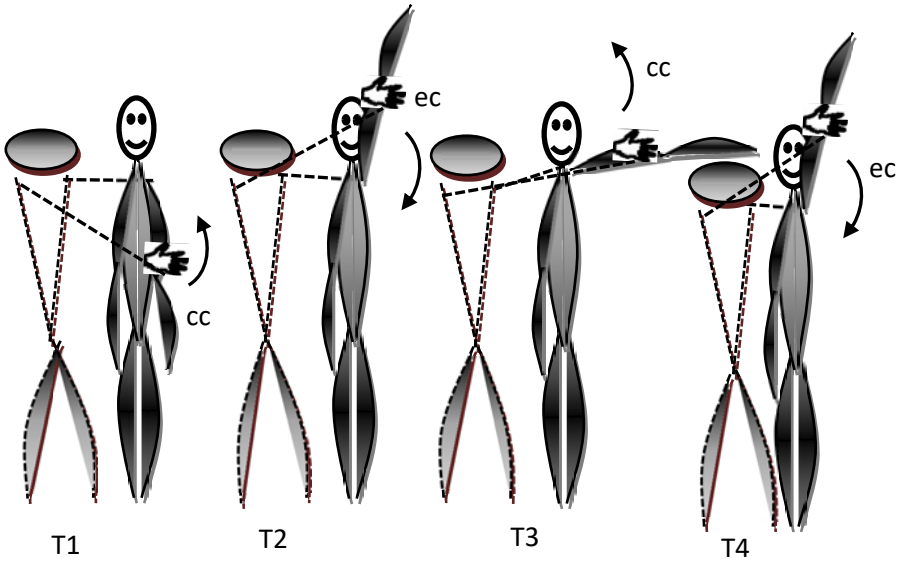

Fig. 39a. AR technique for middle deltoid: T1 – T4
(cc = concentric contraction; ec = eccentric contraction)

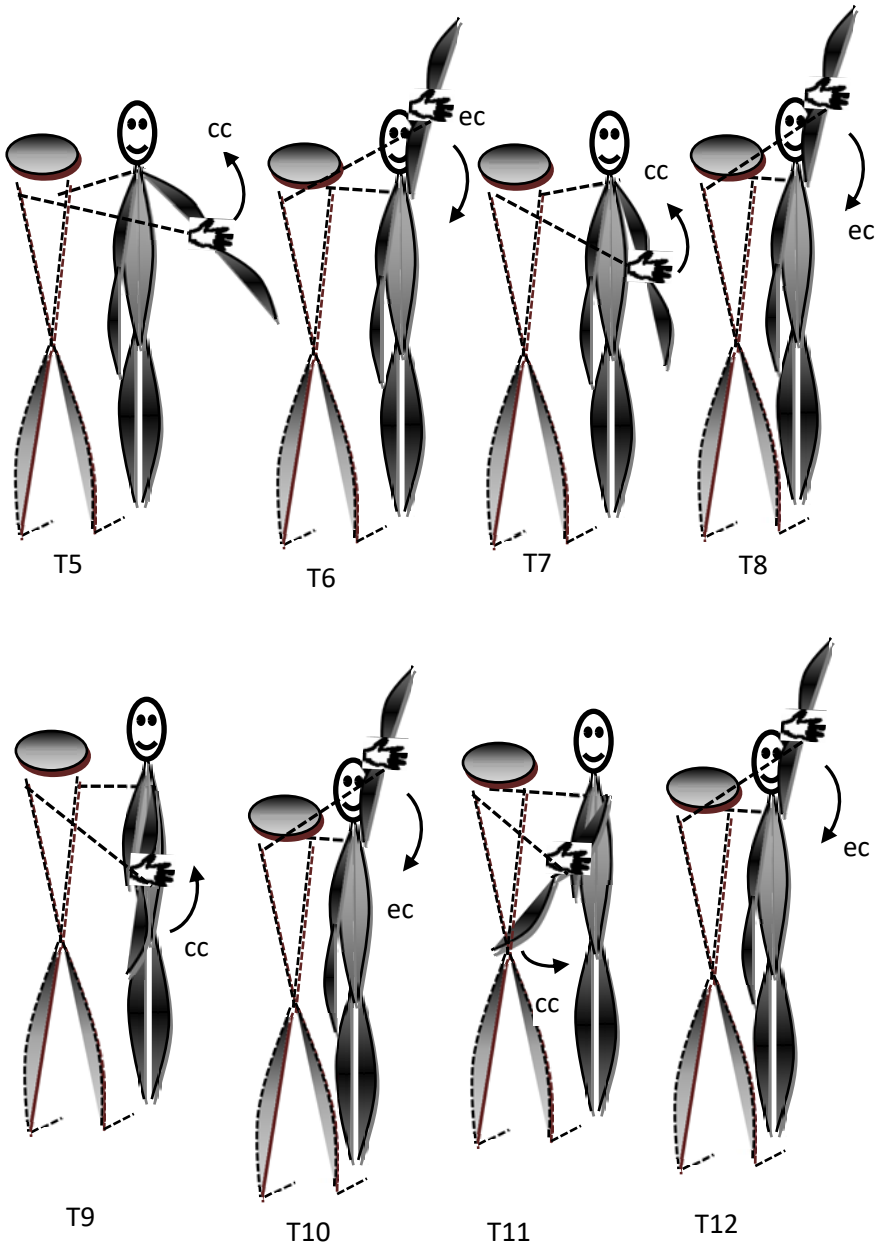

Fig. 39b. AR technique for middle deltoid: T5 – T12
(cc = concentric contraction; ec = eccentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Shoulder abduction	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T2	20° shoulder adduction	Hold, do not let me lower your arm!	Eccentric contraction of the middle deltoid
T3	Shoulder abduction	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid
T4	40° shoulder adduction	Hold, do not let me lower your arm!	Eccentric contraction of the middle deltoid
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the lateral face of the arm and the patient will try to push towards abduction!

5. ***TE (Timing for emphasis)***

Objective: toning the middle deltoid muscle of the left arm.
Variant 1 (bilateral) (fig. 40)
Initial position:

Patient in sitting, with right arm abducted on the trunk at 45°.

Physiotherapist, in front of the patient, mobilizing hands on the distal third of both arms, the lateral face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right arm)	Push your right arm in my hand!	Isometric contraction for the right middle deltoid
T2	Maintaining (right arm) + Abduction of left arm on the trunk	Push in my hands! (Maintain right arm in the same position and do the abduction of the left arm on the trunk!)	Isometric contraction for the right middle deltoid + concentric contraction of the left middle deltoid

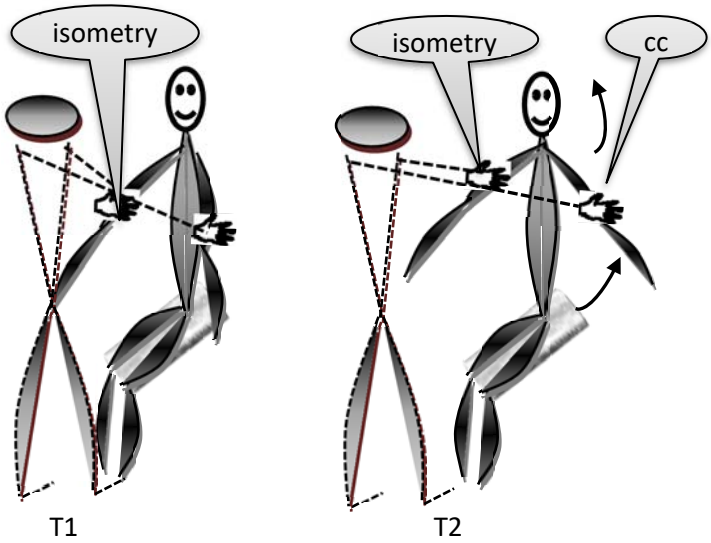

Fig. 40. TE technique for middle deltoid – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) (fig. 41)
Initial position:

Patient in sitting, with forearm slightly flexed on the arm.

Physiotherapist, in front of the patient, one mobilizing hand on the distal third of the forearm, the posterior face, and the other mobilizing hand on the distal third of the arm, the lateral face.

We use the triceps brachii muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of extension for the upper limbs, together with the middle deltoid.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position slightly flexed on the arm	Push your forearm into my hand! (to extension)	Isometric contraction for the triceps brachii

T2	Maintaining forearm position + shoulder abduction	Push your forearm and arm in my hands! (Maintain forearm in the same position and do shoulder abduction!)	Isometric contraction for the triceps brachii + concentric contraction of the middle deltoid

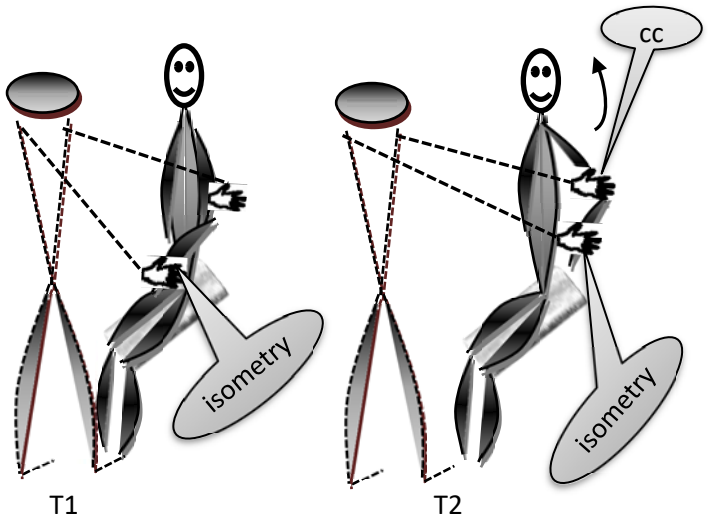

Fig. 41. TE technique for middle deltoid – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-Relax Active Movement)***

Initial position:

Patient in dorsal decubitus, with arm abducted on the trunk at 45°.

Physiotherapist, contralateral to the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the lateral face, by grabbing underneath, supporting the patient's forearm on their forearm (fig. 42 a and b).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the middle deltoid
T2	Arm adduction on the trunk *(The physiotherapist quickly takes the patient's arm in adduction)*	Relax!	Passive movement
T3	Adduction – abduction on low range of motion (archings) *(The physiotherapist makes short, repeated stretches of the middle deltoid)*	Relax!	Passive movement
T4	Shoulder abduction	Push in my hand! (Do arm abduction on the trunk!)	Concentric contraction of the middle deltoid

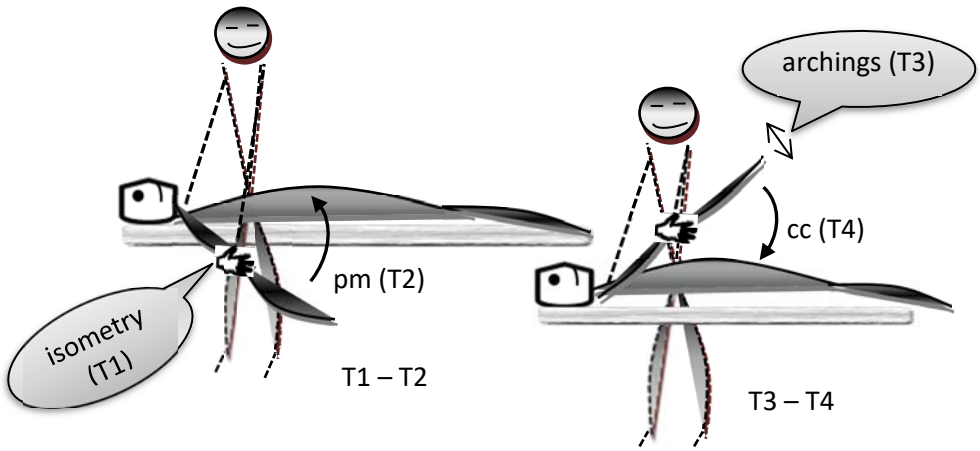

Fig. 42a. HRAM technique for middle deltoid: T1 – T4
(pm = passive movement; cc = concentric contraction)

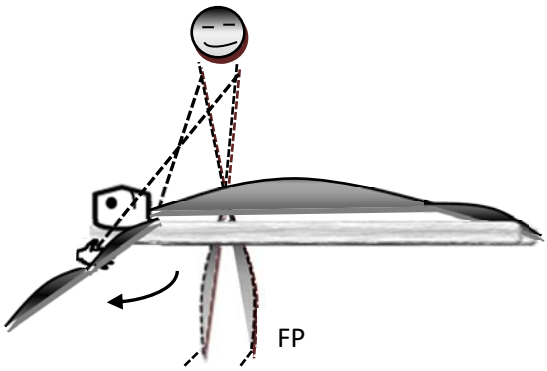

Fig. 42b. HRAM technique for middle deltoid
(FP = final position)

7. ***RI (Rhythmic initiation)***

Initial position:

Patient in orthostatic position.

Physiotherapist, anterior - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm by grabbing it from the lateral (fig. 43).

Moving times	Movement	Verbal command	Technique
T1	Shoulder abduction	Relax, let me move your arm!	Passive movement
T2	Shoulder adduction	Relax, let me move your arm!	Passive movement
T3	Shoulder abduction	Move your arm together with me!	Concentric contraction of the middle deltoid – passive-active movement
T4	Shoulder adduction	Move your arm together with me!	Concentric contraction of the shoulder adductors – passive-active movement
T5	Shoulder abduction	Do arm abduction on the trunk!	Concentric contraction of the middle deltoid – active movement

T6	Shoulder adduction	Do arm adduction on the trunk!	Concentric contraction of the shoulder adductors – active movement

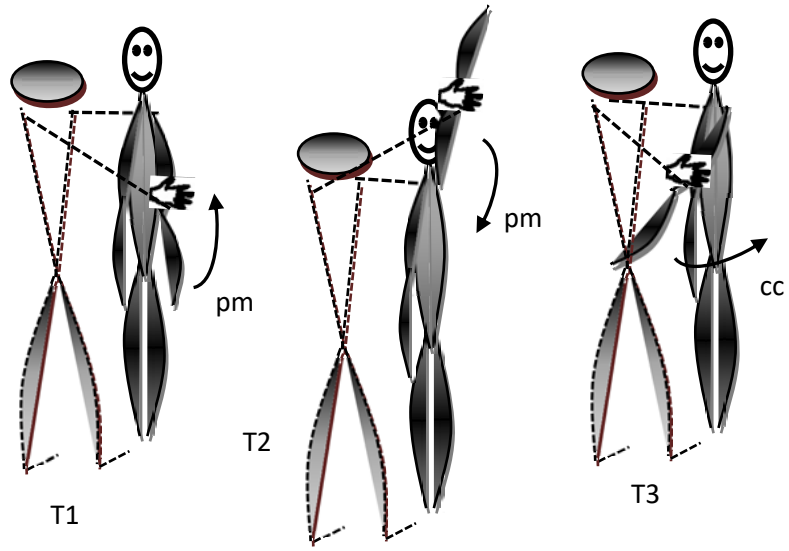

Fig. 43. RI technique for middle deltoid
(pm = passive movement; cc = concentric contraction)

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the middle deltoid, the technique is started with the arm slightly abducted on the trunk, while when we want to obtain its inhibition in order to increase the range of motion in adduction, the technique is started in the limitation point of the movement, i.e., with the arm adducted on the trunk (fig. 44).

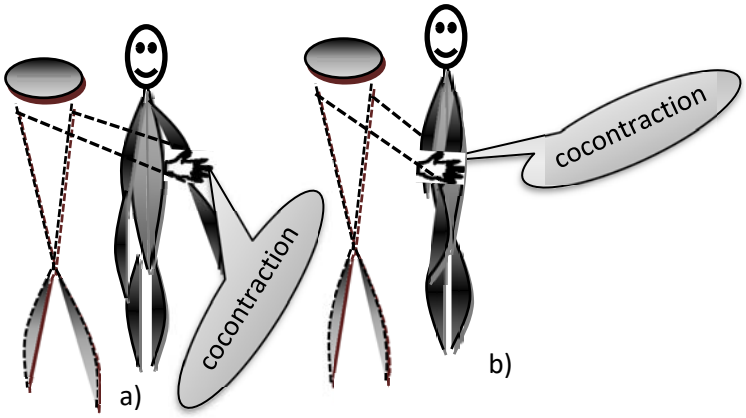

Fig. 44. RS technique for middle deltoid: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Middle Deltoid Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

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

Initial position:

Patient sitting with the shoulder in adduction at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist, anterior to the patient with mobilizing hand on the distal third of the forearm by grasping it and stabilizing hand on the distal third of the arm, supporting it (fig. 45).

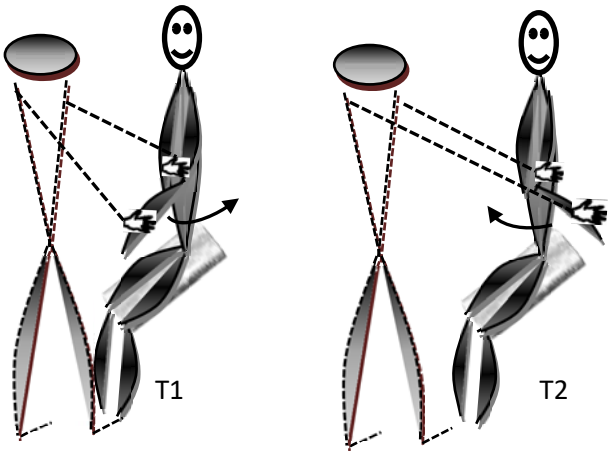

Fig. 45. RR technique for middle deltoid

Moving times	Movement	Verbal command	Technique
T1	Shoulder External Rotation	Relax, let me move your arm!	Passive movement
T2	Shoulder Internal Rotation	Relax, let me move your arm!	Passive movement

T3	Shoulder External Rotation	Move your arm with me!	Passive – active movement
T4	Shoulder Internal Rotation	Move your arm with me!	Passive – active movement
T5	Shoulder External Rotation	Rotate the arm internally on the trunk!	Active movement
T6	Shoulder Internal Rotation	Rotate the arm externally on the trunk!	Active movement

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

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, so the middle deltoid in this case*)
Initial position:

Patient sitting with the shoulder in adduction at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the lateral face (fig. 46).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the middle deltoid
T2	Maintaining	Relax!	Relaxation
T3	Shoulder adduction	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the middle deltoid
T4 – T6	Repeat times 1 - 3		

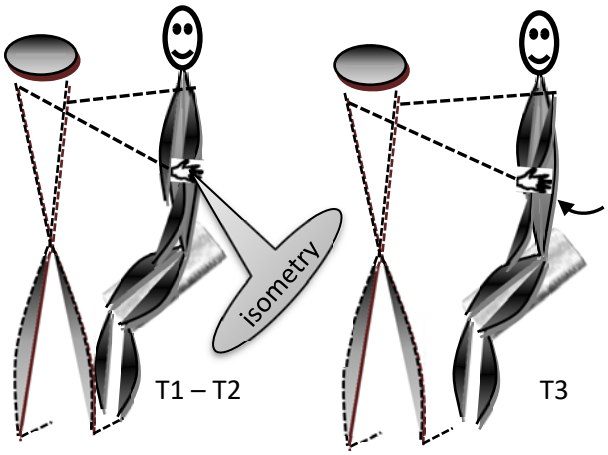

Fig. 46. HR technique for middle deltoid

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, so the shoulder adductors in this case*)
Initial position:

Patient sitting with the shoulder in adduction at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face (fig. 46).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Concentric contraction of the shoulder adductors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder adduction	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the middle deltoid
T4 - T6	Repeat times 1 - 3		

3. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C (fig. 46)
Initial position:

Patient sitting with the shoulder in adduction at the mobility limit.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the lateral face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the middle deltoid
T2	Maintaining	Relax!	Relaxation
T3	Shoulder adduction	Do arm adduction on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder adductors (Active Stretching of the middle deltoid)
T4 - T6	Repeat times 1 - 3		

Version: Agonist HR-C (fig. 46)
Initial position:

Patient sitting with the shoulder in adduction at the mobility limit.

Physiotherapist, anterior to the patient with stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder adductors
T2	Maintaining	Relax!	Relaxation
T3	Shoulder adduction	Do arm adduction on the trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder adductors (Active Stretching of the middle deltoid)
T4 - T6	Repeat times 1 - 3		

4. ***CR (Contract - Relax)***

Initial position:

Patient sitting with the shoulder in adduction at the mobility limit and the elbow flexed at 90°.

Physiotherapist, anterior to the patient with mobilizing hand on the distal third of the forearm by grasping it and the other hand on the distal third of the arm, the lateral face (fig. 47).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the middle deltoid
T2	Maintaining adduction arm position + External shoulder rotation	Do arm abduction on the trunk and let me rotate your shoulder!	Isometric contraction of the middle deltoid + passive movement of external rotation of the shoulder
T3	Maintaining adduction arm position + Internal shoulder rotation	Do arm abduction on the trunk and let me rotate your shoulder!	Isometric contraction of the middle deltoid + passive movement of internal rotation of the shoulder
T4	Maintaining adduction arm position + External shoulder rotation	Do arm abduction on the trunk and do the external shoulder rotation together with me!	Isometric contraction of the middle deltoid + passive-active movement of external rotation of the shoulder
T5	Maintaining adduction arm position + Internal shoulder rotation	Do arm abduction on the trunk and do the internal shoulder rotation together with me!	Isometric contraction of the middle deltoid + passive-active movement of internal rotation of the shoulder

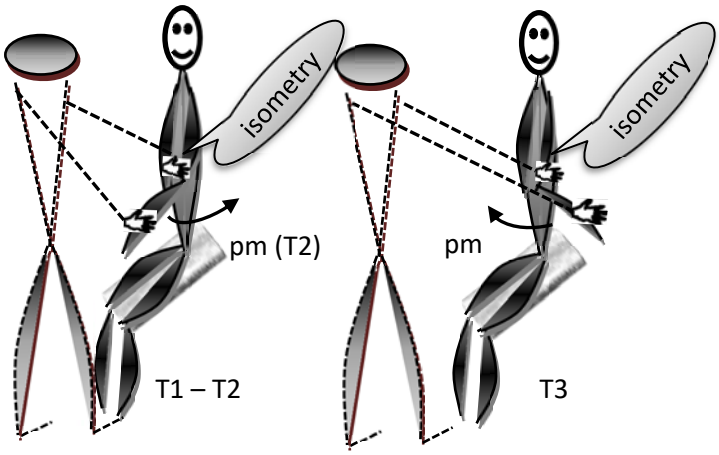

Fig. 47. CR technique for middle deltoid
(pm = passive movement)

5. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 48a)
Initial position:

Patient sitting with the shoulder in adduction at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the arm, in the lateral face and the other mobilizing hand on the distal third of the arm, the medial face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining *(The physiotherapist opposes resistance on the lateral face of the arm)*	Push in my hand!	Isometric contraction of the middle deltoid
T2	Maintaining *(The physiotherapist opposes resistance on the medial face of the arm)*	Push in my hand!	Isometric contraction of the shoulder adductors

T3	Maintaining *(The physiotherapist pushes the patient's arm toward both abduction and adduction, alternating more and more rapidly between the two directions)*	Hold, don't let me move your arm!	Cocontraction for middle deltoid and shoulder adductors
T4	Maintaining	Relax!	Relaxation

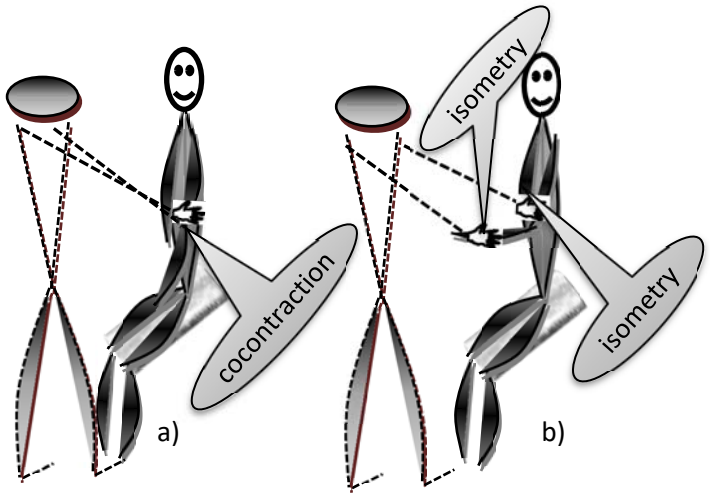

Fig. 48. RS technique for middle deltoid: a) alternative version; b) simultaneous version

Simultaneous version (fig. 48b)
Initial position:

Patient in the orthostatic position with the shoulder in adduction at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist, ipsilateral to the patient with one mobilizing hand on the distal third of the arm, the lateral face and the other mobilizing hand on the distal third of the forearm, the medial face.

We use the internal shoulder rotators muscles which also perform the shoulders adduction, thus being antagonists of the middle deltoid (Pectoralis Major, Latissimus Dorsal, Teres Major, Subscapularis).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Do arm abduction on the trunk and do the internal shoulder rotation! Push your arm and forearm in my hands!	Isometric contraction of the middle deltoid and the internal shoulder rotators (Cocontraction)
T2	Maintaining	Relax!	Relaxation

6. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Pectoralis Major

Action: Arm horizontal adduction on the trunk (shoulder horizontal adduction)
Accessory muscles: Anterior Deltoid
Other actions: Arm adduction on the trunk, shoulder internal rotation

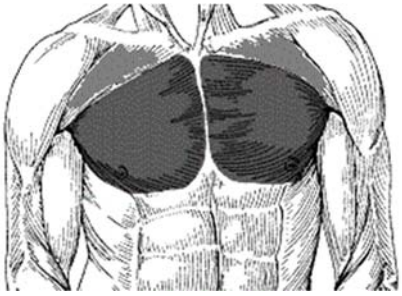

Fig. 49. Pectoralis Major muscle (11)

1. ***SR (Slow reversals)***

Initial position:

Patient in sitting with the arm horizontally adducted on the trunk.

Physiotherapist, behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the posterior face, supporting the arm. The patient's forearm rests on the physiotherapist's forearm (fig. 50).

The technique starts on the antagonist (on the posterior deltoid).

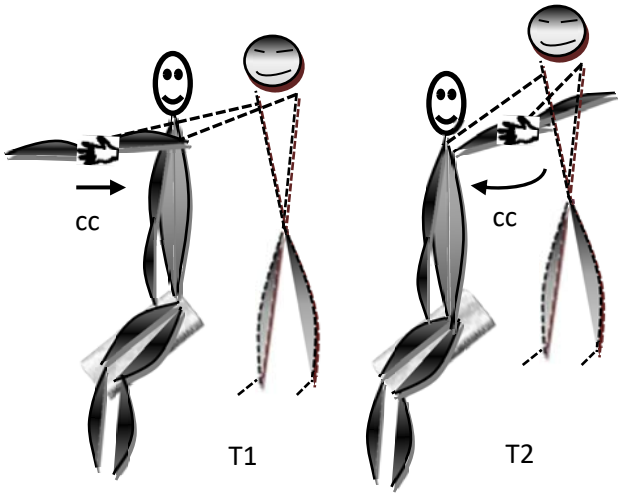

Fig. 50. SR technique for pectoralis major (cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Shoulder horizontal abduction	Push in my hand! (Abduct your arm horizontally on your body!)	Concentric contraction of the posterior deltoid
T2	Shoulder horizontal adduction (*Mobilizing hand switches on the anterior face of the arm)*	Push in my hand! (Adduct your arm horizontally on your body !)	Concentric contraction of the pectoralis major

2. ***SRH (Slow reversals hold)***

Initial position:

Patient sitting with the shoulder horizontally abducted.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the anterior face, supporting the arm. The patient's forearm rests on the physiotherapist's forearm (fig. 51).

Moving times	Movement	Verbal command	Technique
T1	Shoulder horizontal adduction	Push in my hand! (Adduct your arm horizontally on your body!)	Concentric contraction of the pectoralis major
T2	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T3	Shoulder horizontal abduction *(Mobilizing hand switches on the posterior face of the arm)*	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T4	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid

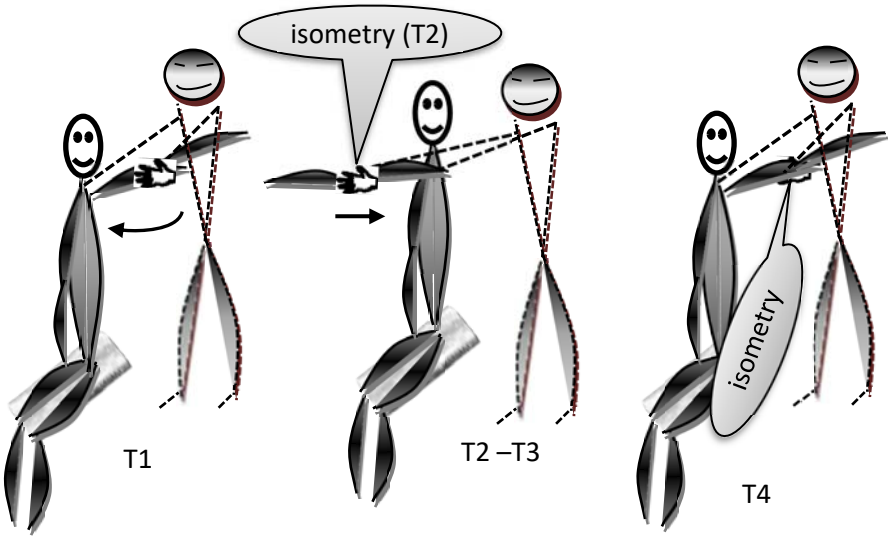

Fig. 51. SRH technique for pectoralis major

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 52)
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.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Shoulder horizontal abductions – adductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the pectoralis major)*	Relax!	Passive movement

T2	Shoulder horizontal abductions – adductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the pectoralis major)*	Contract! (Try to adduct your arm horizontally on the trunk!)	Passive movement

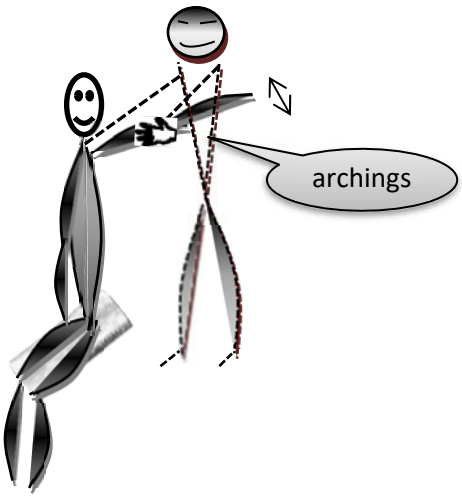

Fig. 52. RC technique for pectoralis major - For strength 0 - 1

For strength 2-3 (fig. 53)
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.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

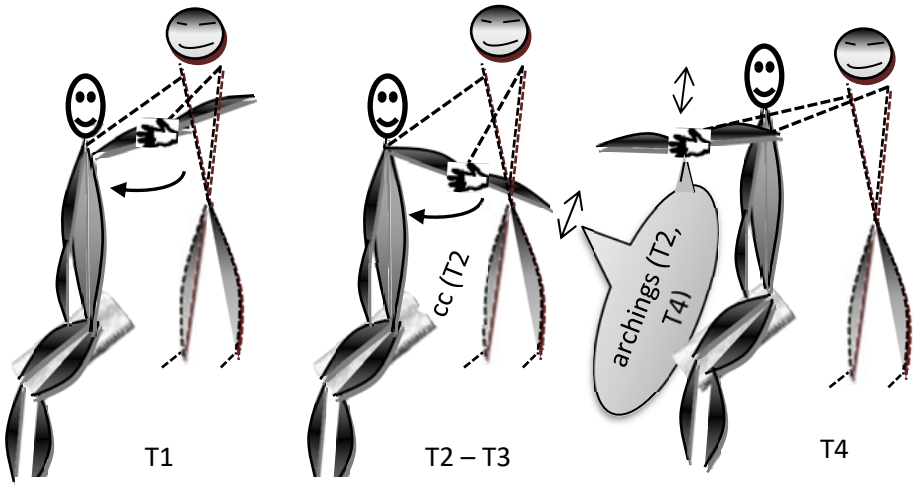

Fig. 53. RC technique for pectoralis major - For strength 2 – 3
(cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	20º arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T2	Shoulder horizontal abductions – adductions on low range of motion (archings) *(The physiotherapist performs 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! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T4	Shoulder horizontal abductions – adductions	Continue to adduct your arm	Passive movement

	on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the pectoralis major)*	horizontally on your trunk!	
T5	It is continued on the entire range of motion.		

For strength 4-5 (fig. 54)
Initial position:

Patient in dorsal decubitus at the edge of the bed with arm horizontally abducted on the trunk.

Physiotherapist contralateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the anterior face.

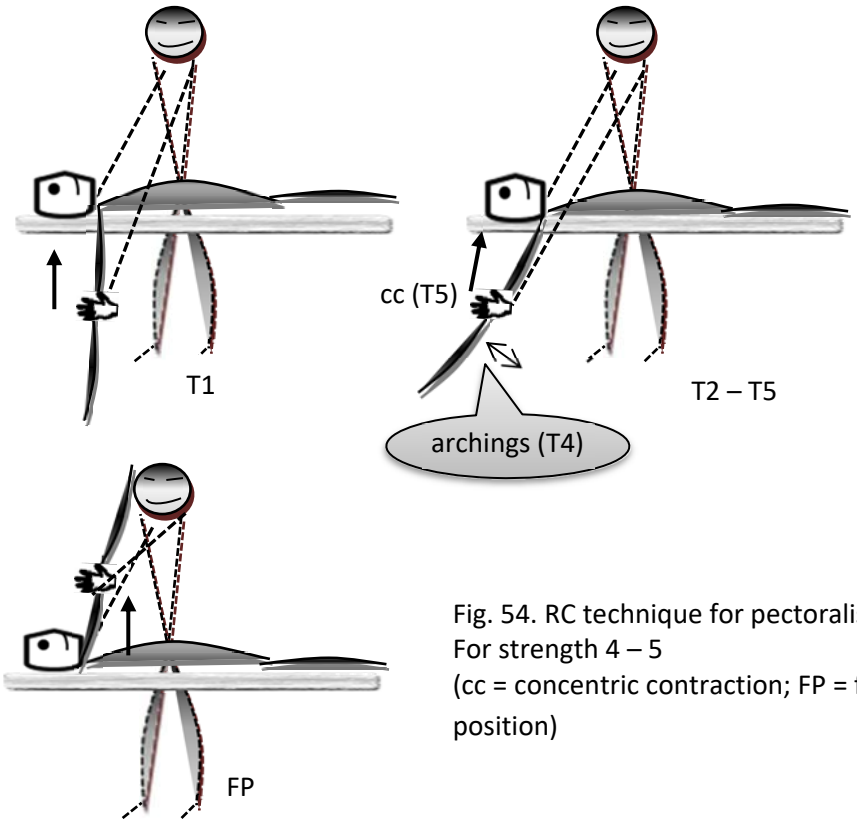

Fig. 54. RC technique for pectoralis major - For strength 4 – 5
(cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal adduction on the trunk – to the point where a hollow of strength can be felt	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T2	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T3	Maintaining	Relax!	Relaxation
T4	Shoulder horizontal abductions – adductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the pectoralis major)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. AR (Agonistic reversal)

Initial position:

Patient sitting with the shoulder horizontally abducted.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the anterior face (fig. 55 a and b). The patient's forearm rests on the physiotherapist's forearm.

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T2	20° arm horizontal abduction on the trunk	Hold, do not let me take your arm laterally!	Eccentric contraction of the pectoralis major
T3	Arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T4	40° arm horizontal abduction on the trunk	Hold, do not let me take your arm laterally!	Eccentric contraction of the pectoralis major
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the anterior face of the arm and the patient will try to push towards horizontal adduction!

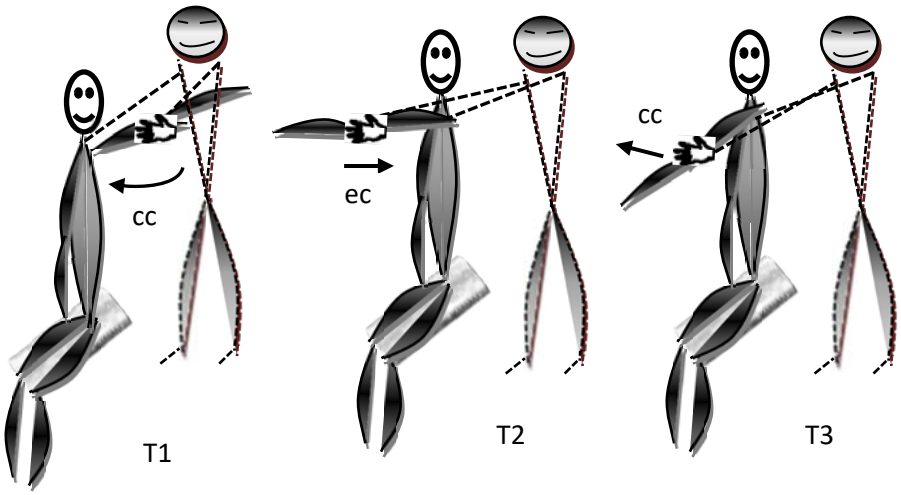

Fig. 55a. AR technique for pectoralis major: T1 – T3
(cc = concentric contraction; ec = eccentric contraction)

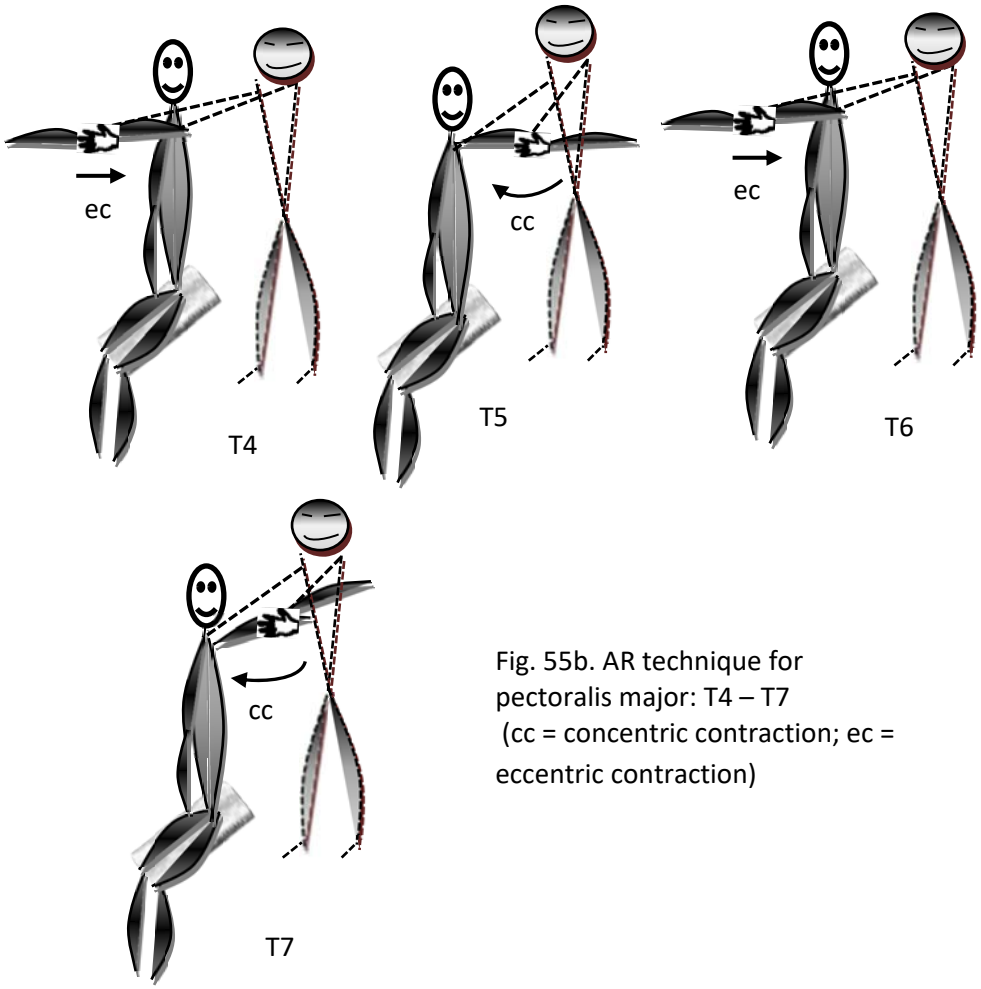

Fig. 55b. AR technique for pectoralis major: T4 – T7
(cc = concentric contraction; ec = eccentric contraction)

5. ***TE (Timing for emphasis)***

Objective: toning the pectoralis major muscle of the left side.
Variant 1 (bilateral) (fig. 56)
Initial position:

Patient sitting with the arms 90° abducted on the trunk.

Physiotherapist in front of the patient, mobilizing hands on the distal third of both arms, the anterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right arm)	Push your right arm in my hand!	Isometric contraction of the right pectoralis major
T2	Maintaining (right arm) + Horizontal adduction of the left arm on the trunk	Push in my hands! (Maintain right arm in the same position and adduct your left arm horizontally on the trunk!)	Isometric contraction of the right pectoralis major + Concentric contraction of the left pectoralis major

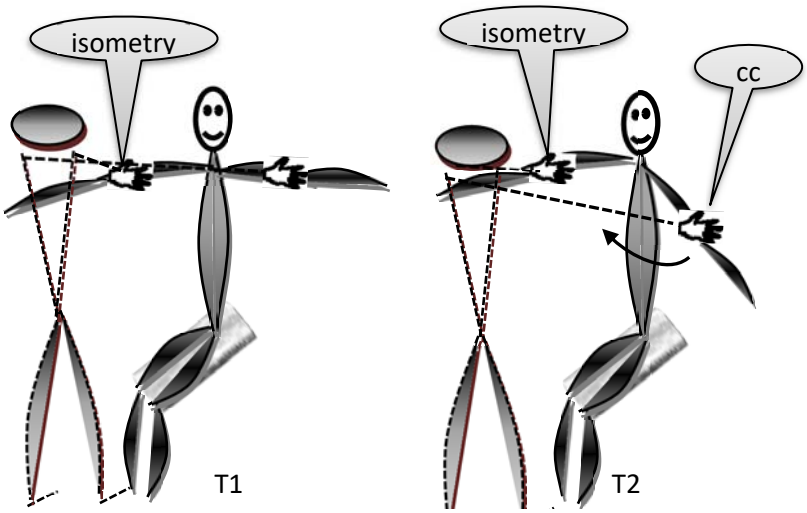

Fig. 56. TE technique for pectoralis major – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) (fig. 57)
Initial position:

Patient in sitting, with the arm horizontally abducted on the trunk and forearm slightly flexed on the arm.

Physiotherapist in front of the patient, one mobilizing hand on the distal third of the forearm, the anterior face, and the other mobilizing hand on the distal third of the arm, the anterior face.

We use the brachial biceps muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of flexion for the upper limbs, together with the pectoralis major.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position slightly flexed on the arm	Push your forearm in my hand!	Isometric contraction of the brachial biceps
T2	Maintaining forearm position + Arm horizontal adduction on the trunk	Push in my hands! (Maintain forearm in the same position and adduct your arm horizontally on your trunk!)	Isometric contraction of the brachial biceps + Concentric contraction of the pectoralis major

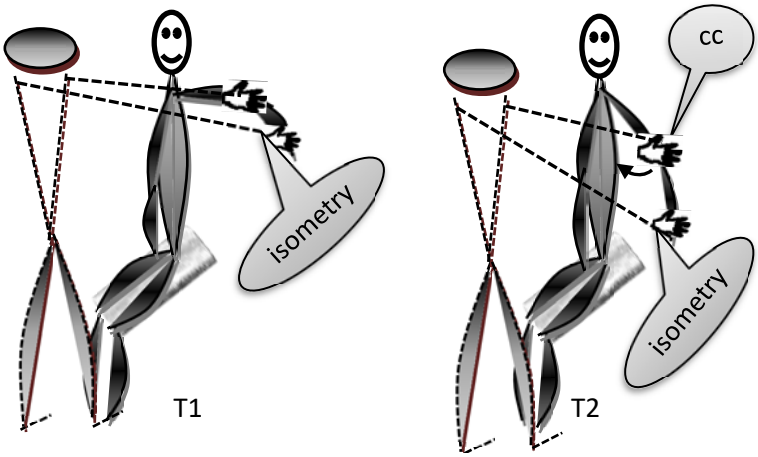

Fig. 57. TE technique for pectoralis major – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient in sitting, with the arm slightly horizontally adducted on the trunk.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting the patient's forearm on their forearm (fig. 58).

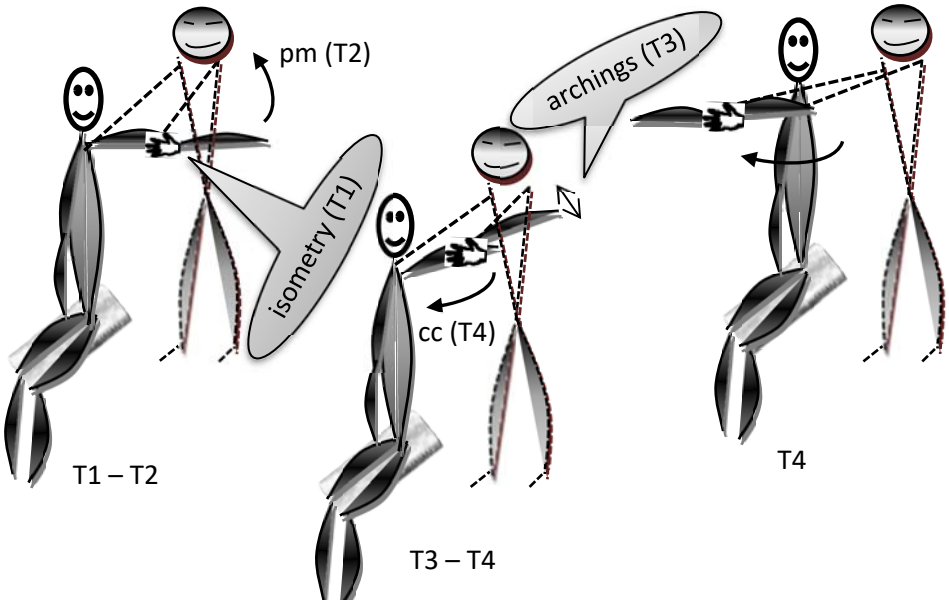

Fig. 58. HRAM technique for pectoralis major
(pm = passive movement; cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T2	Arm horizontal abduction on the trunk	Relax!	Passive movement

	(The physiotherapist quickly takes the patient's arm in horizontal abduction)		
T3	Shoulder horizontal abductions – adductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the pectoralis major)*	Relax!	Passive movement
T4	Arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major

7. RI (Rhythmic initiation)

Initial position:

Patient sitting with the arms 90° abducted on the trunk.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm by grabbing it (fig. 59). The patient's forearm rests on the physiotherapist's forearm.

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal abduction on the trunk	Relax, let me move your arm!	Passive movement
T2	Arm horizontal adduction on the trunk	Relax, let me move your arm!	Passive movement
T3	Arm horizontal abduction on the trunk	Move your arm together with me!	Concentric contraction of the posterior deltoid – passive-active movement

T4	Arm horizontal adduction on the trunk	Move your arm together with me!	Concentric contraction of the pectoralis major – passive-active movement
T5	Arm horizontal abduction on the trunk	Abduct your arm horizontally on your trunk!	Concentric contraction of the posterior deltoid – active movement
T6	Arm horizontal adduction on the trunk	Adduct your arm horizontally on your trunk!	Concentric contraction of the pectoralis major – active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

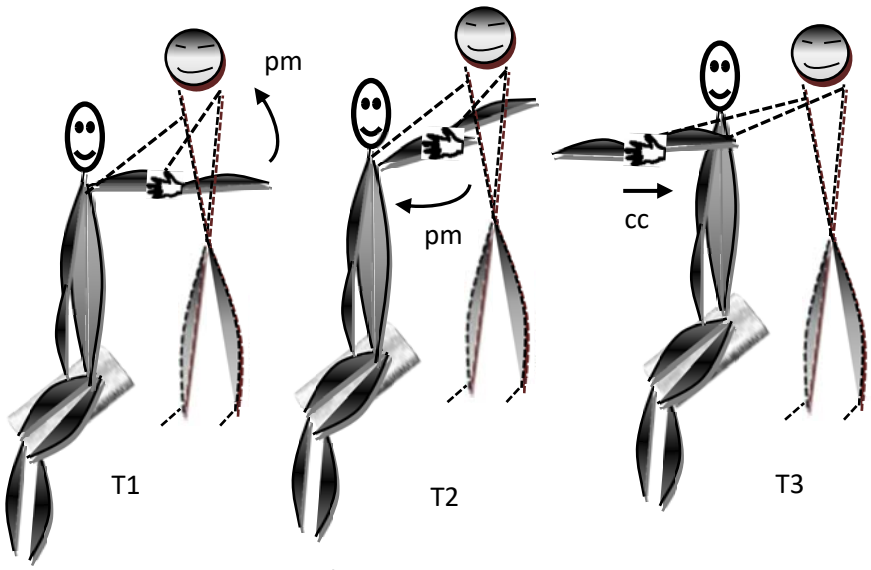

Fig. 59. RI technique for pectoralis major
(pm = passive movement; cc = concentric contraction)

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the pectoralis major, the technique is started with the arm 90° abducted on the trunk, while when we want to obtain its inhibition in order to increase the range of motion in horizontal abduction, the technique is started in the

limitation point of the movement, i.e., with the arm horizontally abducted on the trunk (fig. 60).

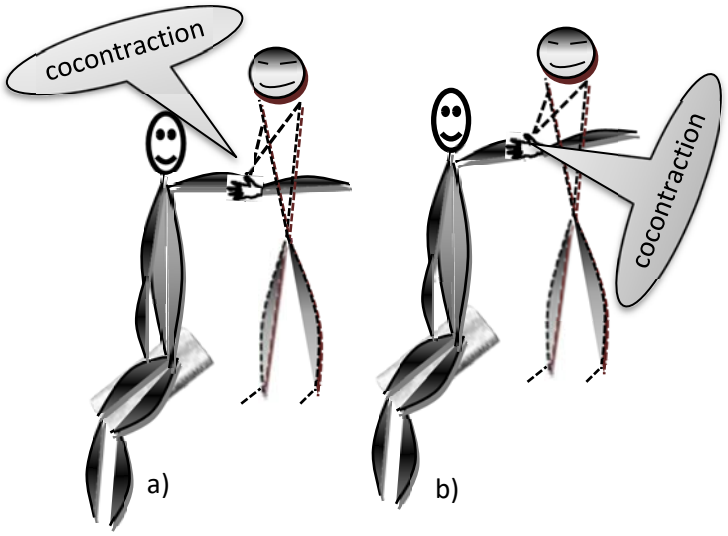

Fig. 60. RS technique for pectoralis major: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Pectoralis Major Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm by grasping it and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 61).

Moving times	Movement	Verbal command	Technique
T1	Shoulder Internal Rotation	Relax, let me move your arm!	Passive movement
T2	Shoulder External Rotation	Relax, let me move your arm!	Passive movement
T3	Shoulder Internal Rotation	Move your arm with me!	Passive – active movement
T4	Shoulder External Rotation	Move your arm with me!	Passive – active movement
T5	Shoulder Internal Rotation	Rotate the arm internally on the trunk!	Active movement
T6	Shoulder External Rotation	Rotate the arm externally on the trunk!	Active movement

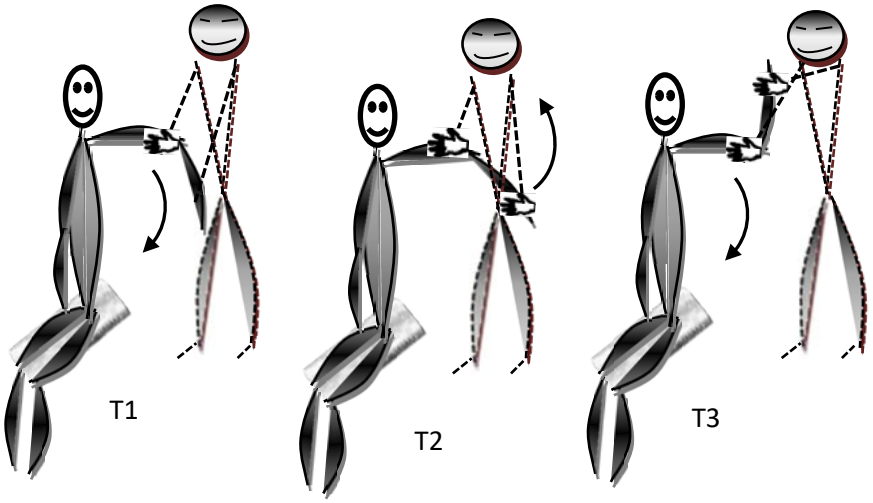

Fig. 61. RR technique for pectoralis major

3. ***HR (Hold-Relax)***

Variant: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as is the pectoralis major in this case*)

Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

Physiotherapist behind the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting it (fig. 62). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal abduction on the trunk	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the pectoralis major
T4 – T6	Repeat times 1 - 3.		

Variant: Agonist HR (*the agonist is the muscle that performs the limited movement, as is the posterior deltoid in this case*)
Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

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 it (fig. 62). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal abduction on the trunk	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the pectoralis major
T4 – T6	Repeat times 1 - 3		

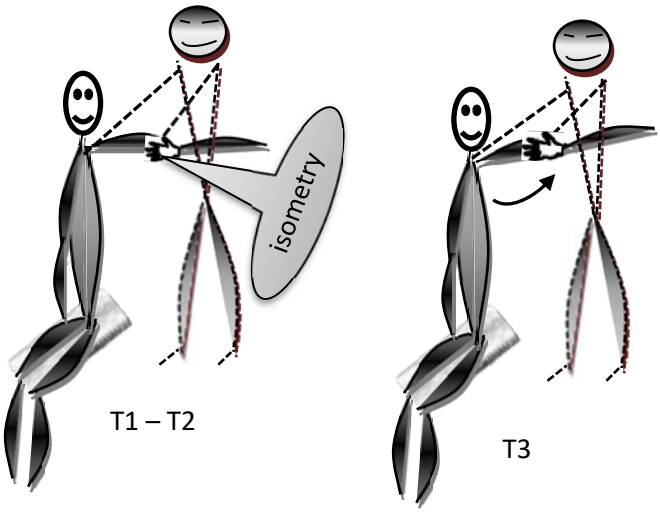

Fig. 62. HR technique for pectoralis major

4. HR-C (Hold-Relax-Contraction)

Version: Antagonist HR-C
Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

Physiotherapist behind the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting it (fig. 62). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal abduction on the trunk	Abduct your arm horizontally on your body! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the posterior deltoid (Active Stretching of the pectoralis major)
T4 – T6	Repeat times 1 - 3.		

Variant: Agonist HR-C
Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

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 it (fig. 62). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Maintaining	Relax!	Relaxation

T3	Arm horizontal abduction on the trunk	Abduct your arm horizontally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the posterior deltoid (Active Stretching of the pectoralis major)
T4 – T6	Repeat times 1- 3		

7. ***CR (Contract - Relax)***

Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist behind the patient, one mobilizing hand on the distal third of the forearm by grabbing it and the other mobilizing hand on the distal third of the arm, the anterior face by grabbing underneath, supporting it (fig. 63).

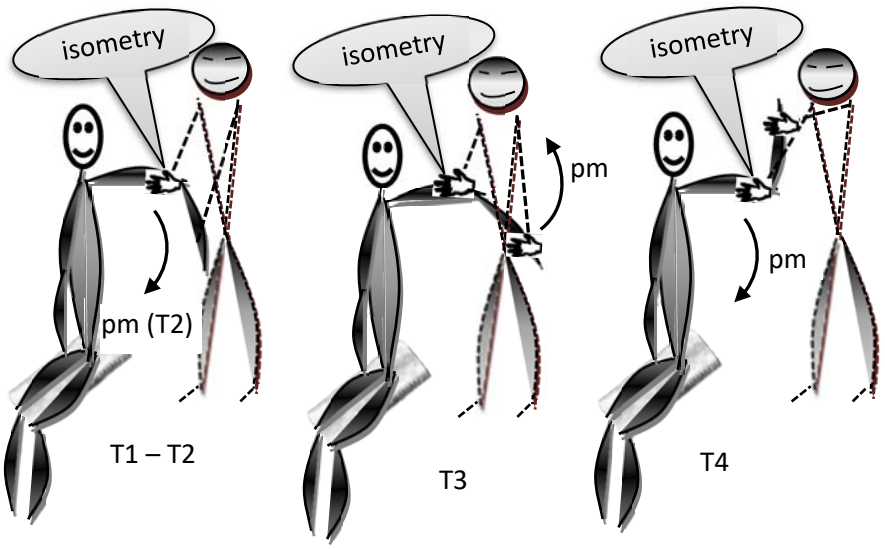

Fig. 63. CR technique for pectoralis major
(pm = passive movement)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push the arm in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining the arm position in horizontal abduction + Internal shoulder rotation	Adduct your arm horizontally on your trunk and let me rotate your shoulder!	Isometric contraction of the pectoralis major + Passive movement of internal rotation of the shoulder
T3	Maintaining the arm position in horizontal abduction + External shoulder rotation	Adduct your arm horizontally on your trunk and let me rotate your shoulder!	Isometric contraction of the pectoralis major + Passive movement of external rotation of the shoulder
T4	Maintaining the arm position in horizontal abduction + Internal shoulder rotation	Adduct your arm horizontally on your trunk and do the internal shoulder rotation with me!	Isometric contraction of the pectoralis major + Passive- active movement of internal rotation of the shoulder
T5	Maintaining the arm position in horizontal abduction + External shoulder rotation	Adduct your arm horizontally on your trunk and do the external shoulder rotation with me!	Isometric contraction of the pectoralis major + Passive- active movement of external rotation of the shoulder

8. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 64a)
Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

Physiotherapist behind the patient, with one mobilizing hand on the distal third of the arm, in the anterior face and another mobilizing hand on the distal third of the arm, the posterior face. The patient's forearm rests on the physiotherapist's forearm and both hands, in addition to resisting, also have the role of supporting the arm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the posterior deltoid
T3	Maintaining *(The physiotherapist pushes the patient's arm toward both horizontal adduction and abduction, alternating more and more rapidly between the two directions)*	Hold, do not let me move your arm!	Cocontraction for pectoralis major and posterior deltoid
T4	Maintaining	Relax!	Relaxation

Simultaneous version (fig. 64b)
Initial position:

Patient in sitting with the arm horizontally abducted on the trunk at the point of mobility limitation.

Physiotherapist behind the patient, with one mobilizing hand on the distal third of the arm, in the medial face and another mobilizing hand on the distal third of the arm, the posterior face.

We use the fact that the pectoralis major has as its main action the horizontal adduction of the arm on the trunk but also the arm adduction on the trunk..

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Lower your arm and push it backwards! (Adduct the arm on your trunk and do the horizontal abduction!)	Isometric contraction for pectoralis major and posterior deltoid (Cocontraction)
T2	Maintaining	Relax!	Relaxation

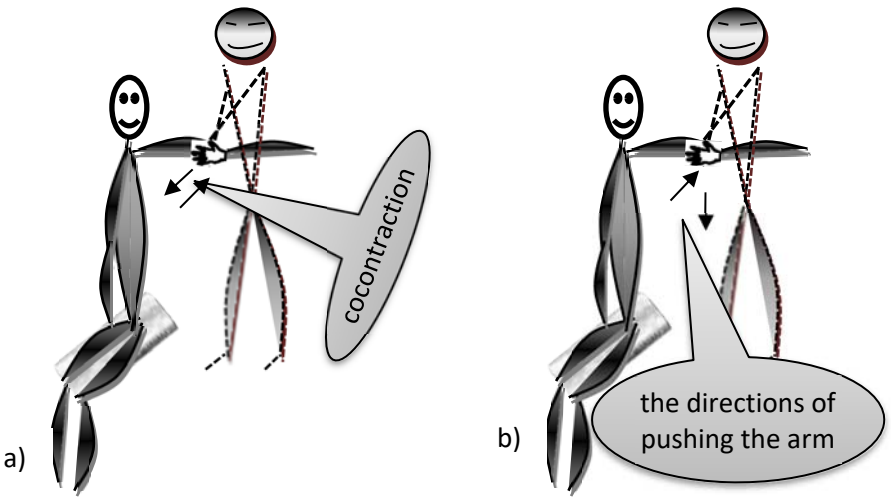

Fig. 64. RS technique for pectoralis major: a) alternative version;
b) simultaneous version

5. ICS (Isometric contraction in a short zone)

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Posterior Deltoid

Action: Arm horizontal abduction on the trunk (shoulder horizontal abduction)
Accessory muscles: Infraspinatus, Teres Minor
Other actions: Arm extension on the trunk, shoulder external rotation

Fig. 65. Posterior deltoid muscle (12)

1. ***SR (Slow reversals)***

Initial position:

Patient in sitting with the arm horizontally abducted on the trunk.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the anterior face, supporting the arm. The patient's forearm rests on the physiotherapist's forearm (fig. 66).

The technique starts on the antagonist (on the pectoralis major).

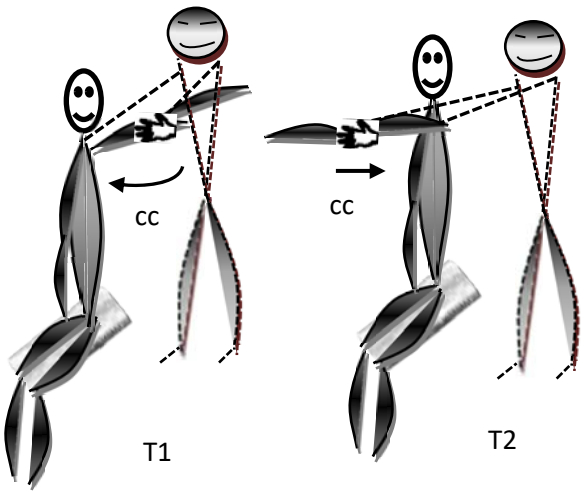

Fig. 66. SR technique for posterior deltoid (cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal adduction on the trunk	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major
T2	Shoulder horizontal abduction (*Mobilizing hand switches on the posterior face of the arm)*	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid

2. ***SRH (Slow reversals hold)***

Initial position:

Patient sitting with the shoulder horizontally adducted.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the posterior face, supporting the arm. The patient's forearm rests on the physiotherapist's forearm (fig. 67).

Moving times	Movement	Verbal command	Technique
T1	Shoulder horizontal abduction	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T2	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T3	Shoulder horizontal adduction *(Mobilizing hand switches on the anterior face of the arm)*	Push in my hand! (Adduct your arm horizontally on your trunk!)	Concentric contraction of the pectoralis major

T4	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major

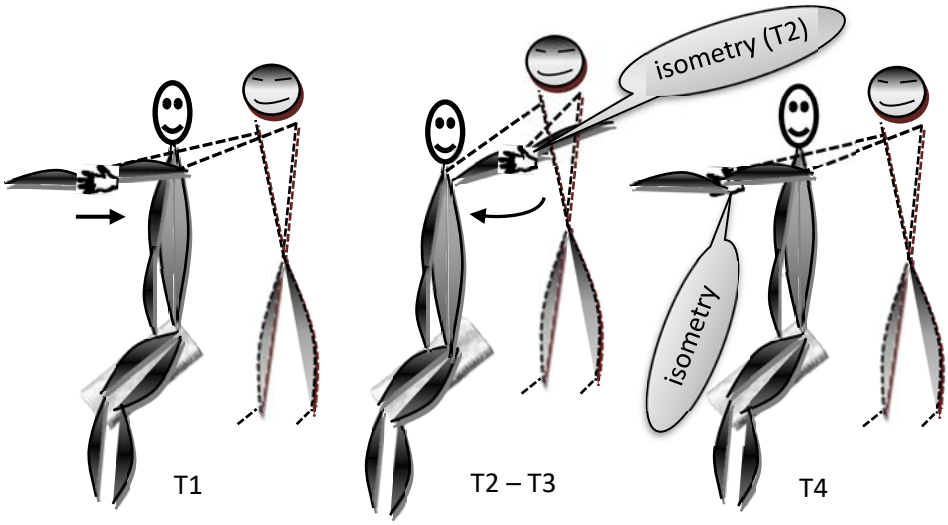

Fig. 67. SRH technique for posterior deltoid

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 68)
Initial position:

Patient sitting with the shoulder horizontally adducted.

Physiotherapist behind the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the posterior face. The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Shoulder horizontal adductions – abductions on low range of motion (archings) *(The physiotherapist performs repeated short*	Relax!	Passive movement

	stretches of the posterior deltoid)		
T3	Shoulder horizontal adductions – abductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the posterior deltoid)*	Contract! Try to abduct your arm horizontally on the trunk!	Passive movement

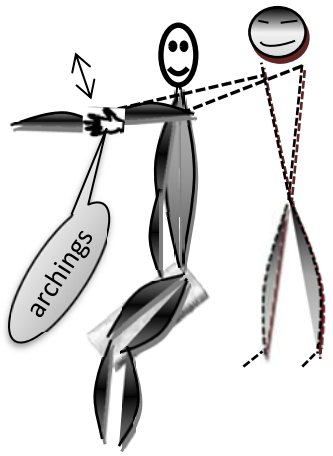

Fig. 68. RC technique for posterior deltoid - For strength 0 – 1

For strength 2-3 (fig. 69)

Initial position:

Patient sitting with the shoulder horizontally adducted.

Physiotherapist behind the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the posterior face. The patient's forearm rests on the physiotherapist's forearm.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

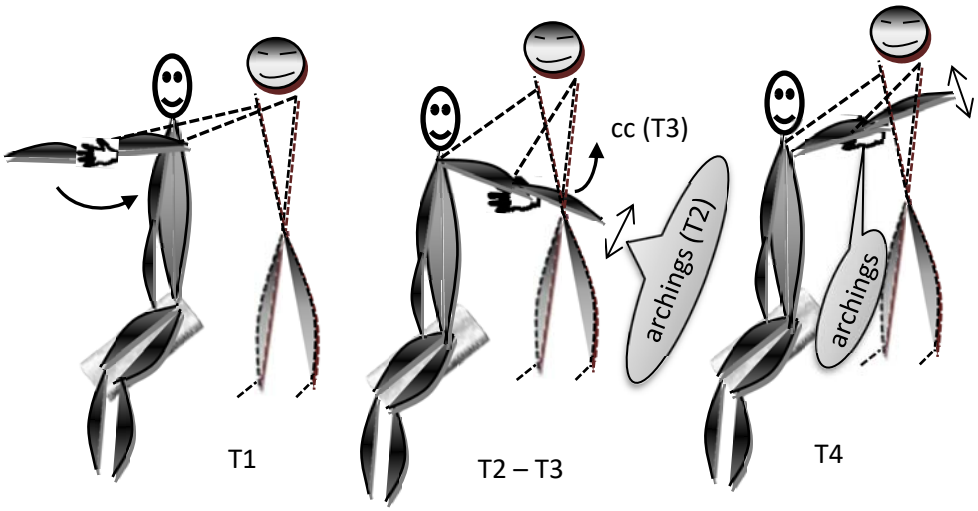

Fig. 69. RC technique for posterior deltoid - For strength 2 – 3

Moving times	Movement	Verbal command	Technique
T1	20º arm horizontal abduction on the trunk at	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T2	Shoulder horizontal adductions – abductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the posterior deltoid)*	Continue to abduct your arm horizontally on your trunk!	Passive movement
T3	20º arm horizontal abduction on the trunk at	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T4	Shoulder horizontal adductions – abductions	Continue to abduct your arm	Passive movement

	on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the posterior deltoid)*	horizontally on your trunk!	
T5	It is continued on the entire range of motion.		

For strength 4-5 (fig. 70)
Initial position:

Patient in ventral decubitus at the edge of the bed with arm horizontally adducted on the trunk.

Physiotherapist contralateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Arm horizontal abduction on the trunk - to the point where a hollow of strength can be felt	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T2	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T3	Maintaining	Relax!	Relaxation
T4	Shoulder horizontal adductions – abductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the posterior deltoid)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

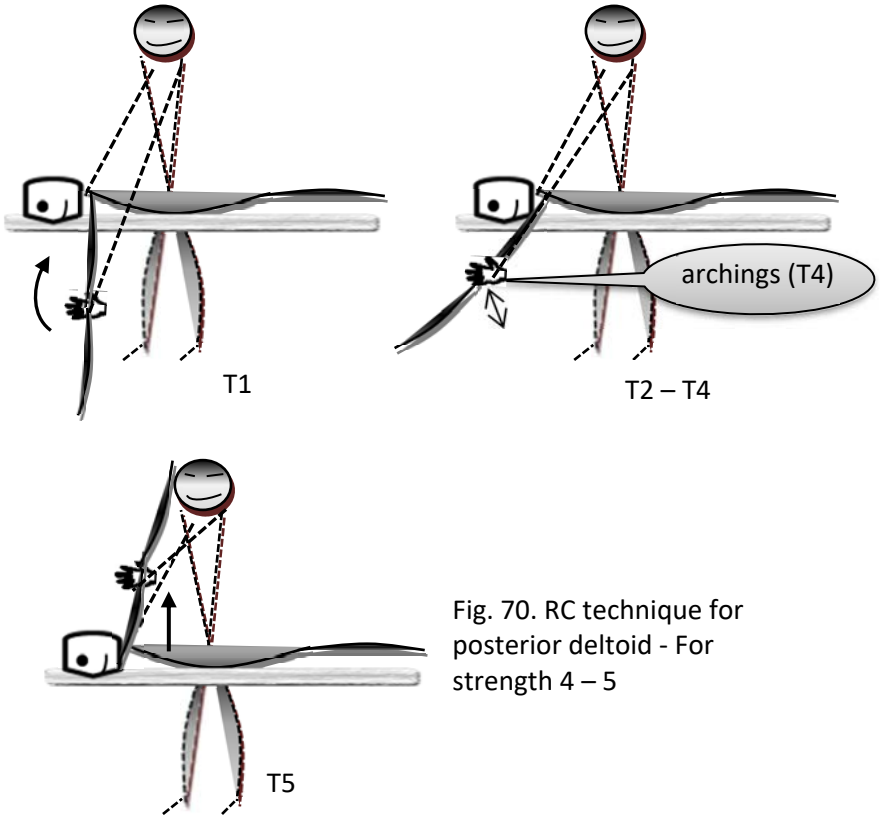

Fig. 70. RC technique for posterior deltoid - For strength 4 – 5

4. ***AR (Agonistic reversal)***

Initial position:

Patient in sitting with the arm horizontally adducted on the trunk.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand underneath, on the distal third of the arm, the posterior face (fig. 71 a and b). The patient's forearm rests on the physiotherapist's forearm.

Attention: During the entire technique, the mobilizing hand remains on the posterior face of the arm and the patient will try to push towards horizontal abduction!

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal abduction on the trunk	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid
T2	20° arm horizontal adduction on the trunk	Hold, do not let me take your arm forward!	Eccentric contraction of the posterior deltoid
T3	Arm horizontal abduction on the trunk	Push in my hand! (Abduct your arm horizontally on your body!)	Concentric contraction of the posterior deltoid
T4	40° arm horizontal adduction on the trunk	Hold, do not let me take your arm forward!	Eccentric contraction of the posterior deltoid
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

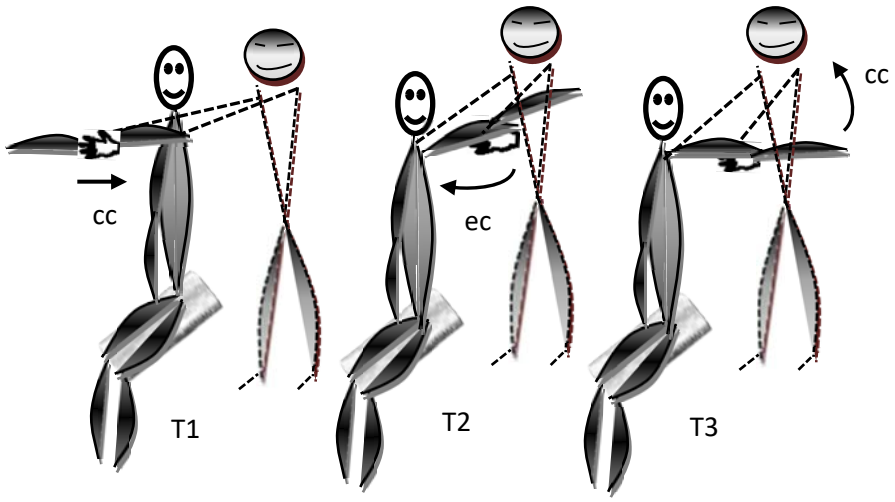

Fig. 71a. AR technique for posterior deltoid: T1 – T3
(cc = concentric contraction; ec = eccentric contraction)

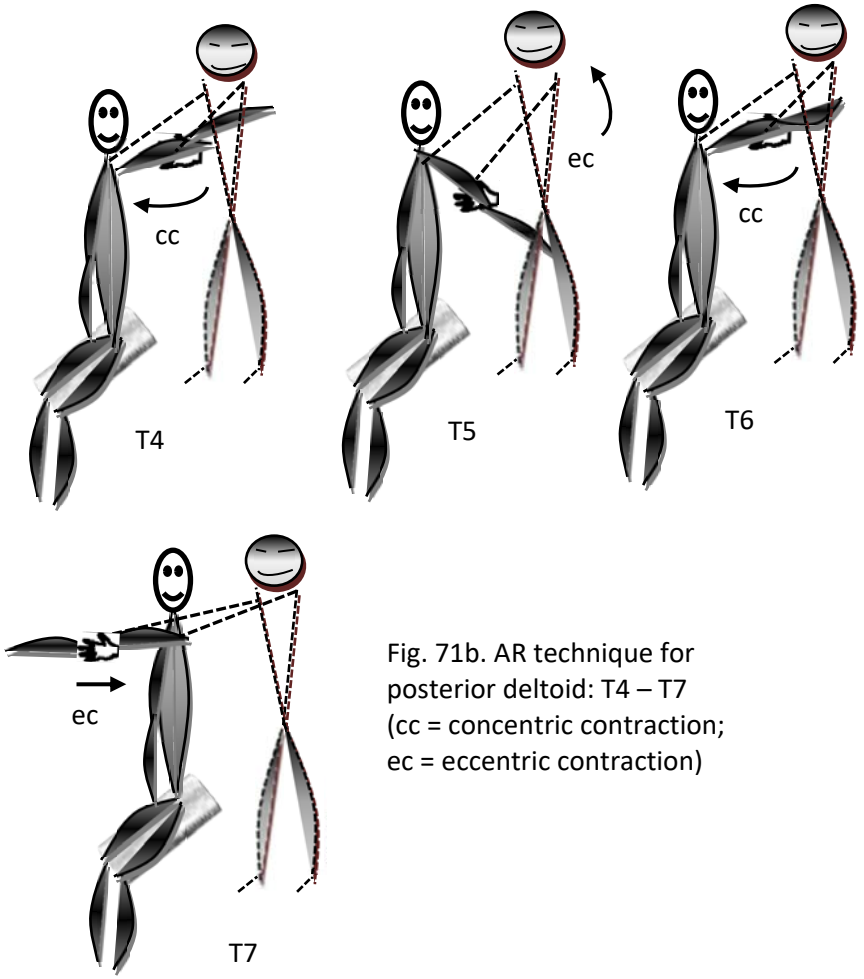

Fig. 71b. AR technique for posterior deltoid: T4 – T7 (cc = concentric contraction; ec = eccentric contraction)

5. ***TE (Timing for emphasis)***

Objective: toning the posterior deltoid muscle of the right arm.
Variant 1 (bilateral) (fig. 72)
Initial position:

Patient sitting with the left arm 90° abducted on the trunk and the right arm horizontally adducted on the trunk.

Physiotherapist behind to patient, mobilizing hands on the distal third of both arms, the posterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (left arm)	Push your left arm in my hand	Isometric contraction of the posterior deltoid of the left side
T2	Maintaining (left arm) + Horizontal abduction of the right arm on the trunk	Push in my hands! (Maintain left arm in the same position and adduct your right arm horizontally on the trunk)	Isometric contraction of the posterior deltoid of the left side + Concentric contraction of the posterior deltoid of the right side

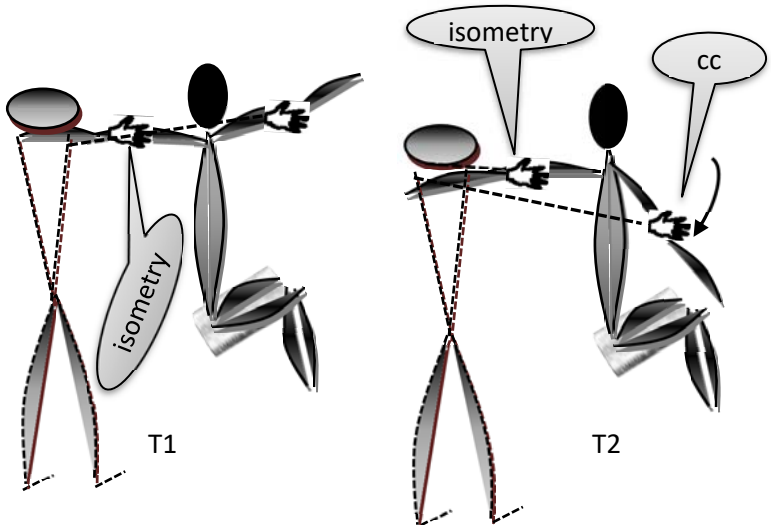

Fig. 72. TE technique for posterior deltoid – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) (fig. 73)
Initial position:

Patient in sitting, with the arm horizontally adducted on the trunk and forearm slightly flexed on the arm.

Physiotherapist behind the patient, one mobilizing hand on the distal third of the forearm, the posterior face, and the other mobilizing hand on the distal third of the arm, the posterior face.

We use the triceps brachii muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of extension for the upper limbs, together with the posterior deltoid.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position slightly flexed on the arm	Push your forearm in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining forearm position + Arm horizontal abduction on the trunk	Push in my hands! (Maintain forearm in the same position and abduct your arm horizontally on your trunk!)	Isometric contraction of the triceps brachii + Concentric contraction of the posterior deltoid

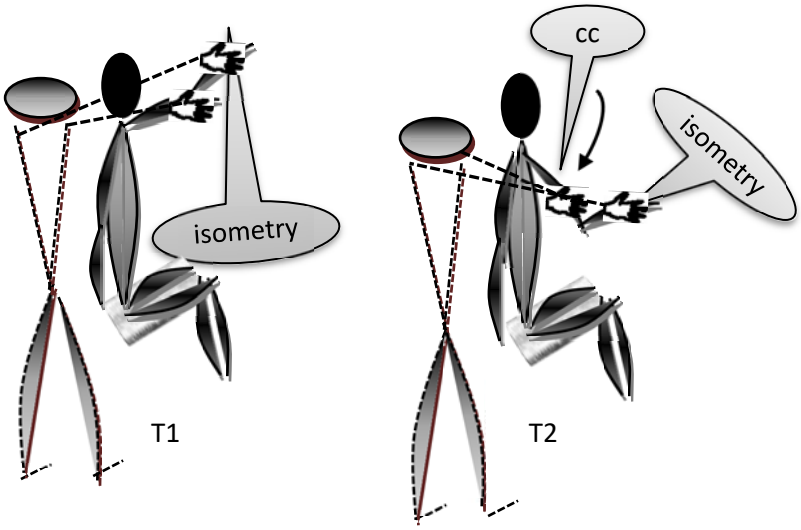

Fig. 73. TE technique for posterior deltoid – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient sitting with the arm 90° abducted on the trunk.

Physiotherapist behind - ipsilateral to 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 (fig. 74).

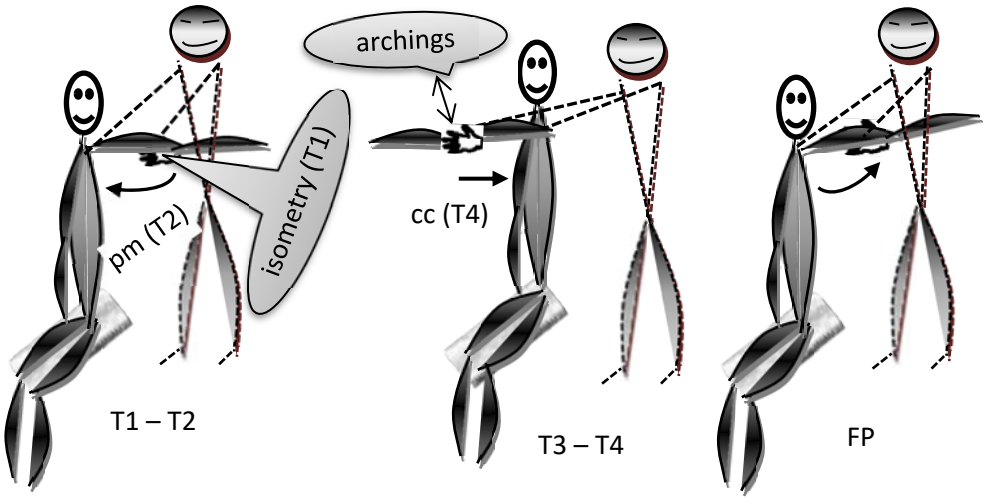

Fig. 74. HRAM technique for posterior deltoid
(mp = passive movement; cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Arm horizontal adduction on the trunk *(The physiotherapist quickly takes the patient's*	Relax!	Passive movement

	arm in horizontal adduction)		
T3	Shoulder horizontal adductions – abductions on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the posterior deltoid)*	Relax!	Passive movement
T4	Arm horizontal abduction on the trunk	Push in my hand! (Abduct your arm horizontally on your trunk!)	Concentric contraction of the posterior deltoid

7. RI (Rhythmic initiation)

Initial position:

Patient sitting with the arm 90° abducted on the trunk.

Physiotherapist behind - ipsilateral to the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm by grabbing it (fig. 75). The patient's forearm rests on the physiotherapist's forearm.

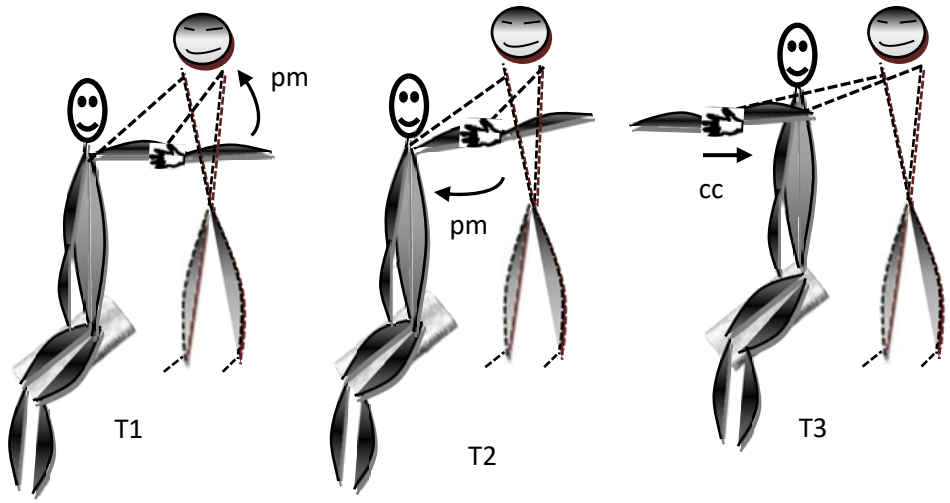

Fig. 75. RI technique for posterior deltoid
(mp = passive movement; cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Arm horizontal abduction on the trunk	Relax, let me move your arm!	Passive movement
T2	Arm horizontal adduction on the trunk	Relax, let me move your arm!	Passive movement
T3	Arm horizontal abduction on the trunk	Move your arm together with me!	Concentric contraction of the posterior deltoid – passive-active movement
T4	Arm horizontal adduction on the trunk	Move your arm together with me!	Concentric contraction of the pectoralis major – passive-active movement
T5	Arm horizontal abduction on the trunk	Abduct your arm horizontally on your trunk!	Concentric contraction of the posterior deltoid – active movement
T6	Arm horizontal adduction on the trunk	Adduct your arm horizontally on your trunk!	Concentric contraction of the pectoralis major – active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

8. RS (Rhythmic stabilization)

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the posterior deltoid, the technique is started with the arm 90° abducted on the trunk, while when we want to obtain its inhibition in order to increase the range of motion in horizontal adduction, the technique is started in the limitation point of the movement, i.e., with the arm horizontally adducted on the trunk (fig. 76).

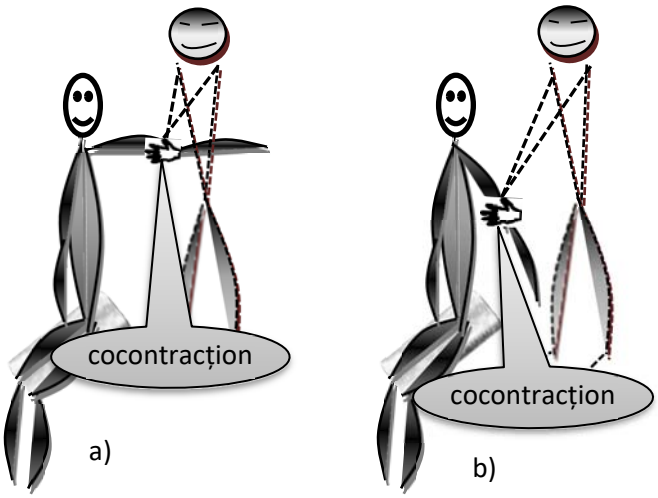

Fig. 76. RS technique for posterior deltoid: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Posterior Deltoid Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist in front of the patient, with mobilizing hand on the distal third of the forearm by grasping it and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 77).

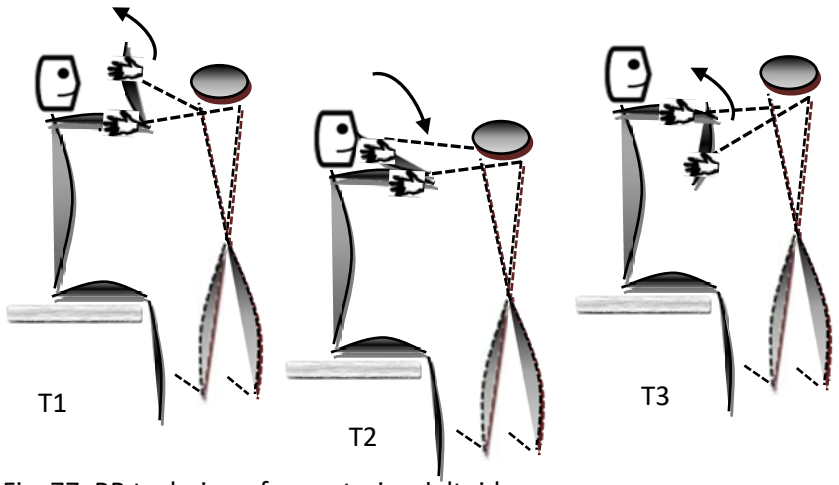

Fig. 77. RR technique for posterior deltoid

Moving times	Movement	Verbal command	Technique
T1	Shoulder Internal Rotation	Relax, let me move your arm!	Passive movement

T2	Shoulder External Rotation	Relax, let me move your arm!	Passive movement
T3	Shoulder Internal Rotation	Move your arm with me!	Passive – active movement
T4	Shoulder External Rotation	Move your arm with me!	Passive – active movement
T5	Shoulder Internal Rotation	Rotate the arm internally on the trunk!	Active movement
T6	Shoulder External Rotation	Rotate the arm externally on the trunk!	Active movement

3. HR (Hold-Relax)

Variant: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as is the posterior deltoid in this case*)
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation.

Physiotherapist in front of 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 it (fig. 78). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal adduction on the trunk	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the posterior deltoid
T4 – T6	Repeat times 1 - 3.		

Variant: Agonist HR (*the agonist is the muscle that performs the limited movement, as is the pectoralis major in this case*)
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation.

Physiotherapist in front of the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting it (fig. 78). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal adduction on the trunk	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the posterior deltoid
T4 – T6	Repeat times 1 - 3		

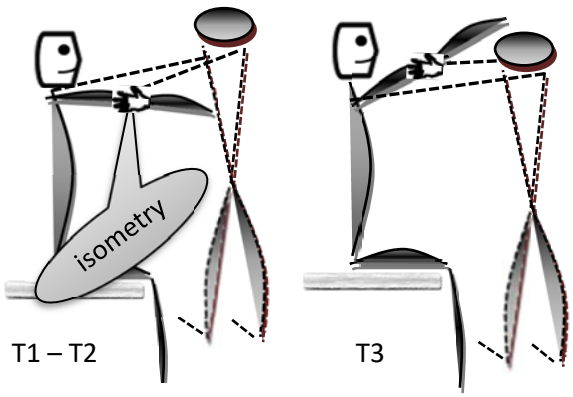

Fig. 78. HR technique for posterior deltoid

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation.

Physiotherapist in front of 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 it (fig. 78). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Maintaining	Relax!	Relaxation
T3	Arm horizontal adduction on the trunk	Adduct your arm horizontally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the pectoralis major (Active Stretching of the posterior deltoid)
T4 – T6	Repeat times 1- 3.		

Version: Agonist HR-C
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation.

Physiotherapist in front of the patient, stabilizing hand on the shoulder and the mobilizing hand on the distal third of the arm, the anterior face, by grabbing underneath, supporting it (fig. 78). The patient's forearm rests on the physiotherapist's forearm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining	Relax!	Relaxation

T3	Arm horizontal adduction on the trunk	Adduct your arm horizontally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the pectoralis major (Active Stretching of the posterior deltoid)
T4 - T6	Repeat times 1 - 3		

5. ***CR (Contract - Relax)***

Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist in front of the patient, one mobilizing hand on the distal third of the forearm by grabbing it and the other mobilizing hand on the distal third of the arm, the posterior face by grabbing underneath, supporting it (fig. 79).

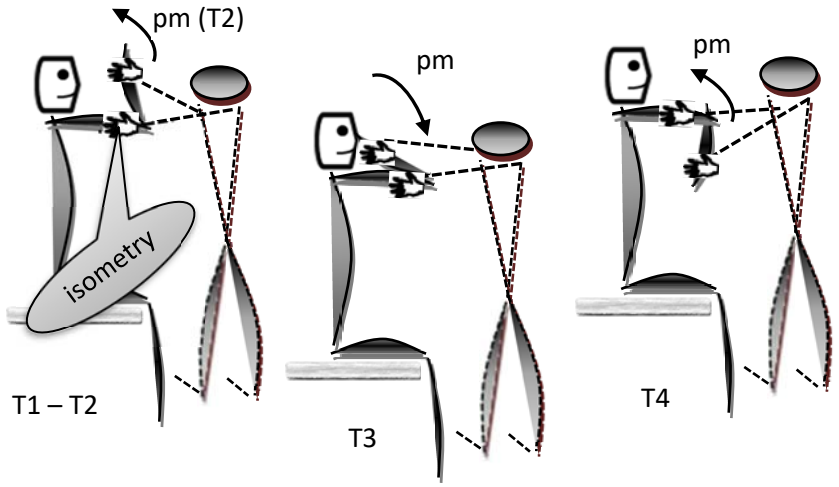

Fig. 79. CR technique for posterior deltoid
(pm = passive movement)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the posterior deltoid
T2	Maintaining the arm position in horizontal adduction + Internal shoulder rotation	Abduct your arm horizontally on your trunk and let me rotate your shoulder!	Isometric contraction of the posterior deltoid + Passive movement of internal rotation of the shoulder
T3	Maintaining the arm position in horizontal adduction + External shoulder rotation	Abduct your arm horizontally on your trunk and let me rotate your shoulder!	Isometric contraction of the posterior deltoid + Passive movement of external rotation of the shoulder
T4	Maintaining the arm position in horizontal adduction + Internal shoulder rotation	Abduct your arm horizontally on your trunk and do the internal shoulder rotation with me!!	Isometric contraction of the posterior deltoid + Passive- active movement of internal rotation of the shoulder
T5	Maintaining the arm position in horizontal adduction + External shoulder rotation	Abduct your arm horizontally on your trunk and do the external shoulder rotation with me!	Isometric contraction of the posterior deltoid + Passive- active movement of external rotation of the shoulder

6. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 80a)
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation.

Physiotherapist behind the patient, with one mobilizing hand on the distal third of the arm, on the anterior face and the other mobilizing hand on the distal third of the arm, the posterior face. The patient's forearm rests on the physiotherapist's forearm and both hands, in addition to resisting, also have the role of supporting the arm.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the pectoralis major
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the posterior deltoid
T3	Maintaining *(The physiotherapist pushes the patient's arm toward both horizontal adduction and abduction, alternating more and more rapidly between the two directions)*	Hold, do not let me move your arm!	Cocontraction for pectoralis major and posterior deltoid
T4	Maintaining	Relax!	Relaxation

Simultaneous version (fig. 80b)
Initial position:

Patient in sitting with the arm horizontally adducted on the trunk at the point of mobility limitation and the elbow flexed at 90°.

Physiotherapist behind the patient, with one mobilizing hand on the distal third of the arm, the posterior face and the other mobilizing hand on the distal third of the forearm, the anterior face.

We use the fact that the pectoralis major has as its main action arm horizontal adduction on the trunk, thus being antagonist of the middle deltoid, but also participates in the internal rotation of the arm on the trunk.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push the forearm in my hand and push the arm backward! (Rotate the arm internally on your trunk and do the horizontal abduction!)	Isometric contraction for pectoralis major and posterior deltoid (Cocontraction)
T2	Maintaining	Relax!	Relaxation

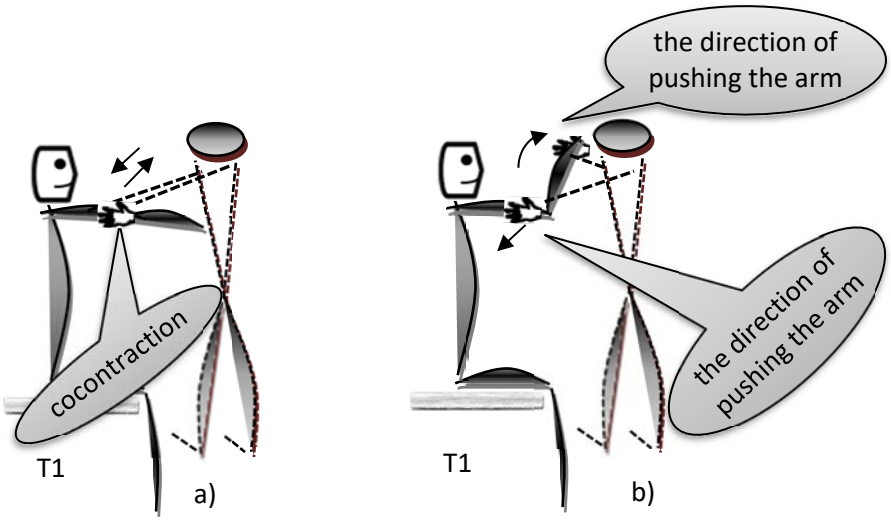

Fig. 80. RS technique for posterior deltoid: a) alternative version; b) simultaneous version

7. ICS (Isometric contraction in a short zone)

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Shoulder External Rotators

Action: Arm external rotation on the trunk (Shoulder external rotation)
Synergist muscles: Infraspinatus, Teres minor
Accessory muscles: Posterior deltoid

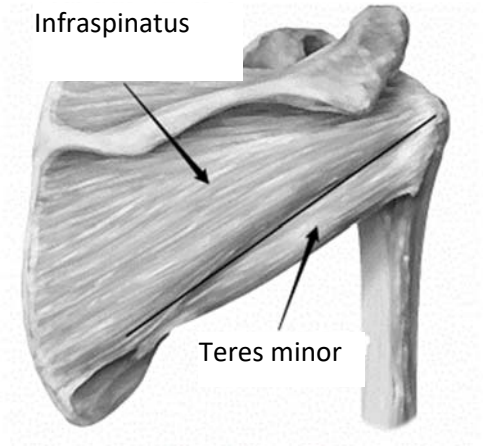

Fig. 81. Infraspinatus and Teres minor muscles (9)

1. SR (Slow reversals)

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, medial face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 82).

The technique starts on the antagonist (on the shoulder internal rotators).

Moving times	Movement	Verbal command	Technique
T1	Arm internal rotation on the trunk	Push in my hand! (Rotate the arm internally on the trunk!)	Concentric contraction of the shoulder internal rotators

T2	Arm external rotation on the trunk *(Mobilizing hand switches on the lateral face of the forearm)*	Push in my hand! (Rotate the arm externally on the trunk!)	Concentric contraction of the shoulder external rotators

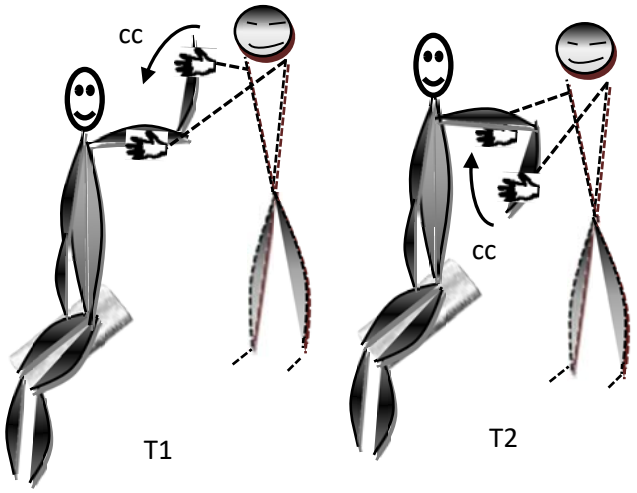

Fig. 82. SR technique for shoulder external rotators
(cc = concentric contraction)

2. ***SRH (Slow reversals hold)***

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, lateral face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 83).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Arm external rotation on the trunk	Push in my hand!	Concentric contraction of the

		(Rotate the arm externally on the trunk!)	shoulder external rotators
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators
T3	Arm internal rotation on the trunk *(Mobilizing hand switches on the medial face of the forearm)*	Push in my hand! (Rotate the arm internally on the trunk!)	Concentric contraction of the shoulder internal rotators
T4	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators

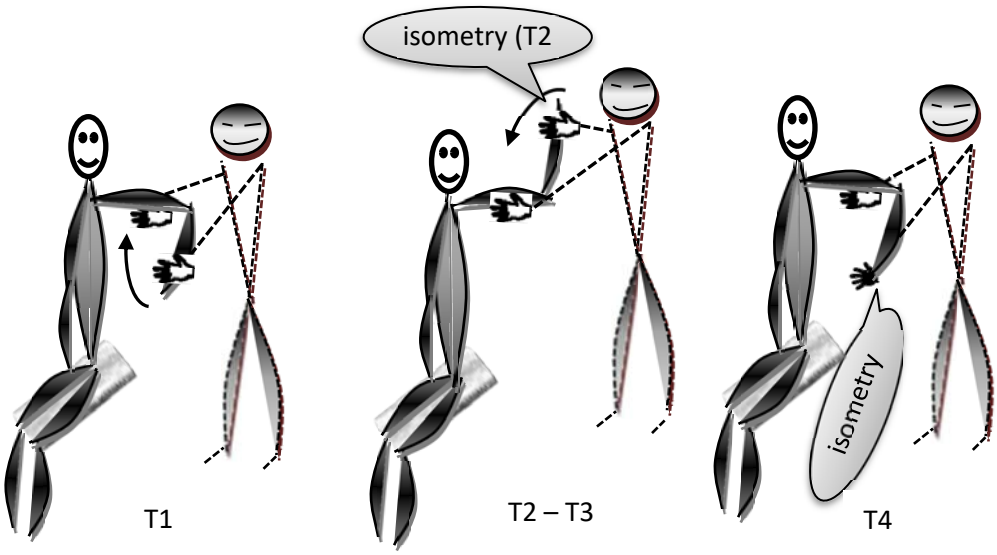

Fig. 83. SRH technique for shoulder external rotators

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 84)
Initial position:

Patient in ventral decubitus at the edge of the bed with arm flexed on the trunk at 90° and internally rotated (the arm hangs at the edge of the bed) and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the lateral face.

Moving times	Movement	Verbal command	Technique
T1	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Relax!	Passive movement
T2	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Contract! Try to rotate the arm externally on your trunk!	Passive movement

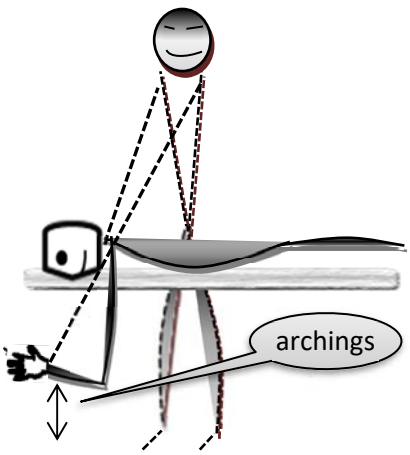

Fig. 84 RC technique for shoulder external rotators - For strength 0 – 1

For strength 2-3 (fig. 85)

Patient in ventral decubitus at the edge of the bed with arm flexed on the trunk at 90° and internally rotated (the arm hangs at the edge of the bed) and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the lateral face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	20º arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T2	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Continue to rotate the arm externally on your trunk!	Passive movement
T3	20º arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T4	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Continue to rotate the arm externally on your trunk!	Passive movement
T5	It is continued on the entire range of motion.		

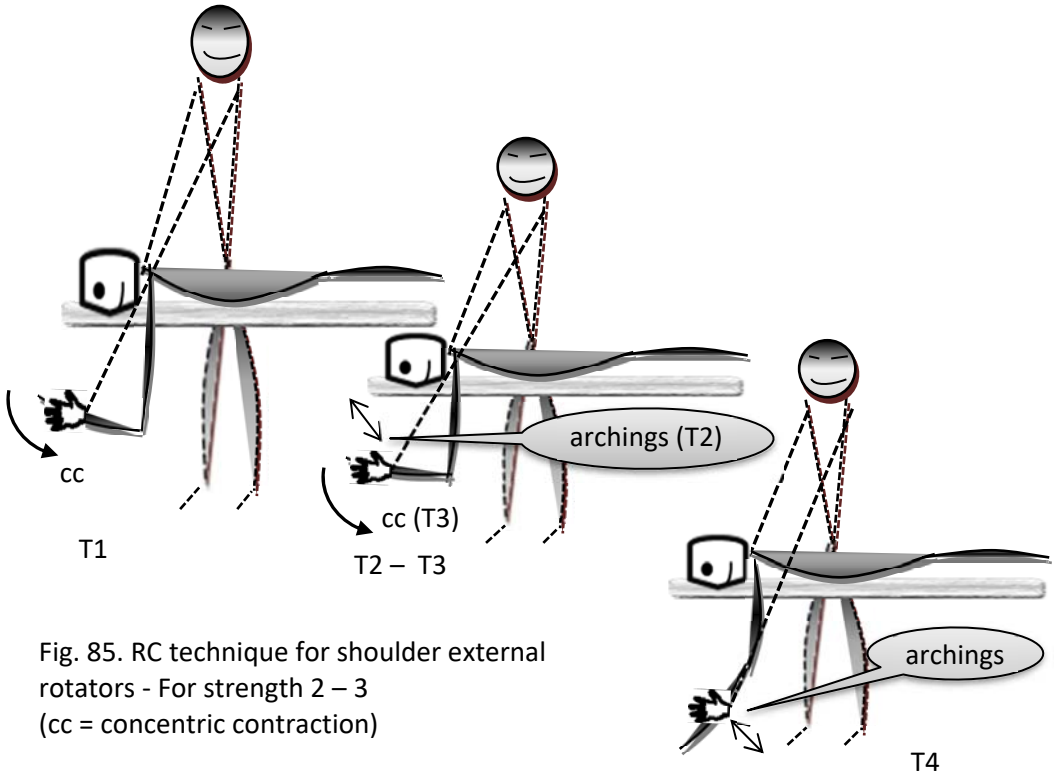

Fig. 85. RC technique for shoulder external rotators - For strength 2 – 3
(cc = concentric contraction)

For strength 4-5 (fig. 86)
Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and internally rotated and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, lateral face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it.

Moving times	Movement	Verbal command	Technique
T1	Arm external rotation on the trunk - to the point where a hollow of strength can be felt	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators
T3	Maintaining	Relax!	Relaxation
T4	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

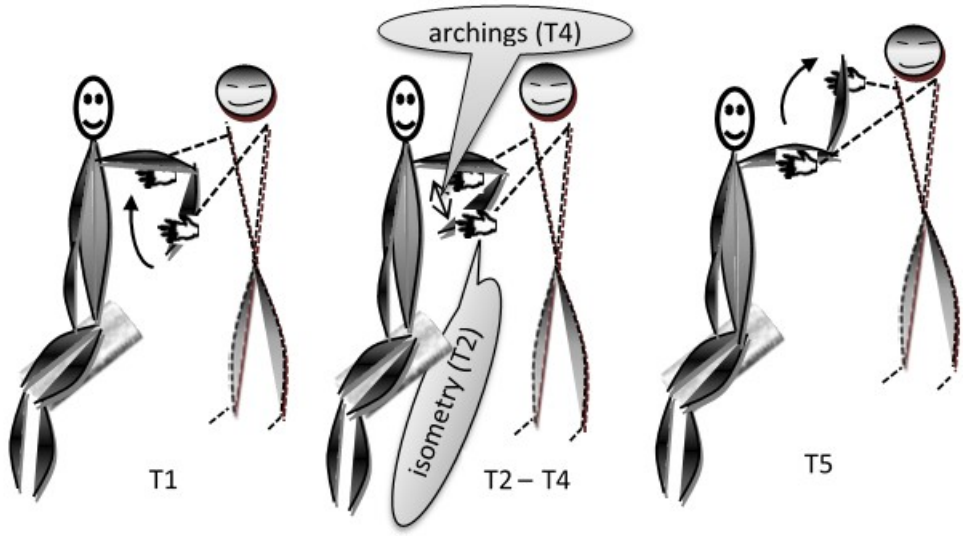

Fig. 86. RC technique for shoulder external rotators - For strength 4 – 5

4. AR (Agonistic reversal)

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and internally rotated and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, lateral face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 87).

Moving times	Movement	Verbal command	Technique
T1	Arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T2	20° arm internal rotation on the trunk	Hold, do not let me lower your forearm!	Eccentric contraction of the shoulder external rotators
T3	Arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T4	40° arm internal rotation on the trunk	Hold, do not let me lower your forearm!	Eccentric contraction of the shoulder external rotators
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the lateral face of the forearm and the patient will try to push towards external rotation!

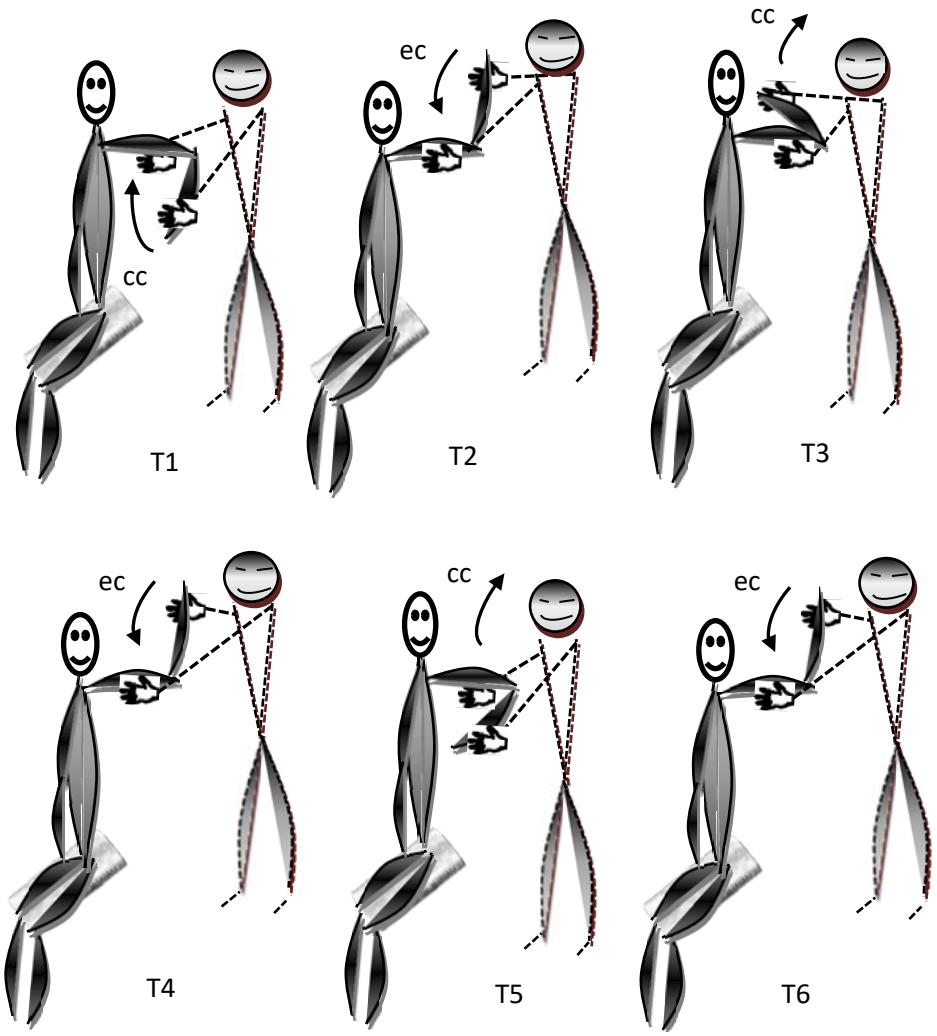

Fig. 87. AR technique for shoulder external rotators
(cc = concentric contraction; ec = eccentric contraction)

5. ***TE (Timing for emphasis)***

Objective: toning the external rotators muscles of the right shoulder.
Variant 1 (bilateral) (fig. 88)
Initial position:

Patient in dorsal decubitus with the arms abducted on the trunk at 90°, the elbows flexed at 90° and the right shoulder internally rotated.

Physiotherapist lateral to the patient, mobilizing hands on the distal third of both forearms, lateral face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (left forearm)	Push your left forearm in my hand!	Isometric contraction for external rotators of the left shoulder
T2	Maintaining (left forearm) + Arm external rotation on the trunk	Push in my hands! (Maintain the left forearm in the same position and rotate the right shoulder externally!)	Isometric contraction of the left shoulder external rotators + Concentric contraction of the right shoulder external rotators

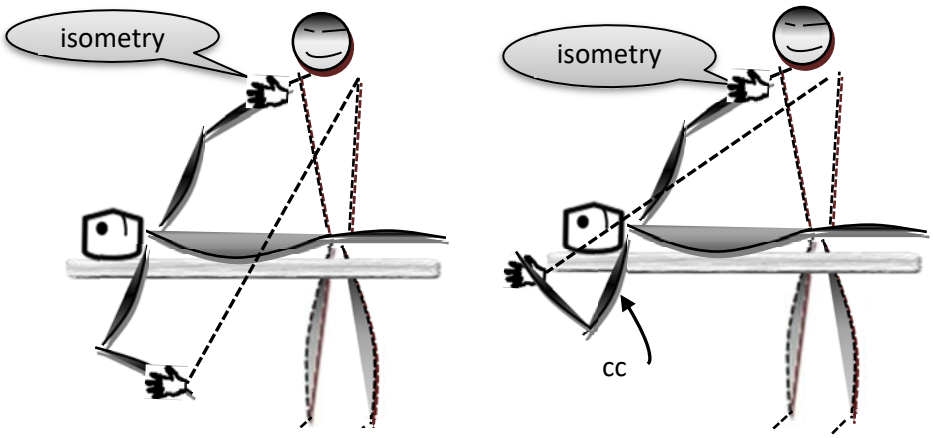

Fig. 88. TE technique for shoulder external rotators – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) (fig. 89)
Initial position:

Patient in sitting, with the arm slightly flexed on the trunk, elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the lateral face, and the other mobilizing hand on the distal third of the arm, the anterior face.

We use the anterior deltoid muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of flexion for the upper limbs, together with the shoulder external rotators.

Moving times	Movement	Verbal command	Technique
T1	Maintaining the arm position slightly flexed on the trunk	Push your arm in my hand!	Isometric contraction for anterior deltoid
T2	Maintaining the arm position slightly flexed on the trunk + Shoulder external rotation	Push in my hands! (Maintain the arm in the same position and rotate the shoulder externally!)	Isometric contraction of the anterior deltoid + Concentric contraction of the shoulder external rotators

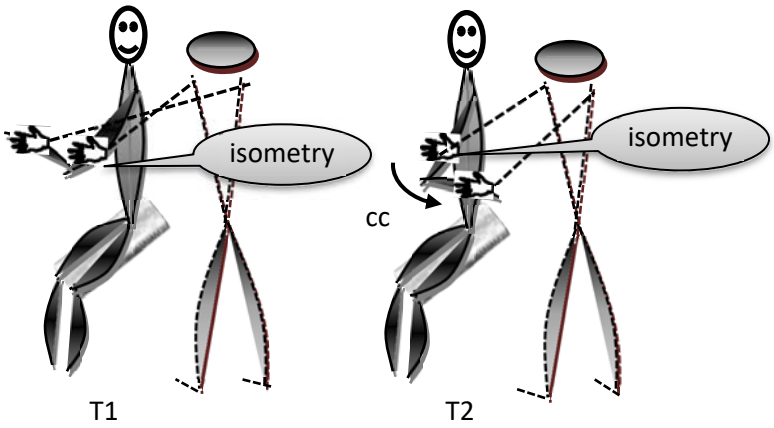

Fig. 89. TE technique for shoulder external rotators – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient sitting with the arm 90° abducted on the trunk and the elbow flexed at 90°.

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 arm, the lateral face (fig. 90).

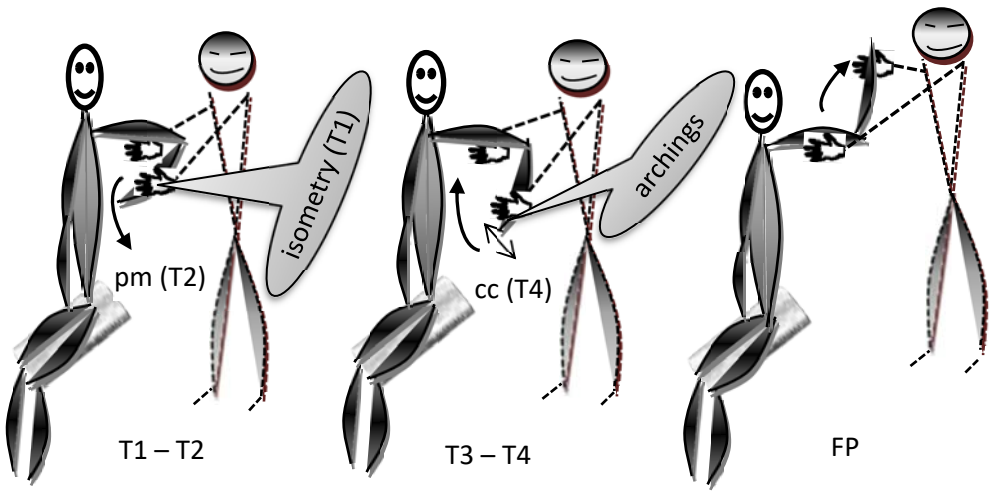

Fig. 90. HRAM technique for shoulder external rotators
(mp = passive movement; cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators
T2	Shoulder internal rotation *(The physiotherapist quickly takes the patient's arm in internal rotation)*	Relax!	Passive movement

T3	Internal - external rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder external rotators)*	Relax!	Passive movement
T4	Arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators

7. RI (Rhythmic initiation)

Initial position:

Patient sitting with the arm 90° abducted on the trunk and the elbow flexed at 90°.

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, by grabbing it (fig. 91).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Arm external rotation on the trunk	Relax, let me move your arm!	Passive movement
T2	Arm internal rotation on the trunk	Relax, let me move your arm!	Passive movement
T3	Arm external rotation on the trunk	Move your arm together with me!	Concentric contraction of the shoulder external rotators – Passive-active movement
T4	Arm internal rotation on the trunk	Move your arm together with me!	Concentric contraction of the shoulder internal rotators – Passive-active movement

T5	Arm external rotation on the trunk	Rotate the arm externally on your trunk!	Concentric contraction of the shoulder external rotators – Active movement
T6	Arm internal rotation on the trunk	Rotate the arm internally on your trunk!	Concentric contraction of the shoulder internal rotators – Active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

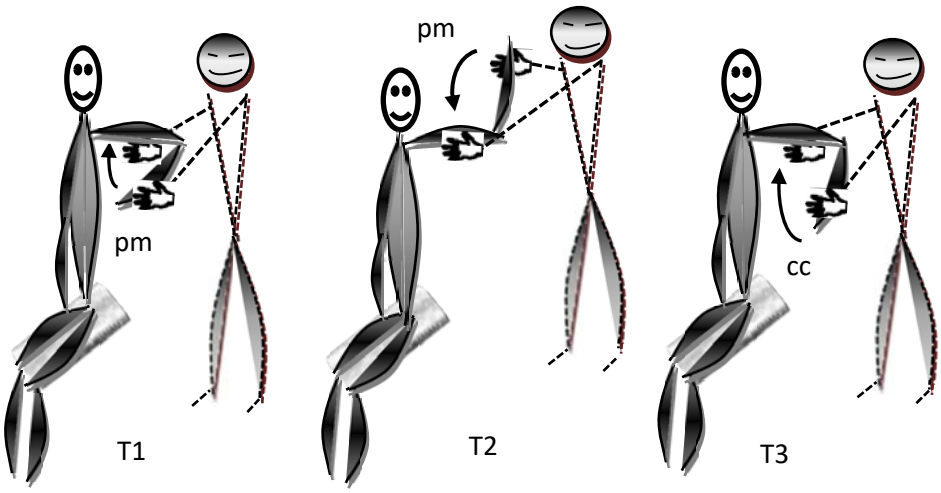

Fig. 91. RI technique for shoulder external rotators
(pm = passive movement; cc = concentric contraction)

8. ***RS (Rhythmic stabilization)***

It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the shoulder external rotators, the technique is started with the arm 90° abducted on the trunk and the elbow flexed at 90°, while when we want to obtain its inhibition in order to increase the range of motion in internal rotation, the technique is started in the limitation point of the movement, i.e., with the arm 90° abducted and internally rotated on the trunk and the elbow flexed at 90° (fig. 92).

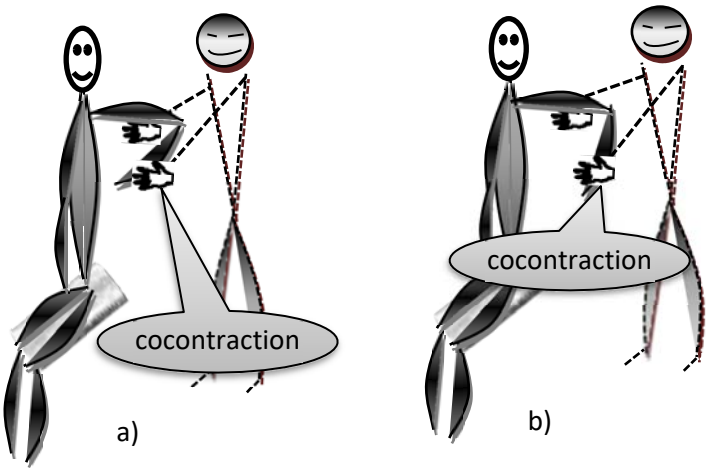

Fig. 92. RS technique for shoulder external rotators: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Shoulder External Rotators Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

- For the shoulder rotators muscle, this technique is performed in the same way as the SR techniques, both consisting of shoulder rotation movements (passive, passive-active and active).

3. ***HR (Hold-Relax)***

Variant: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as are the external rotators in this case*)
Initial position (fig. 93):

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally 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 lateral face.

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

Variant: Agonist HR (*the agonist is the muscle that performs the limited movement, as are the shoulder internal rotators in this case*)
Initial position (fig. 93):

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally 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.

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

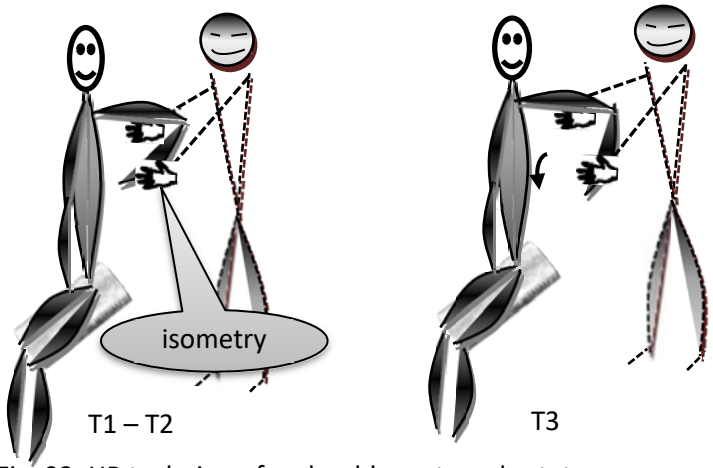

Fig. 93. HR technique for shoulder external rotators

4. HR-C (Hold-Relax-Contraction)

Version: Antagonist HR-C
Initial position:

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally 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 lateral face (fig. 93).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators
T2	Maintaining	Relax!	Relaxation
T3	Arm internal rotation on the trunk	Rotate the arm internally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder internal rotators (Active Stretching of the shoulder external rotators)
T4 - T6	Repeat times 1- 3.		

Variant: Agonist HR-C
Initial position:

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally 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 (fig. 93).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators
T2	Maintaining	Relax!	Relaxation

T3	Arm internal rotation on the trunk	Rotate the arm internally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder internal rotators (Active Stretching of the shoulder external rotators)
T4 - T6	Repeat times 1 - 3		

5. ***CR (Contract - Relax)***

This techniques cannot be performed on the external rotators muscles.

6. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 94)
Initial position:

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally rotated at the point of mobility limitation.

Physiotherapist anterior - ipsilateral to the patient, stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it and the mobilizing hand alternately on the medial and lateral face, in the distal third of the forearm.

Moving times	Movement	Verbal command	Technique
T1	Maintaining *(The physiotherapist opposes resistance on the medial face of the forearm)*	Push in my hand!	Isometric contraction of the shoulder internal rotators
T2	Maintaining *(The physiotherapist opposes resistance on the lateral face of the forearm)*	Push in my hand!	Isometric contraction of the shoulder external rotators

T3	Maintaining *(The physiotherapist pushes the patient's arm toward both internal and external rotation, alternating more and more rapidly between the two directions)*	Hold, don't let me move your arm!	Cocontraction for the shoulder internal and external rotators
T4	Maintaining	Relax!	Relaxation

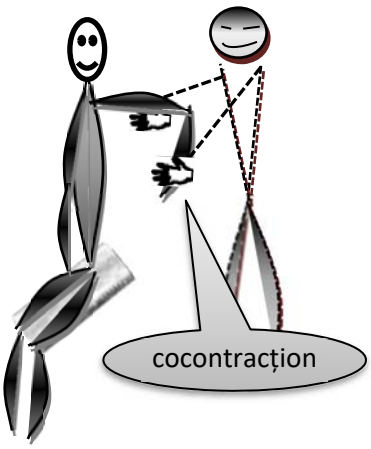

Fig. 94. RS technique for shoulder external rotators

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Shoulder Internal Rotators

Action: Arm internal rotation on the trunk (Shoulder internal rotation)
Synergist muscles: Subscapularis, Pectoralis Major, Latissimus Dorsi, Teres Major
Accessory muscles: Anterior deltoid
Other actions: Arm adduction and arm extension on the trunk (Latissimus Dorsi and Teres Major); Shoulder horizontal adduction (Pectoralis Major).

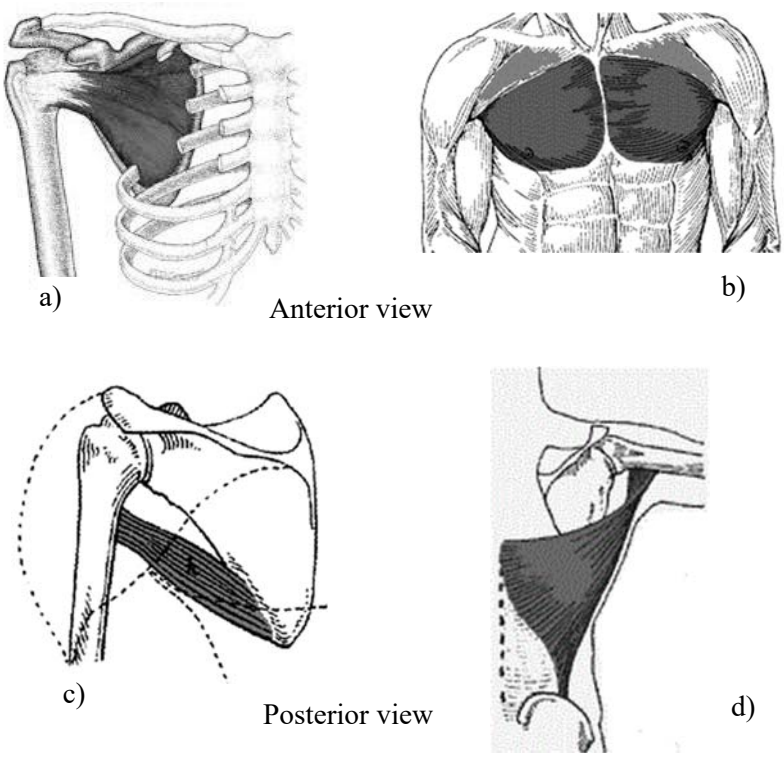

Fig. 95. Internal rotators muscles: a) Subscapularis; b) Pectoralis Major; c) Teres Major; d) Latissimus Dorsi (9)

1. ***SR (Slow reversals)***

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and internally rotated and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, lateral face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 96).

The technique starts on the antagonist (on the shoulder external rotators).

Moving times	Movement	Verbal command	Technique
T1	Arm external rotation on the trunk	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T2	Arm internal rotation on the trunk *(Mobilizing hand switches on the medial face of the forearm)*	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators

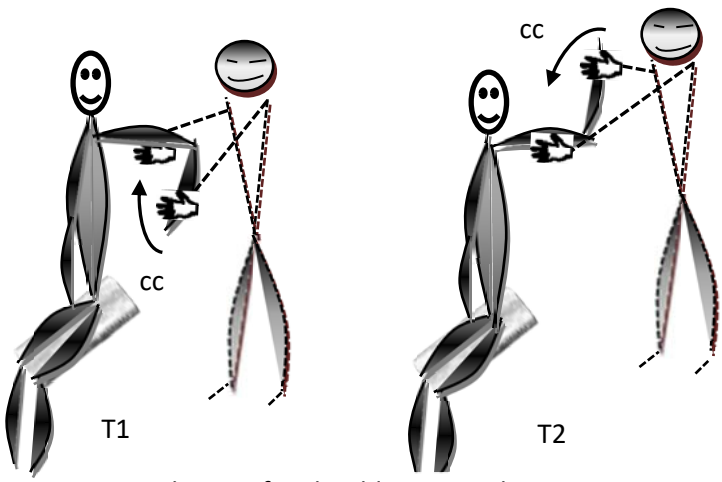

Fig. 96. SR technique for shoulder internal rotators (concentric contraction)

2. ***SRH (Slow reversals hold)***

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, medial face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 97).

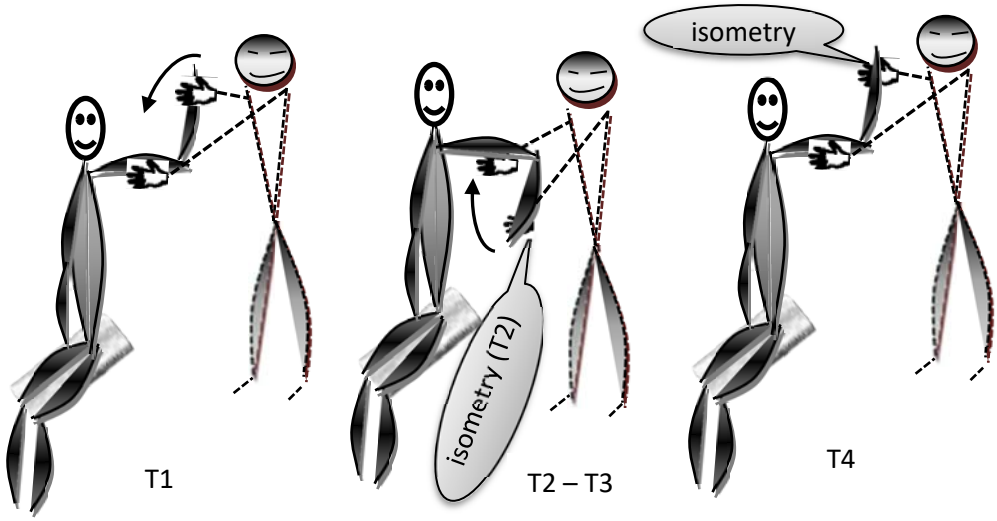

Fig. 97. SRH technique for shoulder internal rotators

Moving times	Movement	Verbal command	Technique
T1	Arm internal rotation on the trunk	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators

T3	Arm external rotation on the trunk *(Mobilizing hand switches on the lateral face of the forearm)*	Push in my hand! (Rotate the arm externally on your trunk!)	Concentric contraction of the shoulder external rotators
T4	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators

3. RC (Repeated Contractions)

For strength 0-1 (fig. 98)
Initial position:

Patient in ventral decubitus at the edge of the bed with arm flexed on the trunk at 90° and externally rotated (the arm hangs at the edge of the bed) and the elbow flexed at 90°.

Physiotherapist lateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Relax!	Passive movement
T3	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Contract! Try to rotate the arm internally on your trunk!	Passive movement

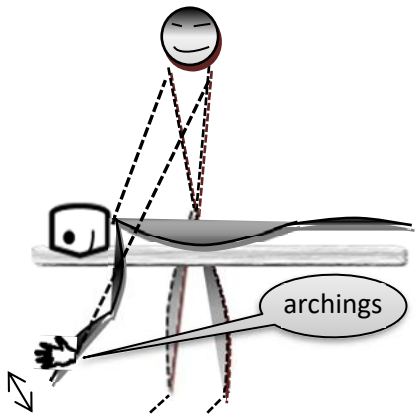

Fig. 98. RC technique for shoulder internal rotators - For strength 0 – 1

For strength 2-3 (fig. 99)

Patient in ventral decubitus at the edge of the bed with arm flexed on the trunk at 90° and externally rotated (the arm hangs at the edge of the bed) and the elbow flexed at 90°.

Physiotherapist lateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Arm internal rotation on the trunk at 20º	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators
T2	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Continue to rotate the arm internally on your trunk!	Passive movement
T3	Arm internal rotation on the trunk at 40º	Push in my hand!	Concentric contraction of

		(Rotate the arm internally on your trunk!)	the shoulder internal rotators
T4	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Continue to rotate the arm internally on your trunk!	Passive movement
T5	It is continued on the entire range of motion.		

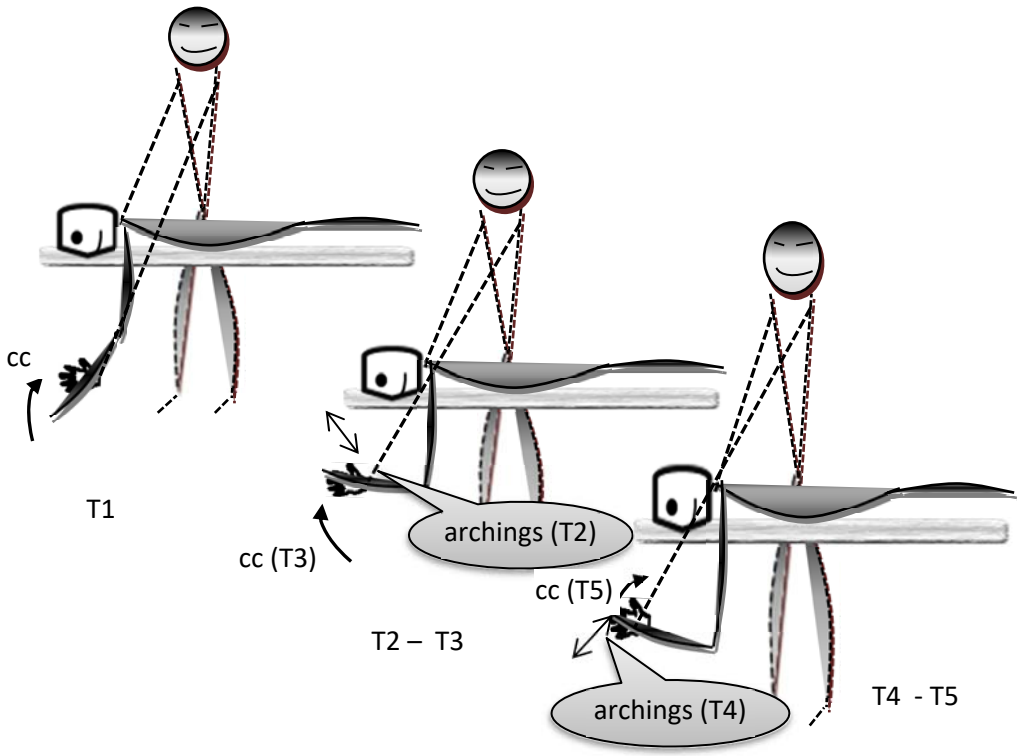

Fig. 99. RC technique for shoulder internal rotators - For strength 2– 3
(cc = concentric contraction)

For strength 4-5 (fig. 100)

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, medial face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it.

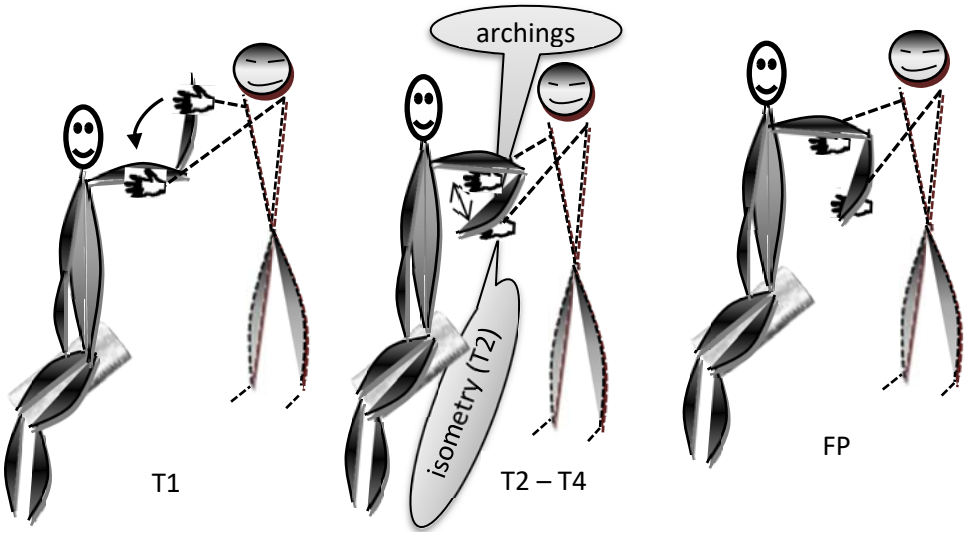

Fig. 100. RC technique for shoulder internal rotators - For strength 4– 5
(FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Arm internal rotation on the trunk - to the point where a hollow of strength can be felt	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators
T2	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators
T3	Maintaining	Relax!	Relaxation

T4	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. AR (Agonistic reversal)

Initial position:

Patient in sitting with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, medial face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 101).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Arm internal rotation on the trunk	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators
T2	20° arm external rotation on the trunk	Hold, do not let me bring your forearm up!	Eccentric contraction of the shoulder internal rotators
T3	Arm internal rotation on the trunk	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators
T4	40° arm external rotation on the trunk	Hold, do not let me bring your forearm up!	Eccentric contraction of the shoulder internal rotators

T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.

Attention: During the entire technique, the mobilizing hand remains on the medial face of the forearm and the patient will try to push towards internal rotation!

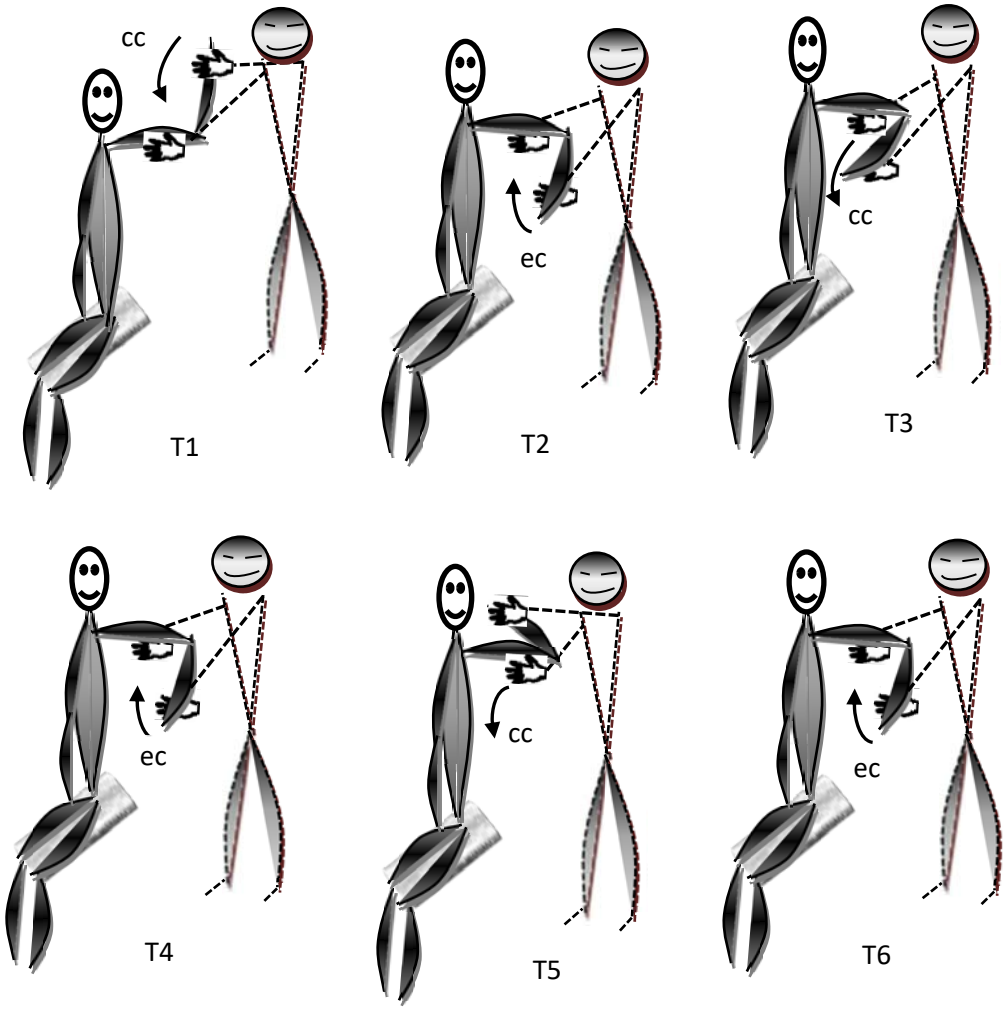

Fig. 101. AR technique for shoulder internal rotators
(cc = concentric contraction; ec = eccentric contraction)

5. ***TE (Timing for emphasis)***

Objective: toning the internal rotators muscles of the right shoulder.
Variant 1 (bilateral) (fig. 102)
Initial position:

Patient in dorsal decubitus with the arms abducted on the trunk at 90°, the elbows flexed at 90° and the right shoulder externally rotated.

Physiotherapist lateral to the patient, mobilizing hands on the distal third of both forearms, medial face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (left forearm)	Push your left forearm in my hand!	Isometric contraction for internal rotators of the left shoulder
T2	Maintaining (left forearm) + Arm internal rotation on the trunk	Push in my hands! (Maintain the left forearm in the same position and rotate the right shoulder internally!)	Isometric contraction of the left shoulder internal rotators + Concentric contraction of the right shoulder internal rotators

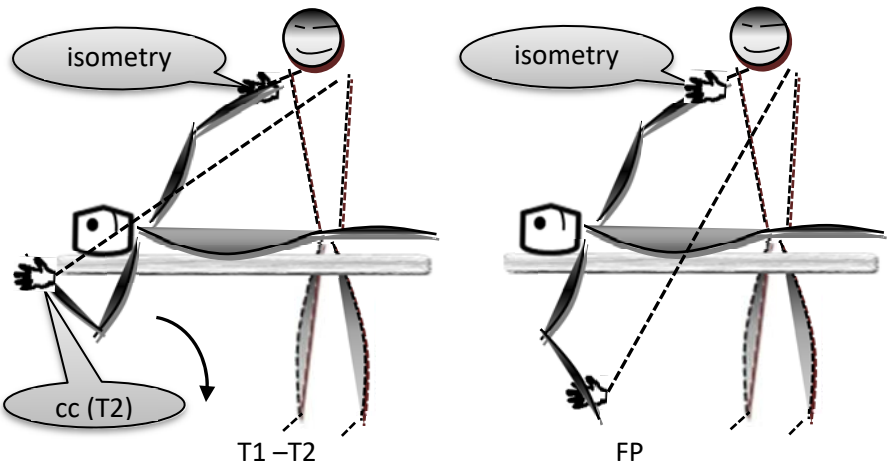

Fig. 102. TE technique for shoulder internal rotators – variant 1
(cc = concentric contraction; FP = final position)

Variant 2 (unilateral) (fig. 103)
Initial position:

Patient in sitting, with the arm abducted on the trunk at 90° and externally rotated and the elbow flexed at 90°.

Physiotherapist ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, medial face and the other mobilizing hand on the distal third of the arm, lateral face.

We use the middle deltoid muscle which goes into the kinetic chain which makes the Kabat diagonals D1 of extension for the upper limbs, together with the shoulder internal rotators.

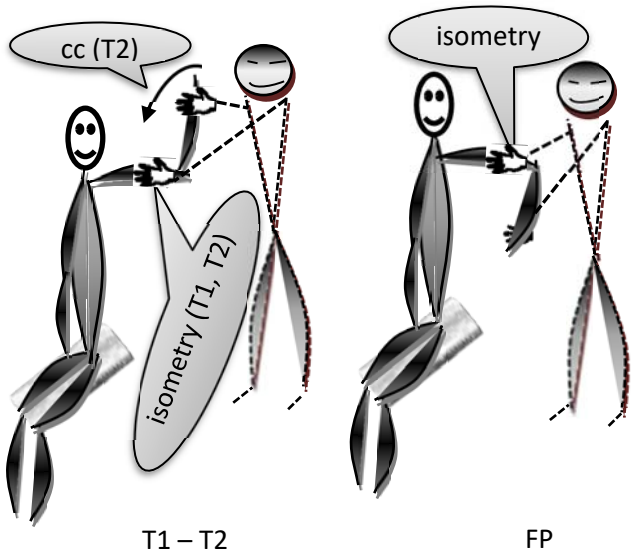

Fig. 103. TE technique for shoulder internal rotators – variant 2
(cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Maintaining the arm position abducted on the trunk at 90°	Push your arm in my hand!	Isometric contraction for middle deltoid

T2	Maintaining the arm position abducted on the trunk at 90° + Shoulder internal rotation	Push in my hands! (Maintain the arm in the same position and rotate the shoulder internally!)	Isometric contraction of the middle deltoid + Concentric contraction of the shoulder internal rotators

6. HRAM (Hold-relax Active Movement)

Initial position:

Patient in sitting, with the arm abducted on the trunk at 90° and the elbow flexed at 90°.

Physiotherapist behind - ipsilateral to the patient, with mobilizing hand on the distal third of the forearm, medial face and stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it (fig. 104).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder internal rotators
T2	Shoulder external rotation *(The physiotherapist quickly takes the patient's arm in external rotation)*	Relax!	Passive movement
T3	External - internal rotation on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the shoulder internal rotators)*	Relax!	Passive movement

T4	Arm internal rotation on the trunk	Push in my hand! (Rotate the arm internally on your trunk!)	Concentric contraction of the shoulder internal rotators

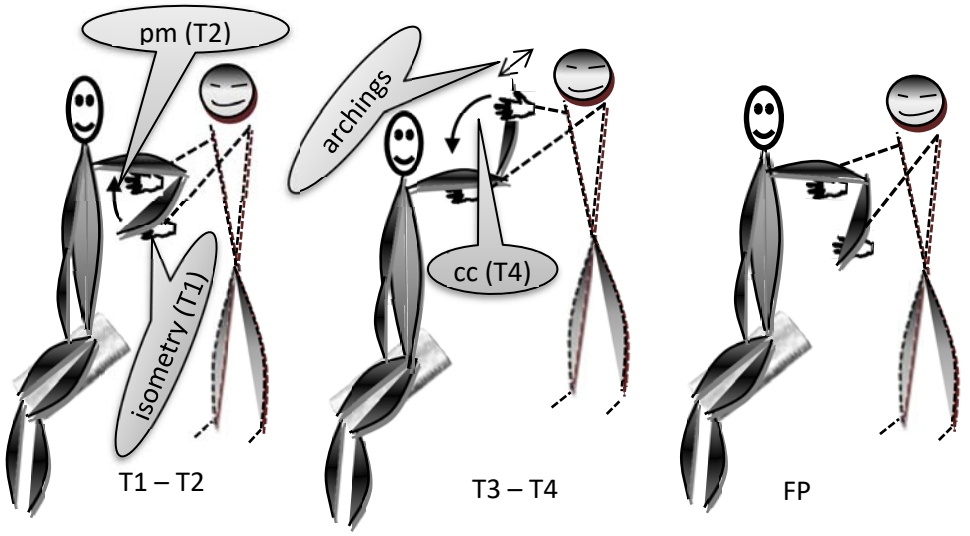

Fig. 104. HRAM technique for shoulder internal rotators
(pm = passive movement; cc = concentric contraction; FP = final position)

7. RI (Rhythmic initiation)

Initial position:

Patient sitting with the arm 90° abducted on the trunk and the elbow flexed at 90°.

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 arm, by grabbing it (fig. 105).

Moving times	**Movement**	**Verbal command**	**Technique**

T1	Arm internal rotation on the trunk	Relax, let me move your arm!	Passive movement
T2	Arm external rotation on the trunk	Relax, let me move your arm!	Passive movement
T3	Arm internal rotation on the trunk	Move your arm together with me!	Concentric contraction of the shoulder internal rotators – Passive-active movement
T4	Arm external rotation on the trunk	Move your arm together with me!	Concentric contraction of the shoulder external rotators – Passive-active movement
T5	Arm internal rotation on the trunk	Rotate the arm internally on your trunk!	Concentric contraction of the shoulder internal rotators – Active movement
T6	Arm external rotation on the trunk	Rotate the arm externally on your trunk!	Concentric contraction of the shoulder external rotators – Active movement

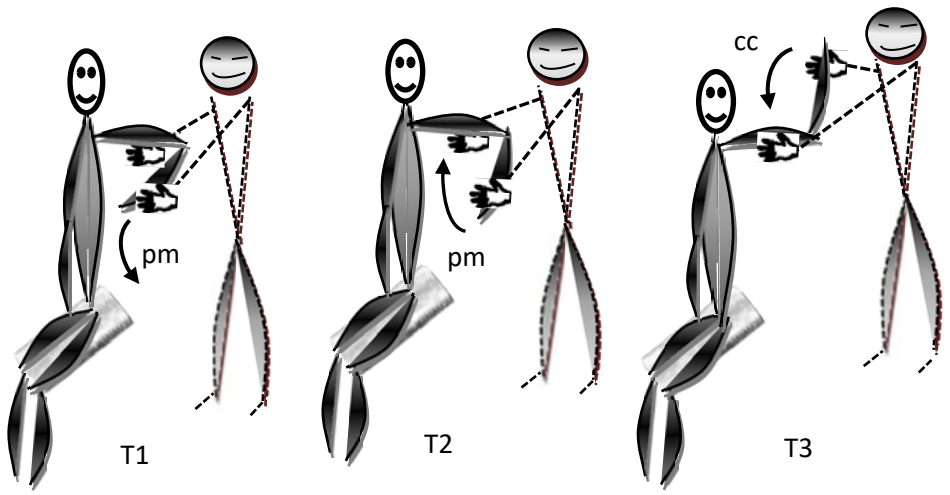

Fig. 105. RI technique for shoulder internal rotators
(mp = passive movement; cc = concentric contraction)

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

8. RS (Rhythmic stabilization)

It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the shoulder internal rotators, the technique is started with the arm 90° abducted on the trunk and the elbow flexed at 90°, while when we want to obtain its inhibition in order to increase the range of motion in external rotation, the technique is started in the limitation point of the movement, i.e., with the arm 90° abducted and externally rotated on the trunk and the elbow flexed at 90° (fig. 106).

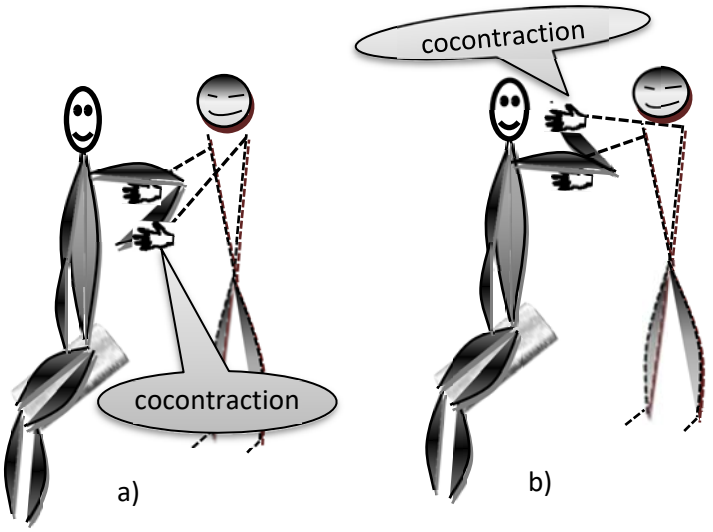

Fig. 106. RS technique for shoulder internal rotators: a) for muscle toning; b) for muscle inhibition

PNF Techniques for Shoulder Internal Rotators Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

- For the shoulder rotators muscle, this technique is performed in the same way as the SR techniques, both consisting of shoulder rotation movements (passive, passive-active and active).

3. ***HR (Hold-Relax)***

Variant: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as are the internal rotators in this case*)
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 (fig. 107).

Moving times	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.		

Variant: RO agonist (*the agonist is the muscle that performs the limited movement, as are the shoulder external rotators in this case*)
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 lateral face (fig. 107).

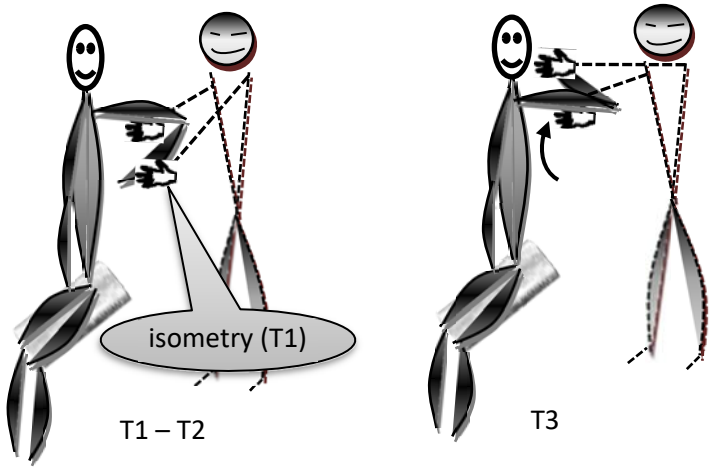

Fig. 107. HR technique for shoulder internal rotators

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder external 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		

4. HR-C (Hold-Relax-Contraction)

Variant: Antagonist HR-C
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 (fig. 107).

Moving times	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	Rotate the arm externally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder external rotators (Active Stretching of the shoulder internal rotators)
T4 – T6	Repeat times 1- 3.		

Variant: Agonist HR-C
Initial position:

Patient sitting with the arm 90° abducted on the trunk, elbow flexed at 90° and the shoulder internally 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 lateral face (fig. 107).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder external rotators
T2	Maintaining	Relax!	Relaxation

T3	Arm external rotation on the trunk	Rotate the arm externally on your trunk! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the shoulder external rotators (Active Stretching of the shoulder internal rotators)
T4 – T6	Repeat times 1 - 3		

5. CR (Contract - Relax)

This technique cannot be performed on the internal rotators muscles.

6. RS (Rhythmic Stabilization)

Alternative version (fig. 108)
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 ipsilateral to the patient, stabilizing hand on the distal third of the arm, by grabbing underneath, supporting it and the mobilizing hand alternately on the medial and lateral face, in the distal third of the forearm (fig. 108).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the medial face of the forearm)*	Push in my hand!	Isometric contraction of the shoulder internal rotators
T2	Maintaining *(The physiotherapist opposes resistance on the lateral face of the forearm)*	Push in my hand!	Isometric contraction of the shoulder external rotators

T3	Maintaining *(The physiotherapist pushes the patient's arm toward both internal and external rotation, alternating more and more rapidly between the two directions)*	Hold, don't let me move your arm!	Cocontraction for the shoulder internal and external rotators
T4	Maintaining	Relax!	Relaxation

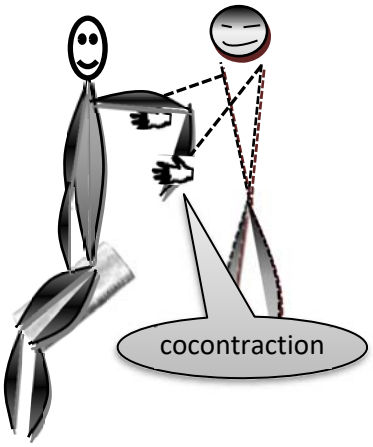

Fig. 108. RS technique for shoulder internal rotators

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for shoulder stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for increasing Shoulder Stability

1. *ICS (Isometric contraction in a short zone)*

Initial position:

Patient in sitting with the arm horizontally adducted on the trunk and forearm slightly flexed on the arm.

Physiotherapist ipsilateral to the patient, stabilizing hand on the shoulder and mobilizing hand on the distal third of the arm, the medial face (fig. 109 a and b).

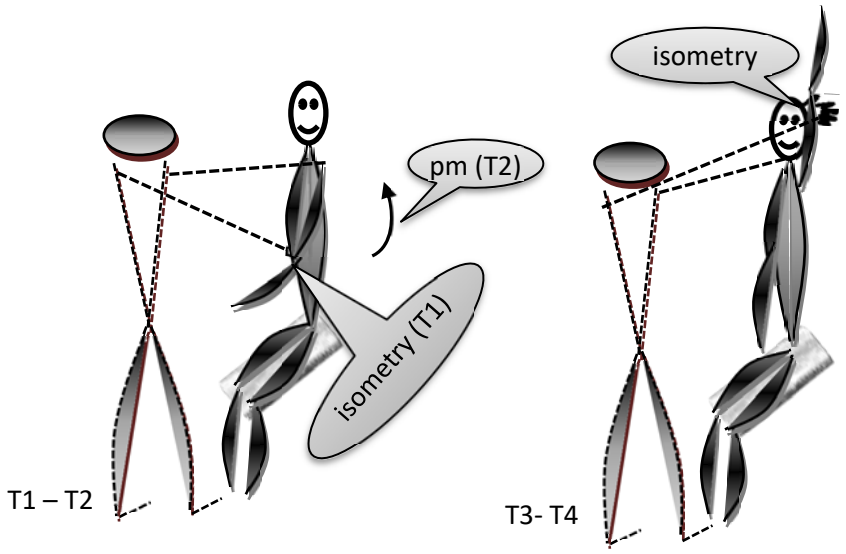

Fig. 109a. ICS technique for shoulder: T1 – T4

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the shoulder adductor muscles
T2	Arm adduction on the trunk	Relax!	Passive movement

	(The physiotherapist takes the patient's arm to the point where the shoulder abductors are maximally shortened)		
T3	Maintaining *(The physiotherapist opposes resistance on the lateral face of the arm)*	Push in my hand!	Isometric contraction of the middle deltoid
T4	Maintaining *(Mobilizing hand switches on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the anterior deltoid
T5	Arm extension on the trunk *(The physiotherapist takes the patient's arm to the point where the shoulder extensors are maximally shortened)*	Relax!	Passive movement
T6	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the shoulder extensor muscles
T7	Arm abduction on the trunk at 90° and shoulder horizontal adduction *(The physiotherapist takes the patient's arm to the point where the pectoralis major is maximally shortened)*	Relax!	Passive movement
T8	Maintaining *(The physiotherapist opposes resistance on the anterior face of the arm)*	Push in my hand!	Isometric contraction of the pectoralis major
T9	Shoulder horizontal abduction	Relax!	Passive movement

	(The physiotherapist takes the patient's arm to the point where the posterior deltoid is maximally shortened)		
T10	Maintaining *(The physiotherapist opposes resistance on the posterior face of the arm)*	Push in my hand!	Isometric contraction of the posterior deltoid
T11	Arm horizontal adduction on the trunk to point 0, elbow flexion at 90° and shoulder internal rotation *(The physiotherapist takes the patient's arm to the point where the shoulder internal rotators are maximally shortened)*	Relax!	Passive movement
T12	Maintaining *(The physiotherapist opposes resistance on the medial face of the arm)*	Push in my hand!	Isometric contraction of the shoulder internal rotators
T13	Shoulder external rotation *(The physiotherapist takes the patient's arm to the point where the shoulder external rotators are maximally shortened)*	Relax!	Passive movement
T14	Maintaining *(The physiotherapist opposes resistance on the lateral face of the arm)*	Push in my hand!	Isometric contraction of the shoulder external rotators
T15	Return to zero position	Relax!	Passive movement

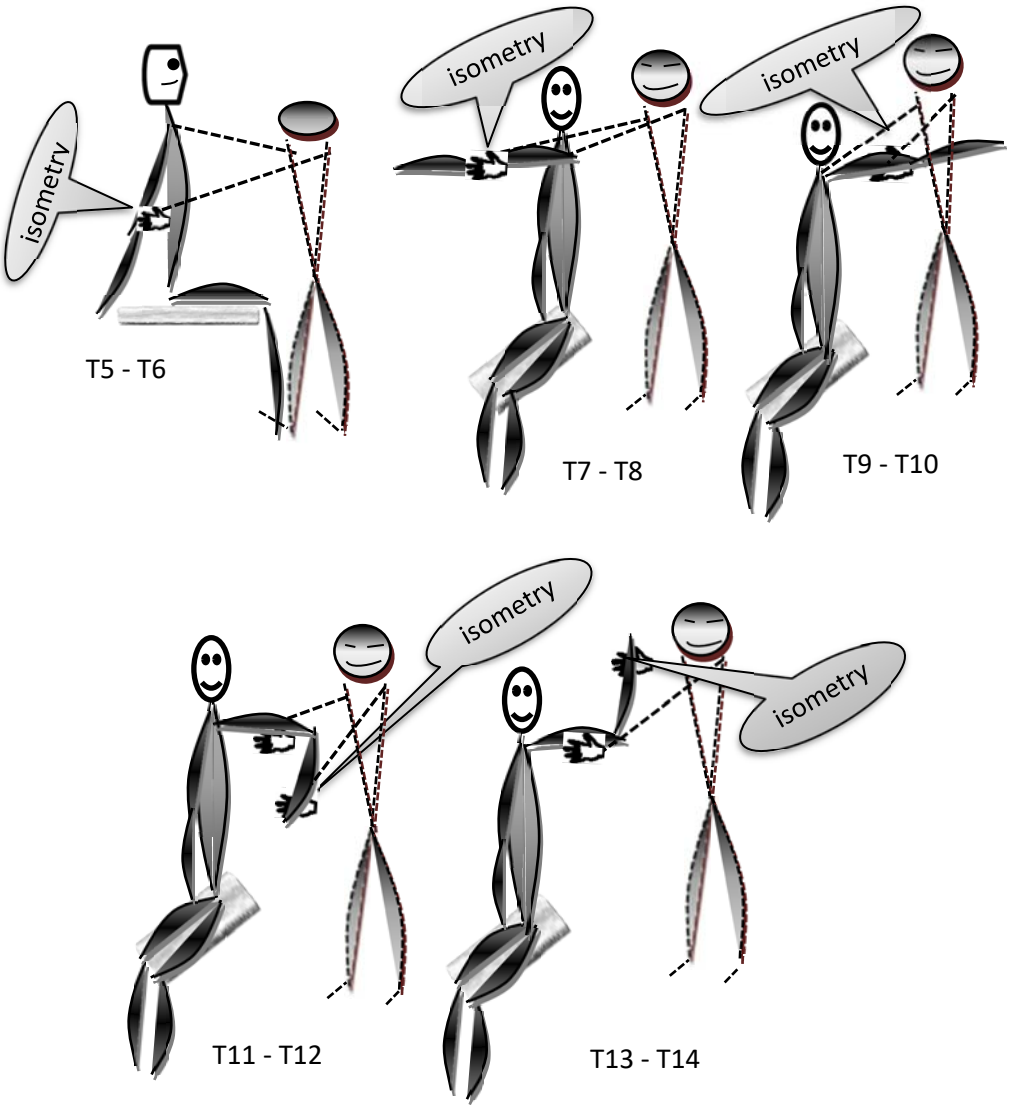

Fig. 109b. ICS technique for shoulder: T5 – T14

2. ***AI (Alternating isometrics)***

Initial position:

Patient in sitting with the arm adducted on the trunk and forearm slightly flexed on the arm.

Physiotherapist ipsilateral to the patient, one mobilizing hand on the distal third of the arm, the lateral face, and the other mobilizing hand on the distal third of the arm, the medial face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the medial face of the arm)*	Push in my hand!	Isometric contraction of the shoulder adductor muscles
T2	Maintaining *(The physiotherapist opposes resistance on the lateral face of the arm)*	Push in my hand!	Isometric contraction of the middle deltoid
T3	Arm abduction on the trunk 15°	Relax!	Passive movement
T3	Maintaining *(The physiotherapist opposes resistance on the medial face of the arm)*	Push in my hand!	Isometric contraction of the shoulder adductor muscles
T4	Maintaining *(The physiotherapist opposes resistance on the lateral face of the arm)*	Push in my hand!	Isometric contraction of the middle deltoid
T5	Arm abduction on the trunk 15°	Relax!	Passive movement
T6….	It is continued with isometries on adductors and middle deltoid in each point of the movement arch in the abduction direction, then isometric contractions are made in each point of the movement arch on flexion-extension, horizontal adduction-abduction, internal-external rotation.		

3. RS (Rhythmic stabilization)

It is described in techniques for inhibition.

PNF techniques for toning the Elbow Flexors

Action: Forearm flexion on the arm (elbow flexion)
Synergist muscles: Biceps brachii, Brachialis, Brahioradial
Other actions: Forearm supination (Biceps brachii, Brahioradial), Shoulder flexion (Biceps brachii), Shoulder abduction (Biceps brachii – long head), Shoulder adduction (Biceps brachii – short head)

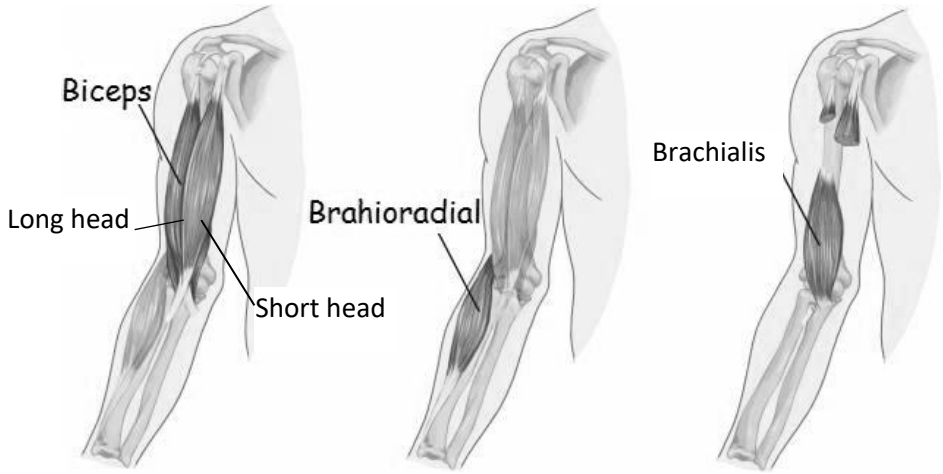

Fig. 110. Flexor muscles of the elbow (13)

1. SR (Slow reversals)

Initial position:

Patient sitting with the elbow in flexion.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 111).

The technique starts on the antagonist (on the elbow extensors in this case).

Moving times	Movement	Verbal command	Technique
T1	Elbow extension	Push in my hand! (Extend your elbow!)	Concentric contraction of the elbow extensors
T2	Elbow flexion *(Mobilizing hand switches on the anterior face of the forearm)*	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors

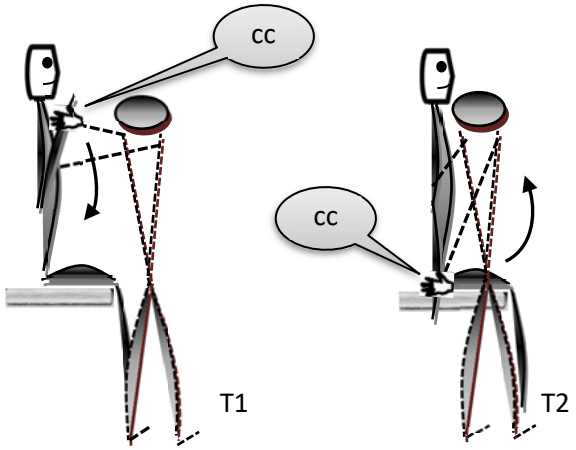

Fig. 111. SR technique for forearm flexors on the arm
(cc = concentric contraction)

2. ***SRH (Slow reversals hold)***

Initial position:

Patient sitting.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 112).

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T2	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T3	Forearm extension on the arm *(Mobilizing hand switches on the posterior face of the forearm)*	Push in my hand! (Extend your elbow!)	Concentric contraction of the elbow extensors
T4	Maintaining	Push in my hand!	Isometric contraction of the elbow extensors

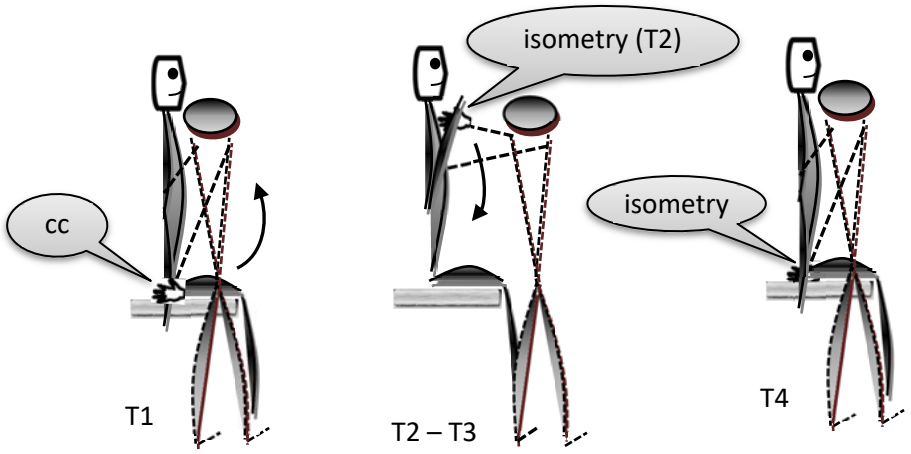

Fig. 112. SRH technique for forearm flexors on the arm
(cc = concentric contraction)

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 113)
Initial position:

Patient in sitting, with arm abducted on the trunk at 90°.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the anterior face.

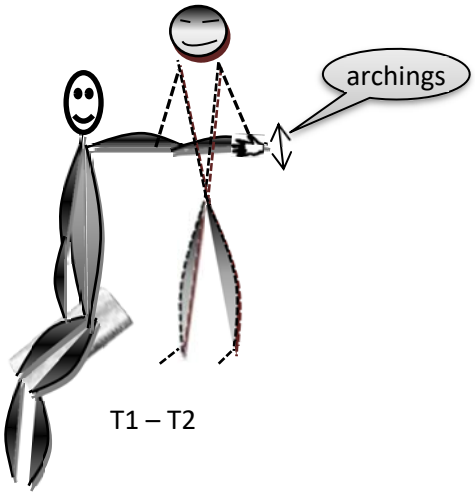

Fig. 113. RC technique for forearm flexors on the arm
- For strength 0 - 1

Moving times	Movement	Verbal command	Technique
T1 - 2	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Relax!	Passive movement
T3 - 4	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Contract! (Try to flex the elbow!)	Passive movement

For strength 2-3 (fig. 114)
Initial position:

Patient in sitting, with arm abducted on the trunk at 90°.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the anterior face.

The mobilizing hand on the arm has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Forearm flexion on the arm 20º	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T2	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Continue to flex!	Passive movement
T3	Forearm flexion on the arm 45º	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T4	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Continue to flex!	Passive movement
T5	It is continued on the entire range of motion.		

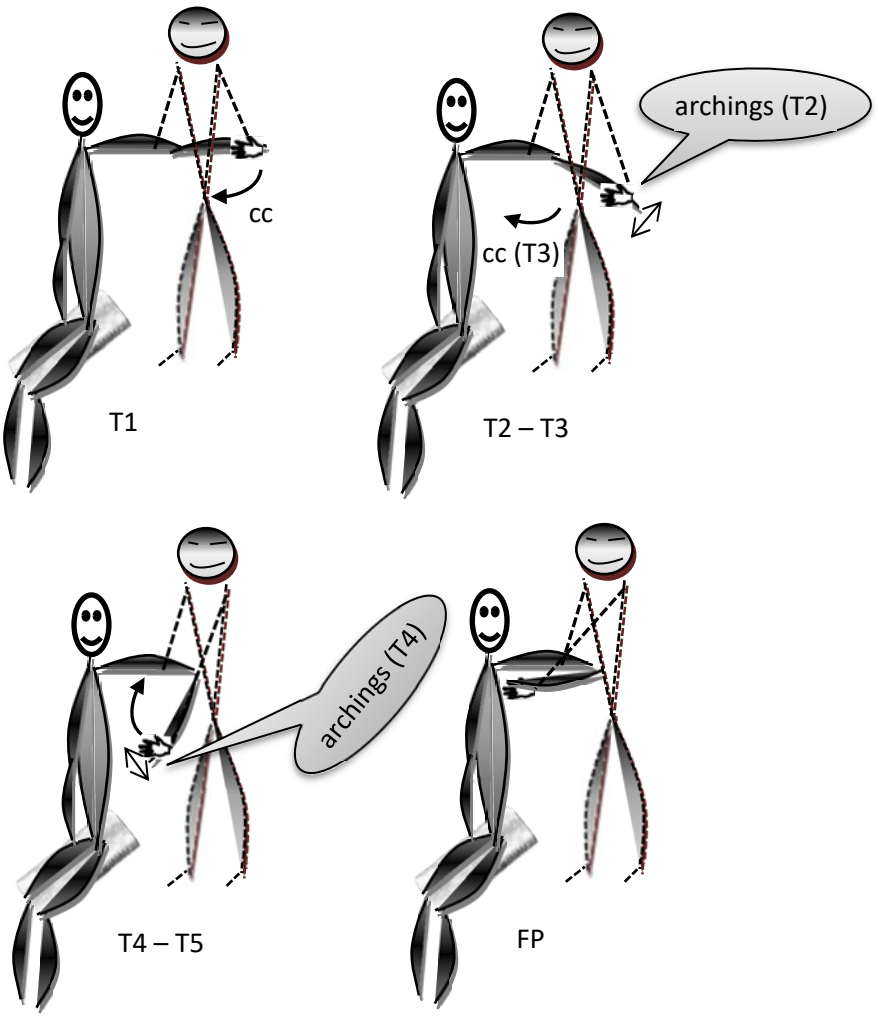

Fig. 114. RC technique for forearm flexors on the arm - For strength 2 – 3
(cc = concentric contraction, FP = final position)

For strength 4-5 (fig. 115)
Initial position:

Patient in sitting.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face.

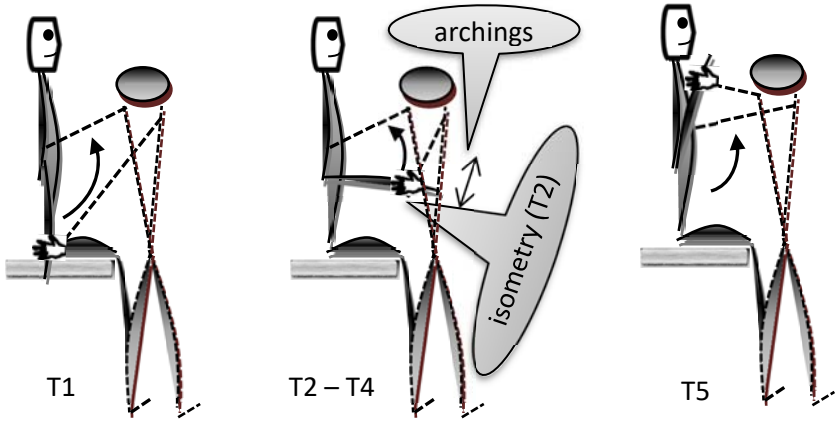

Fig. 115. RC technique for forearm flexors on the arm - For strength 4 – 5

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm – to the point where a hollow of strength can be felt	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T2	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T3	Maintaining	Relax!	Relaxation
T4	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. ***AR (Agonistic reversal)***

Initial position:

Patient in sitting.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face. (fig. 116 a and b).

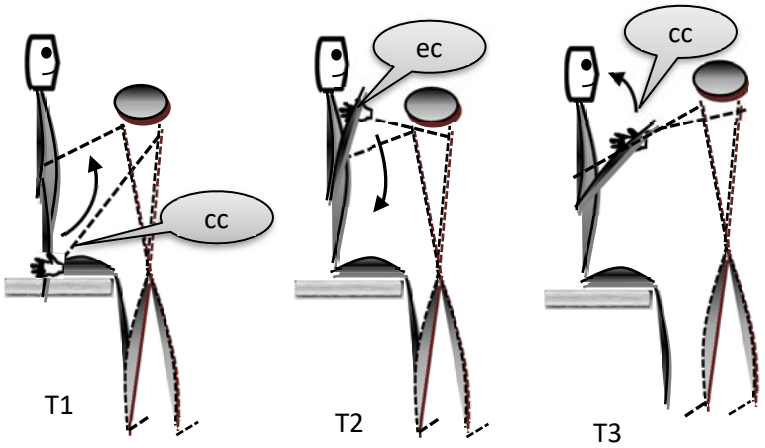

Fig. 116a. AR technique for forearm flexors on the arm: T1 – T3
(cc = concentric contraction; ec = eccentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T2	Forearm extension on the arm at 20°	Hold, do not let me lower your forearm	Eccentric contraction of the elbow flexors
T3	Forearm flexion on the arm	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T4	Forearm extension on the arm at 40°	Hold, do not let me lower your forearm!	Eccentric contraction of the elbow flexors

T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.

Attention: During the entire technique, the mobilizing hand remains on the anterior face of the forearm and the patient will try to push towards flexion!

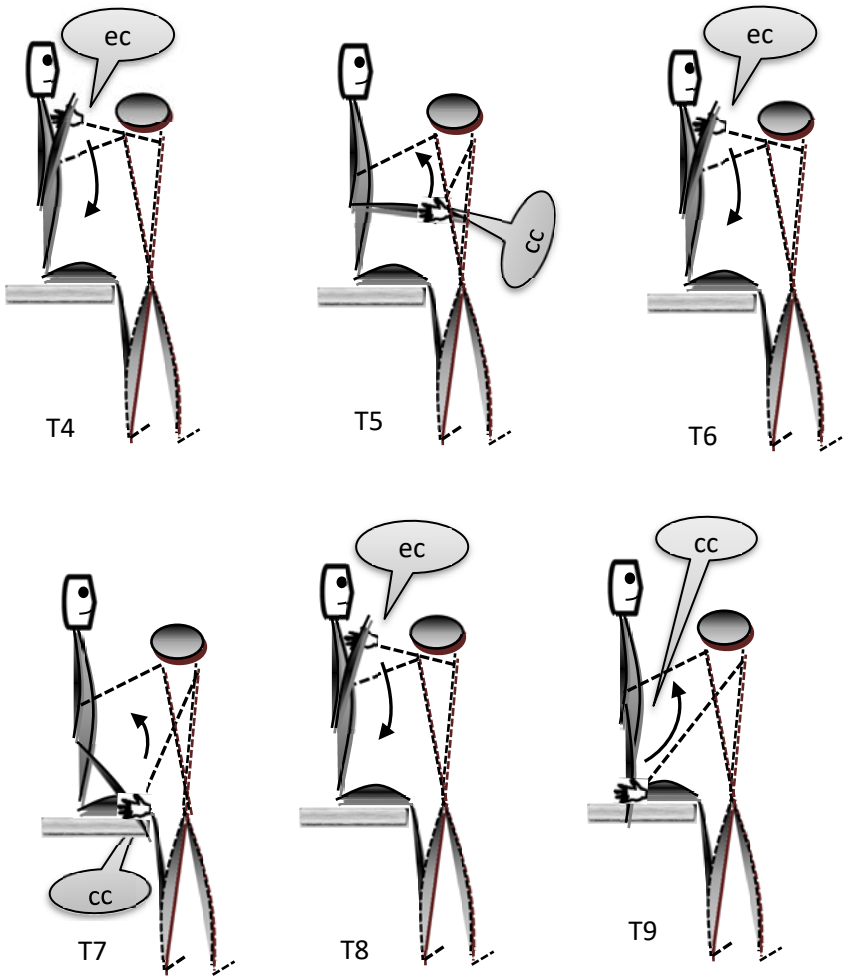

Fig. 116b. AR technique for forearm flexors on the arm: T4 – T9
(cc = concentric contraction; ec = eccentric contraction)

5. ***TE (Timing for emphasis)***

Objective: toning the flexor muscles of the left elbow.
Variant 1 (bilateral) (fig. 117)
Initial position:

Patient sitting, with the right forearm flexed on the arm at 90°.

Physiotherapist, in front of the patient, mobilizing hands on the distal third of both forearms, the anterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right forearm)	Push your right forearm in my hand!	Isometric contraction for the right flexors of elbow
T2	Maintaining (right forearm) + flexion of left forearm on the arm	Push in my hands! (Maintain right forearm in the same position and flex your left elbow!)	Isometric contraction of the right elbow flexors + Concentric contraction of the left elbow flexors

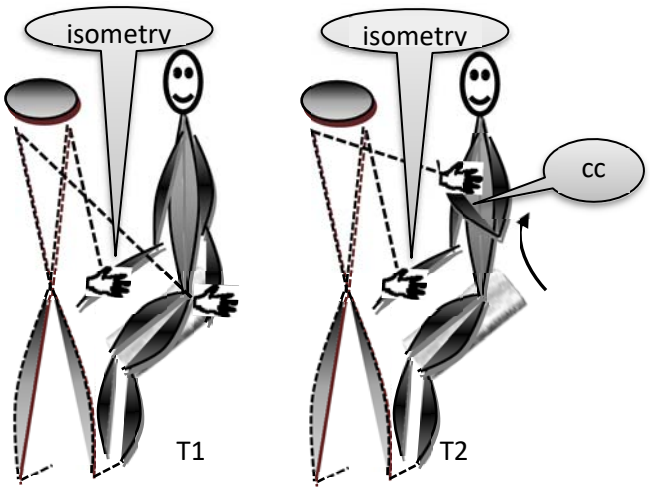

Fig. 117. TE technique for forearm flexors on the arm – variant 1
(cc = concentric contraction)

Variant 2 (unilateral) (fig. 118)
Initial position:

Patient in sitting, with the arm flexed on the trunk at 45°.

Physiotherapist, ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the anterior face, and the other mobilizing hand on the distal third of the arm, the anterior face.

We use the muscle anterior deltoid which goes into the kinetic chain which makes the Kabat diagonals D1 and D2 of flexion for the upper limbs, together with the biceps brachii.

Moving times	Movement	Verbal command	Technique
T1	Maintaining arm position	Push in my hand!	Isometric contraction for the anterior deltoid
T2	Maintaining arm position + Forearm flexion on the arm	Push in my hands! (Maintain the arm in the same position and raise your forearm!)	Isometric contraction of the anterior deltoid + Concentric contraction of the biceps brachii

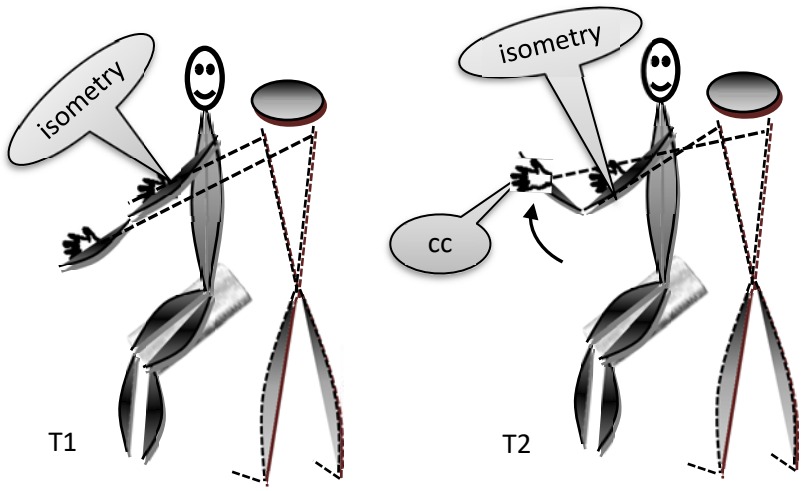

Fig. 118. TE technique for forearm flexors on the arm – variant 2
(cc = concentric contraction)

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient in sitting, with the arm abducted on the trunk at 90° and the elbow flexed at 90°.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 119).

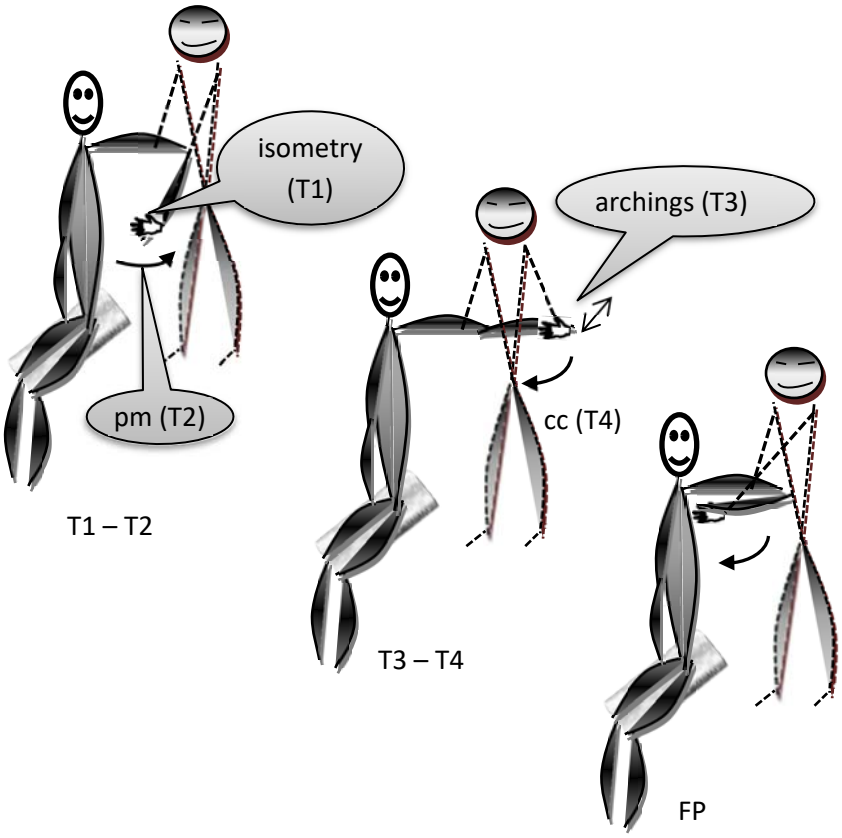

Fig. 119. HRAM technique for forearm flexors on the arm
(pm = passive movement; cc = concentric contraction; FP = final position)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T2	Forearm extension on the arm *(The physiotherapist quickly takes the patient's forearm in extension)*	Relax!	Passive movement
T3	Elbow extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the elbow flexors)*	Relax!	Passive movement
T4	Forearm flexion on the arm	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors

7. RI (Rhythmic initiation)

Initial position:

Patient in sitting, with the arm abducted on the trunk at 90°.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 120).

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm	Relax, let me move your forearm!	Passive movement

T2	Forearm extension on the arm	Relax, let me move your forearm!	Passive movement
T3	Forearm flexion on the arm	Move your forearm together with me!	Concentric contraction of the elbow flexors – passive-active movement
T4	Forearm extension on the arm	Move your forearm together with me!	Concentric contraction of the triceps brachii – passive-active movement
T5	Forearm flexion on the arm	Flex your elbow!	Concentric contraction of the elbow flexors – active movement
T6	Forearm extension on the arm	Extend your elbow!	Concentric contraction of the triceps brachii – active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

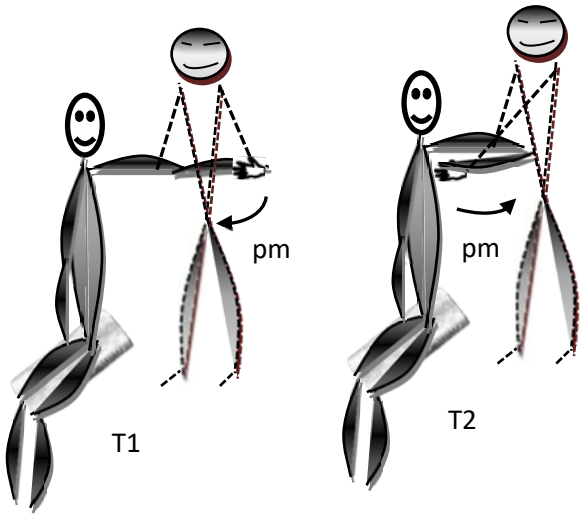

Fig. 120. RI technique for forearm flexors on the arm
(pm = passive movement)

8. RS (Rhythmic stabilization)

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the elbow flexors the technique is started with the forearm slightly flexed on the arm, while when we want to obtain its inhibition in order to increase the range of motion in extension, the technique is started in the limitation point of the movement, i.e., with the forearm extended on the arm (fig. 121).

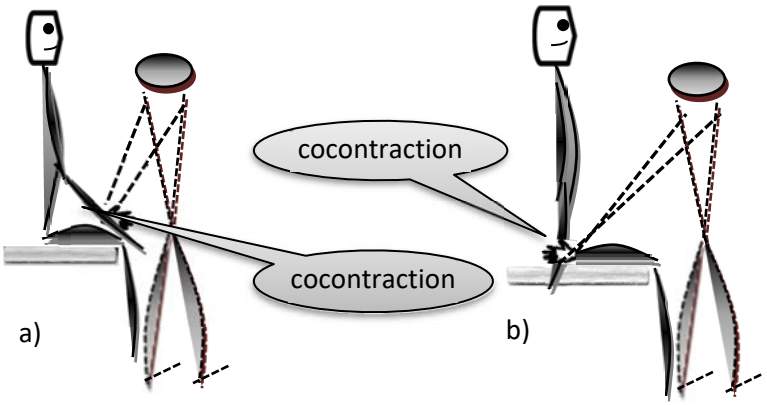

Fig. 121. RS technique for forearm flexors on the arm: a) for muscle toning; b) for muscle inhibition

PNF techniques for Elbow Flexors Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, ipsilateral to the patient with mobilizing hand grasping the patient's hand and stabilizing hand on the distal third of the arm, the lateral face (fig. 122).

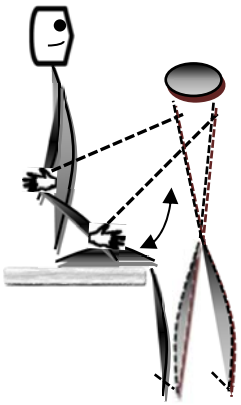

Fig. 122. RR technique for forearm flexors on the arm

Moving times	Movement	Verbal command	Technique
T1	Forearm pronation	Relax, let me move your forearm!	Passive movement
T2	Forearm supination	Relax, let me move your forearm!	Passive movement
T3	Forearm pronation	Move your forearm with me!	Passive-active movement
T4	Forearm supination	Move your forearm with me!	Passive-active movement
T5	Forearm pronation	Rotate the forearm with the palm down!	Active movement
T6	Forearm supination	Rotate the forearm with the palm up!	Active movement

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, so are the elbow flexors in this case*)

Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 123).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T2	Maintaining	Relax!	Relaxation
T3	Forearm extension on the arm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the elbow flexors
T4- T6	Repeat times 1 - 3.		

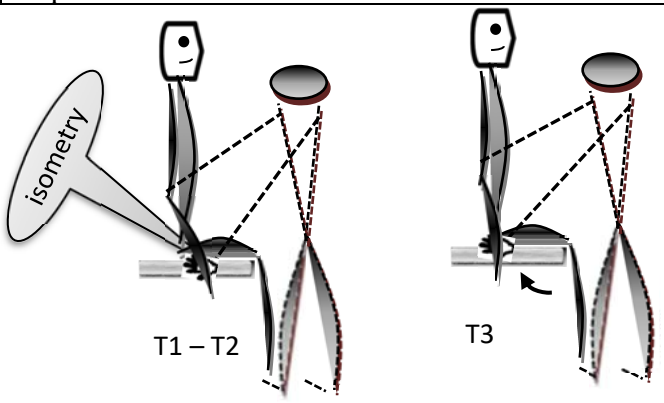

Fig. 123. HR technique for forearm flexors on the arm

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, so are the elbow extensors in this case*)
Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the posterior face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 123).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining	Relax!	Relaxation
T3	Forearm extension on the arm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the elbow flexors
T4 - T6	Repeat times 1 - 3		

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 123).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T2	Maintaining	Relax!	Relaxation

T3	Forearm extension on the arm	Extend your elbow! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the triceps brachii (Active Stretching of the elbow flexors)
T4 – T6	Repeat times 1- 3.		

Version: Agonist HR-C
Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the posterior face and mobilizing hand on the distal third of the forearm, the posterior face (fig. 123).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining	Relax!	Relaxation
T3	Forearm extension on the arm	Extend your elbow! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the triceps brachii (active stretching of the elbow flexors)
T4 – T6	Repeat times 1- 3		

5. *CR (Contract - Relax)*

Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient, one mobilizing hand grasping the patient's hand and the other mobilizing hand on the distal third of the forearm, the anterior face (fig. 124).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push the forearm in my hand!	Isometric contraction of the elbow flexors
T2	Maintaining extension forearm position + Elbow pronation	Try to flex the elbow and let me rotate your forearm!	Isometric contraction of the elbow flexors + Passive movement of forearm pronation
T3	Maintaining extension forearm position + Elbow supination	Try to flex the elbow and let me rotate your forearm!	Isometric contraction of the elbow flexors + Passive movement of forearm supination
T4	Maintaining extension forearm position + Elbow pronation	Try to flex the elbow and rotate the forearm with the palm down with me!	Isometric contraction of the elbow flexors + Passive-active movement of forearm pronation
T5	Maintaining extension forearm position + Elbow supination	Try to flex the elbow and rotate the forearm with the palm up with me!	Isometric contraction of the elbow flexors + Passive-active movement of forearm supination

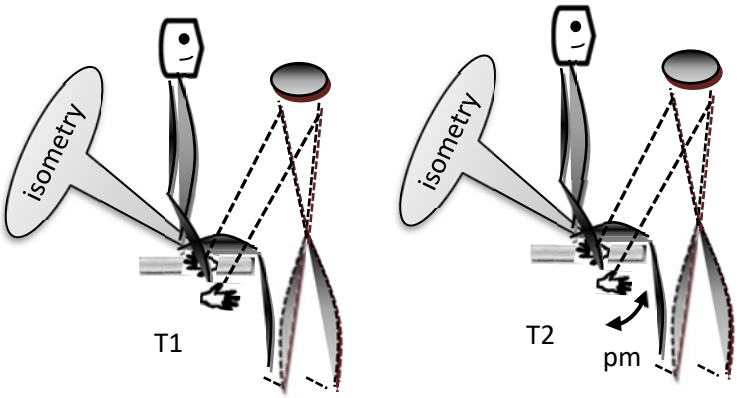

Fig. 124. CR technique for forearm flexors on the arm
(pm = passive movement)

6. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 125a)
Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the forearm, the anterior face, and the other mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the forearm)*	Push in my hand, towards flexion!	Isometric contraction of the elbow flexors
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the forearm)*	Push in my hand, towards extension!	Isometric contraction of the triceps brachii
T3	Maintaining *(The physiotherapist pushes the patient's forearm toward both flexion and extension, alternating more and more rapidly between the two directions)*	Hold, don't let me move your forearm!	Cocontraction of the elbow flexors and extensors
T4	Maintaining	Relax!	Relaxation

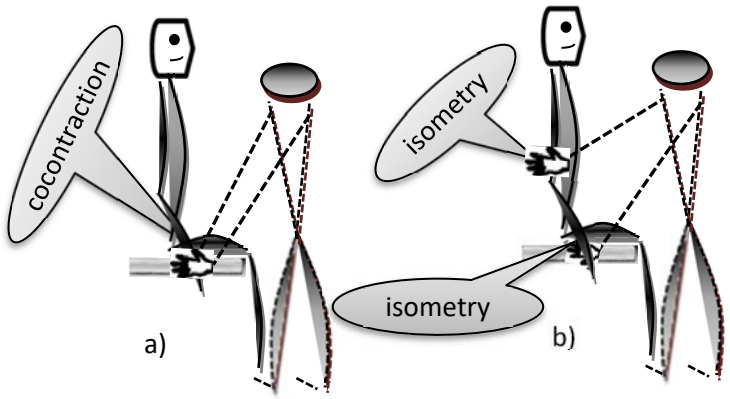

Fig. 125. RS technique for forearm flexors on the arm: a) alternative version; b) simultaneous version

Simultaneous version (fig. 125b)
Initial position:

Patient in sitting with the elbow in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the arm, the posterior face, and the other mobilizing hand on the distal third of the forearm, the anterior face.

We use the triceps brachii muscle, biarticular muscle, which realizes the extension of the elbow (thus being antagonist of the biceps brachii) but also participates in the shoulder extension.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Flex your elbow and extend the arm on the trunk!	Isometric contraction of the elbow flexors and triceps brachii (Cocontraction)
T2	Maintaining	Relax!	Relaxation

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for elbow stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Triceps Brachii

Action: Forearm extension on the arm (elbow extension)
Accessory muscle: Anconeus
Other actions: Shoulder extension (long head), Shoulder adduction (long head)

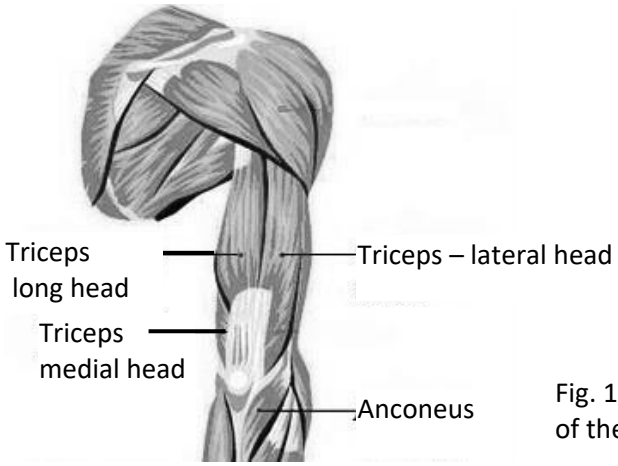

Fig. 126. Extensor muscles of the elbow (14)

1. ***SR (Slow reversals)***

Initial position:

Patient sitting.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 127).

The technique starts on the antagonist (on the elbow flexors in this case).

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors

T2	Forearm extension on the arm *(Mobilizing hand switches on the posterior face of the forearm)*	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii

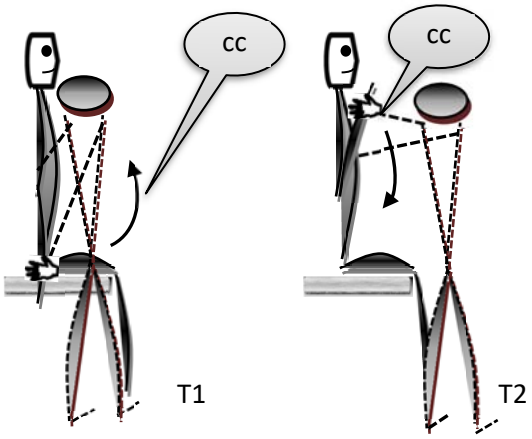

Fig. 127. SR technique for triceps brachii
(cc = concentric contraction)

2. *SRH (Slow reversals hold)*

Initial position:

Patient sitting with the elbow in flexion.

Physiotherapist, ipsilateral to the patient, stabilizing hand on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 128).

Moving times	Movement	Verbal command	Technique
T1	Forearm extension on the arm	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T2	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii

T3	Forearm flexion on the arm *(Mobilizing hand switches on the anterior face of the forearm)*	Push in my hand! (Flex your elbow!)	Concentric contraction of the elbow flexors
T4	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors

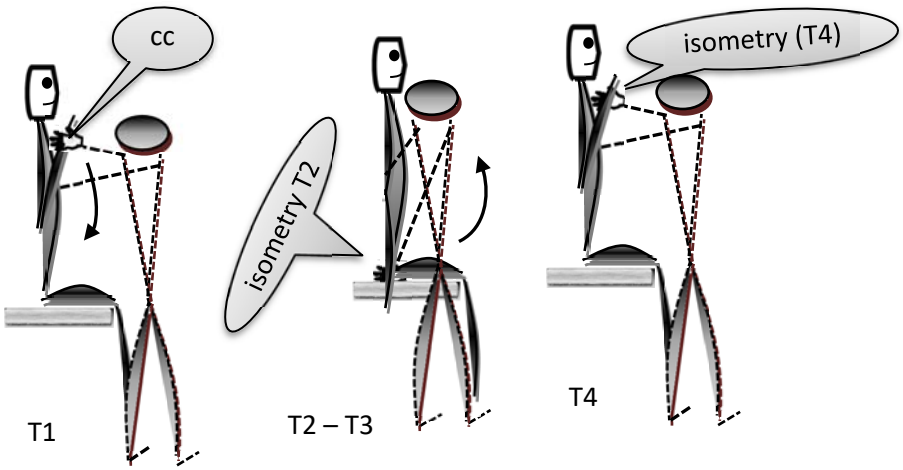

Fig. 128. SRH technique for triceps brachii
(cc = concentric contraction)

3. ***RC (Repeated Contractions)***

For strength 0-1 (fig. 129)
Initial position:

Patient in sitting, with arm abducted on the trunk at 90° and the elbow in flexion.

Physiotherapist, behind the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	Movement	Verbal command	Technique
T1	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Relax!	Passive movement
T3	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Contract! Try to extend the elbow!	Passive movement

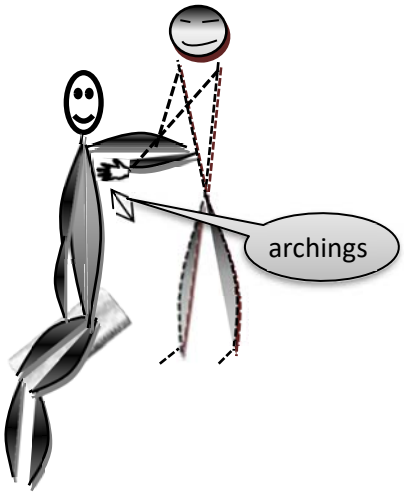

Fig. 129. RC technique for triceps brachii - For strength 0 - 1

For strength 2-3 (fig. 130)
Initial position:

Patient in sitting, with arm abducted on the trunk at 90° and the elbow in flexion.

Physiotherapist, behind the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Forearm extension on the arm at 40º	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T2	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Continue to extend the elbow!	Passive movement
T3	Forearm extension on the arm at 80º	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T4	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Continue to extend the elbow!	Passive movement
T5	It is continued on the entire range of motion.		

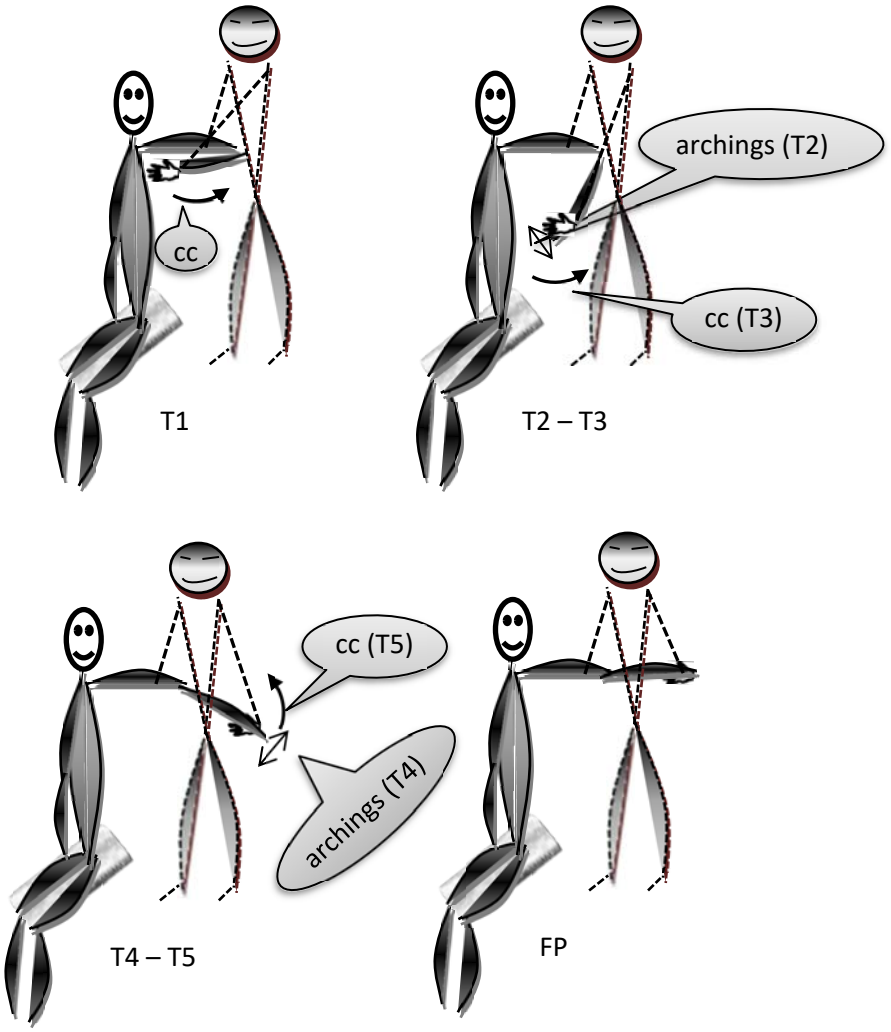

Fig. 130. RC technique for triceps brachii - For strength 2 – 3
(cc = concentric contraction; FP = final position)

For strength 4-5 (fig. 131)
Initial position:

Patient in sitting with the elbow flexed.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	Movement	Verbal command	Technique
T1	Forearm extension on the arm – to the point where a hollow of strength can be felt	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T2	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T3	Maintaining	Relax!	Relaxation
T4	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

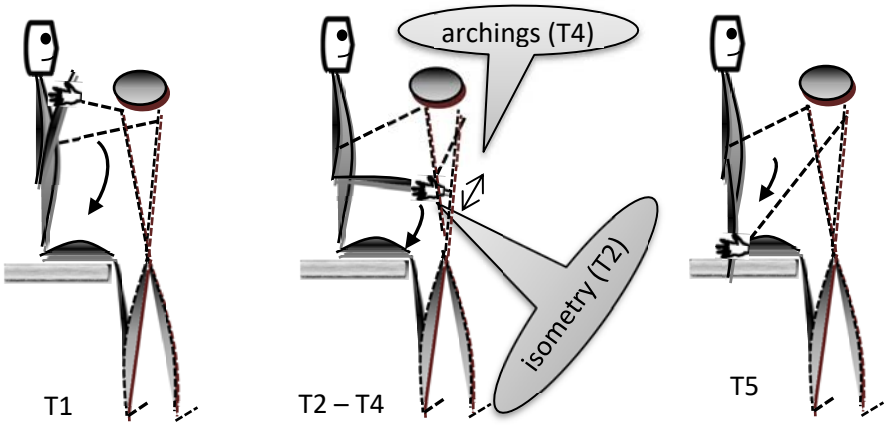

Fig. 131. RC technique for triceps brachii - For strength 4 – 5

4. ***AR (Agonistic reversal)***

Initial position:

Patient in sitting with the elbow flexed.

Physiotherapist, anterior - ipsilateral to the patient, stabilizing hand, on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 132 a and b).

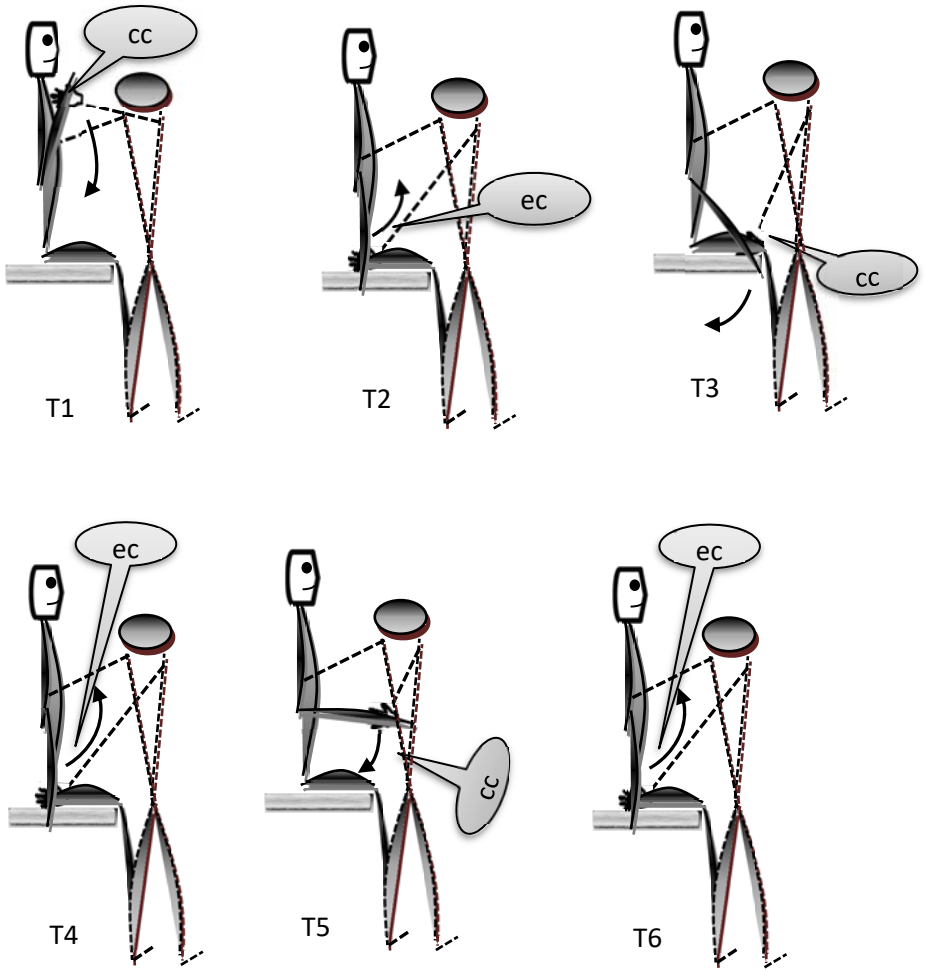

Fig. 132a. AR technique for triceps brachii: T1 – T6
(cc = concentric contraction; ec = eccentric contraction)

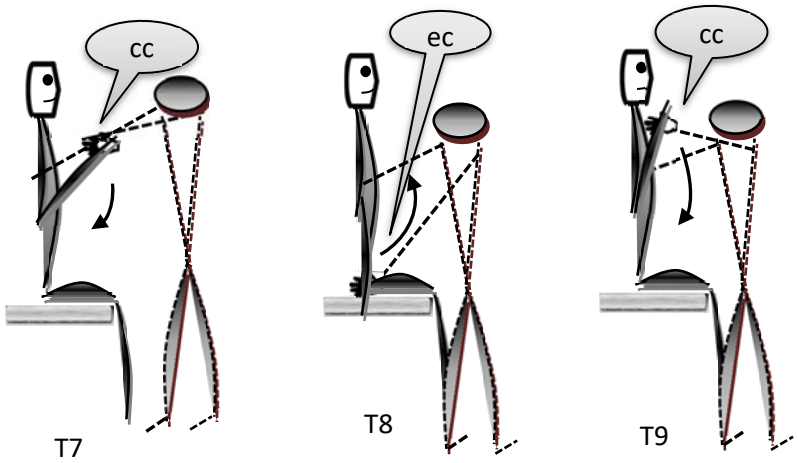

Fig. 132b. AR technique for triceps brachii: T7 – T9
(cc = concentric contraction; ec = eccentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Forearm extension on the arm	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T2	Forearm flexion on the arm at 15°	Hold, do not let me bring your forearm up !	Eccentric contraction of the triceps brachii
T3	Forearm extension on the arm	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii
T4	Forearm flexion on the arm at 30°	Hold, do not let me bring your forearm up!	Eccentric contraction of the triceps brachii
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the posterior face of the forearm and the patient will try to push towards extension!

5. *TE (Timing for emphasis)*

Objective: toning the left triceps brachii.
Variant 1 (bilateral) (fig. 133)
Initial position:

Patient sitting with the right forearm flexed on the arm at 90° and the left arm flexed on the arm.

Physiotherapist behind the patient, mobilizing hands on the distal third of both forearms, the posterior face.

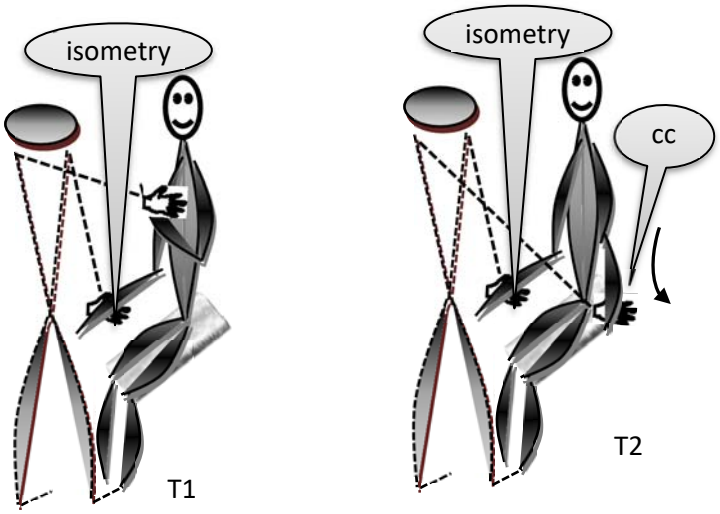

Fig. 133. TE technique for triceps brachii – variant 1
(cc = concentric contraction)

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right forearm)	Push in my hand with your right forearm!	Isometric contraction of the right triceps brachii
T2	Maintaining (right forearm) + extension of left forearm on the arm	Push in my hands! (Maintain right forearm in the same position and extend your left elbow!)	Isometric contraction of the right triceps brachii + Concentric contraction of the left triceps brachii

Variant 2 (unilateral) (fig. 134)
Initial position:

Patient in sitting with the elbow flexed.

Physiotherapist, behind – ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the posterior face, and the other mobilizing hand on the distal third of the arm, the posterior face.

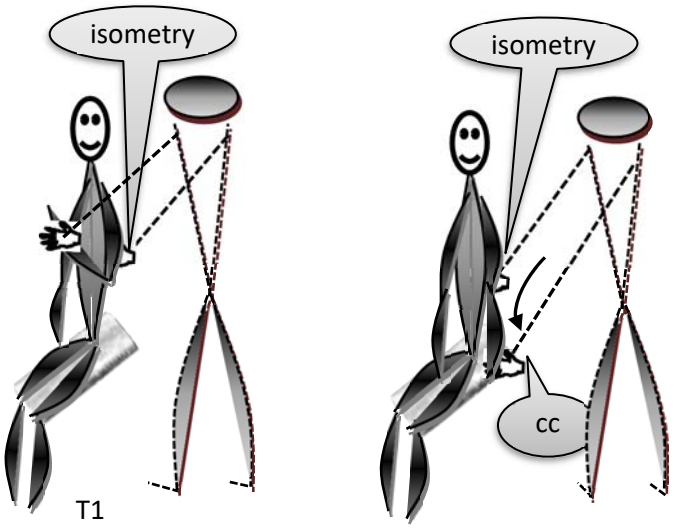

Fig. 134. TE technique for triceps brachii – variant 2
(cc = concentric contraction)

We use the arm extensor muscles which enter into the kinetic chain which makes the Kabat diagonals D1 of extension for the upper limbs, together with the triceps brachii.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining arm position	Push the arm in my hand!	Isometric contraction for the arm extensor muscles on the trunk
T2	Maintaining arm position + Forearm extension on the arm	Push in my hands! (Maintain the arm in the same position and extend your elbow!)	Isometric contraction of the arm extensor muscles on the trunk + Concentric contraction of the triceps brachii

6. ***HRAM (Hold-relax Active Movement))***

Initial position:

Patient in sitting with the elbow slightly flexed.

Physiotherapist, behind - lateral to the patient with stabilizing hand on the distal third of the arm, the posterior face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 135).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Forearm flexion on the arm *(The physiotherapist quickly takes the patient's forearm in flexion)*	Relax!	Passive movement
T3	Elbow flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the triceps brachii)*	Relax!	Passive movement
T4	Forearm extension on the arm	Push in my hand! (Extend your elbow!)	Concentric contraction of the triceps brachii

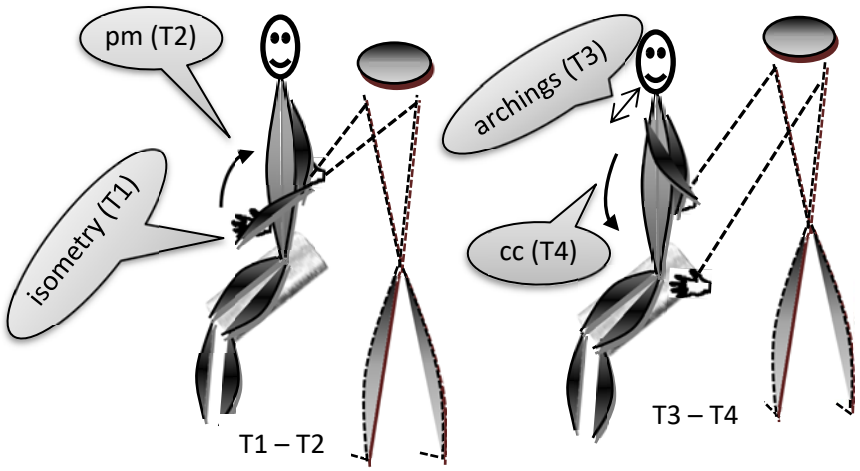

Fig. 135. Tehnica MARO pentru triceps brachii
(cc = concentric contraction; pm = passive movement)

7. ***RI (Rhythmic initiation)***

Initial position:

Patient in sitting, with the arm abducted on the trunk at 90°.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 136).

Moving times	Movement	Verbal command	Technique
T1	Forearm flexion on the arm	Relax, let me move your forearm!	Passive movement
T2	Forearm extension on the arm	Relax, let me move your forearm!	Passive movement
T3	Forearm flexion on the arm	Move your forearm together with me!	Concentric contraction of the elbow flexors –

			Passive-active movement
T4	Forearm extension on the arm	Move your forearm together with me!	Concentric contraction of the triceps brachii – Passive-active movement
T5	Forearm flexion on the arm	Flex your elbow!	Concentric contraction of the elbow flexors – Active movement
T6	Forearm extension on the arm	Extend your elbow!	Concentric contraction of the triceps brachii – Active movement

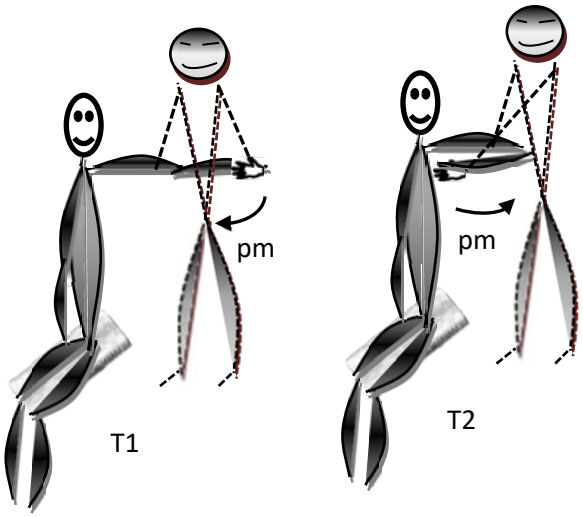

Fig. 136. RI technique for triceps brachii
(pm = passive movement)

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

The technique is performed in the same way as for the flexor muscles of the elbow

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the triceps brachii, the technique is started with the forearm slightly flexed on the arm, while when we want to obtain its inhibition in order to increase the range of motion in flexion, the technique is started in the limitation point of the movement, i.e., with the forearm flexed on the arm to the limit allowed by the hypertonic triceps brachii (fig. 137).

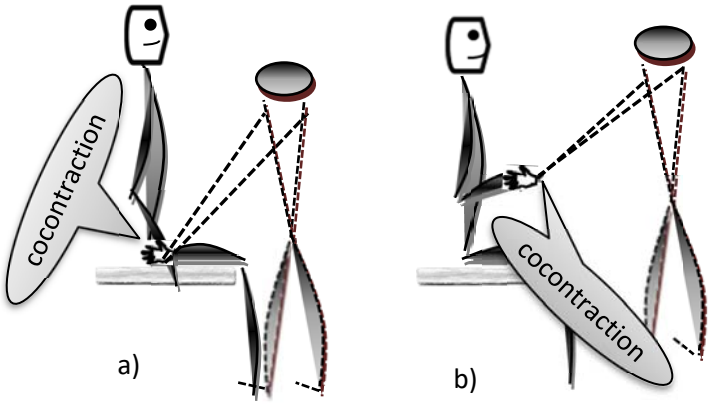

Fig. 137. RS technique for triceps brachii: a) for muscle toning; b) for muscle inhibition

PNF techniques for Triceps Brachii Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with mobilizing hand grasping the patient's hand and stabilizing hand on the distal third of the arm, the lateral face (fig. 138).

Moving times	Movement	Verbal command	Technique
T1	Elbow pronation	Relax, let me move your forearm!	Passive movement
T2	Elbow supination	Relax, let me move your forearm!	Passive movement
T3	Elbow pronation	Move your forearm with me!	Passive-active movement
T4	Elbow supination	Move your forearm with me!	Passive-active movement
T5	Elbow pronation	Rotate the forearm with the palm down!	Active movement
T6	Elbow supination	Rotate the forearm with the palm up!	Active movement

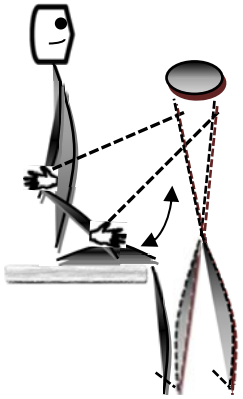

Fig. 138. RR technique for triceps brachii

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as is the triceps brachii in this case*)
Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the posterior face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 139).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining	Relax!	Relaxation
T3	Forearm flexion on the arm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the triceps brachii
T4 – T6	Repeat times 1- 3.		

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, as is the elbow flexors in this case*)

Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 139).

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T2	Maintaining	Relax!	Relaxation
T3	Forearm flexion on the arm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the triceps brachii
T4 – T6	Repeat times 1 - 3		

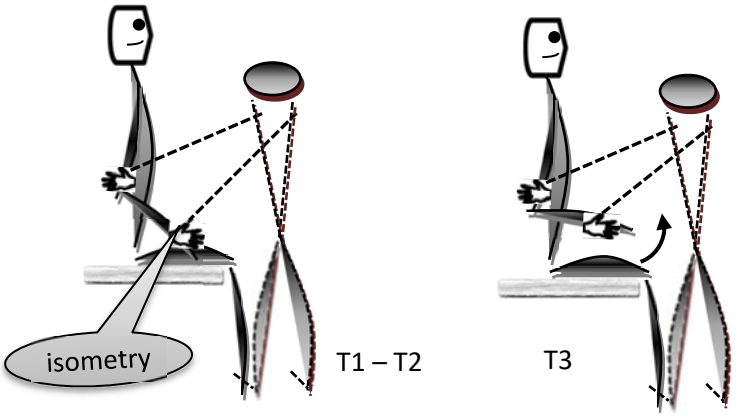

Fig. 139. HR technique for triceps brachii

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the posterior face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 139).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining	Relax!	Relaxation
T3	Forearm flexion on the arm	Flex your elbow! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the elbow flexors (Active Stretching of the triceps brachii)
T4 – T6	Repeat times 1 - 3.		

Version: Agonist HR-C
Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with stabilizing hand on the distal third of the arm, the anterior face, and mobilizing hand on the distal third of the forearm, the anterior face (fig. 139).

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the elbow flexors
T2	Maintaining	Relax!	Relaxation
T3	Forearm flexion on the arm	Flex your elbow! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the elbow flexors (Active Stretching of the triceps brachii)
T4 – T6	Repeat times 1 - 3		

5. *CR (Contract - Relax)*

Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient, one mobilizing hand grasping the patient's hand and the other mobilizing hand on the distal third of the forearm, the posterior face (fig. 140).

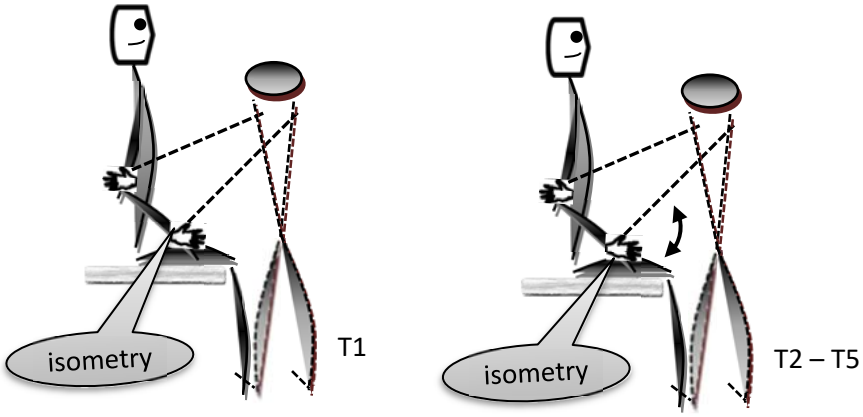

Fig. 140. CR technique for triceps brachii

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining flexion forearm position + Elbow pronation	Try to extend the elbow and let me rotate your forearm!	Isometric contraction of the triceps brachii + Passive movement of forearm pronation
T3	Maintaining flexion forearm position + Elbow supination	Try to extend the elbow and let me rotate your forearm!	Isometric contraction of the triceps brachii + Passive movement of forearm supination
T4	Maintaining flexion forearm	Try to extend the elbow and rotate the forearm with the	Isometric contraction of the triceps brachii + Passive-active

	position + Elbow pronation	palm down with me!	movement of forearm pronation
T5	Maintaining flexion forearm position + Elbow supination	Try to extend the elbow and rotate the forearm with the palm up with me!	Isometric contraction of the triceps brachii + Passive-active movement of forearm supination

6. ***RS (Rhythmic Stabilization)***

Alternative version (fig. 141a)
Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the forearm, the anterior face and the other mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	Movement	Verbal command	Technique
T1	Maintaining *(The physiotherapist opposes resistance on the anterior face of the forearm)*	Push in my hand, towards flexion!	Isometric contraction of the elbow flexors
T2	Maintaining *(The physiotherapist opposes resistance on the posterior face of the forearm)*	Push in my hand, towards extension!	Isometric contraction of the triceps brachii
T3	Maintaining *(The physiotherapist pushes the patient's forearm toward both flexion and extension, alternating more and more rapidly between the two directions)*	Hold, don't let me move your forearm!	Cocontraction for the elbow flexors and triceps brachii
T4	Maintaining	Relax!	Relaxation

Simultaneous version (fig. 141b)
Initial position:

Patient in sitting with the elbow flexed at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the distal third of the arm, the posterior face, and the other mobilizing hand on the distal third of the forearm, the anterior face.

We use the biceps brachii muscle, biarticular muscle, which realizes the flexion of the elbow (thus being antagonist of the triceps brachii) but also participates in the shoulder flexion.

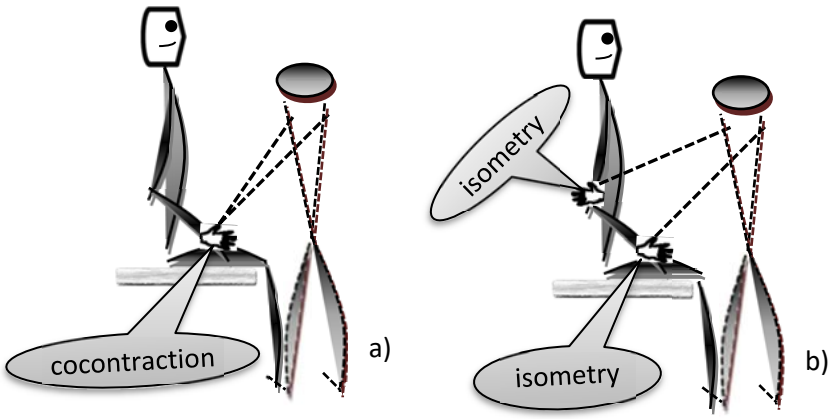

Fig. 141. RS technique for triceps brachii: a) alternative version; b) simultaneous version

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Flex the arm on the trunk and extend your elbow!	Isometric contraction of the biceps brachii and triceps brachii (Cocontraction)
T2	Maintaining	Relax!	Relaxation

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for elbow stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for increasing Elbow Stability

1. ***ICS (Isometric contraction in a short zone)***

Initial position:

Patient in sitting.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the arm, the lateral face, and mobilizing hand on the distal third of the forearm, the posterior face (fig. 142).

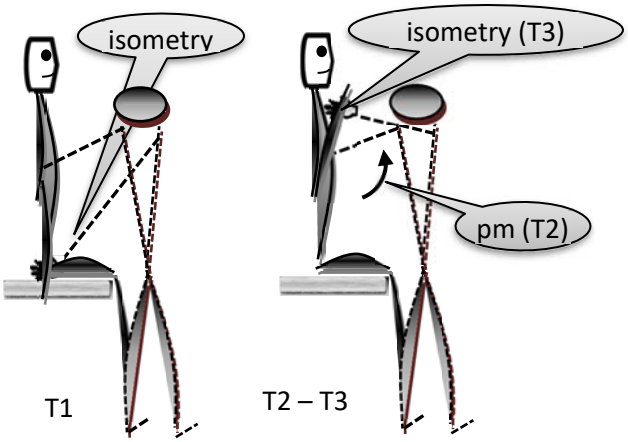

Fig. 142. ICS technique for elbow
(pm = passive movement)

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the triceps brachii
T2	Forearm flexion on the arm *(The physiotherapist takes the patient's forearm to the point where the elbow flexors are maximally shortened)*	Relax!	Passive movement

T3	Maintaining *(The physiotherapist opposes resistance on the anterior face of the forearm)*	Push in my hand!	Isometric contraction of the biceps brachii

2. ***AI (Alternating isometrics)***

Initial position:

Patient in sitting.

Physiotherapist ipsilateral to the patient, one mobilizing hand on the distal third of the arm, the anterior face, and the other mobilizing hand on the distal third of the forearm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the posterior face of the forearm)*	Push in my hand!	Isometric contraction of the triceps brachii
T2	Maintaining *(The physiotherapist opposes resistance on the anterior face of the forearm)*	Push in my hand!	Isometric contraction of the biceps brachii
T3	Forearm flexion on the arm at 5°	Relax!	Passive movement
T3	Maintaining *(The physiotherapist opposes resistance on the posterior face of the forearm)*	Push in my hand!	Isometric contraction of the triceps brachii
T4	Maintaining *(The physiotherapist opposes resistance on the anterior face of the forearm)*	Push in my hand!	Isometric contraction of the biceps brachii
T5	Forearm flexion on the arm at 30°	Relax!	Passive movement
T6….	It is continued with isometries on biceps and triceps in each point of the movement arch up to maximum flexion.		

3. RS (Rhythmic stabilization)

It is described in techniques for inhibition.

PNF techniques for toning the Wrist Flexors

Action: Flexion of the hand on the forearm (wrist flexion)
Synergist muscles: Flexor carpi radialis, Flexor carpi ulnaris
Accessory muscle: Palmaris longus
Other actions: Radial deviation (Flexor carpi radialis), Ulnar deviation (Flexor carpi ulnaris)

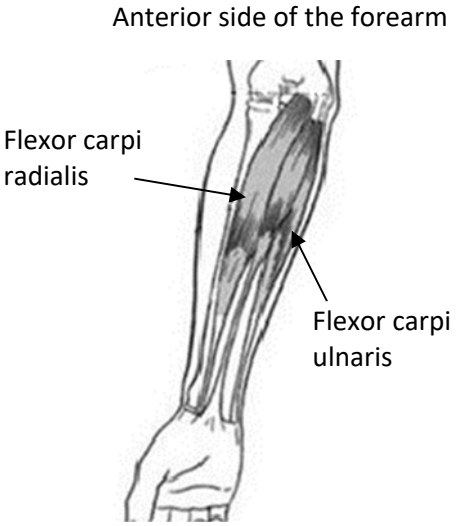

Fig. 143. Flexor muscles of the wrist (15)

1. ***SR (Slow reversals)***

Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals and stabilizing hand on the distal third of the forearm, anterior face.

The technique starts on the antagonist (on the wrist extensors).

Moving times	Movement	Verbal command	Technique
T1	Hand extension on the forearm	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors

T2	Hand flexion on the forearm *(Mobilizing hand switches on the palmar face of the hand)*	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors

2. ***SRH (Slow reversals hold)***

Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support, with the wrist extend.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the palmar side of the hand, at the level of the metacarpals and stabilizing hand on the distal third of the forearm, anterior face.

Moving times	Movement	Verbal command	Technique
T1	Hand flexion on the forearm	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T2	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T3	Hand extension on the forearm *(Mobilizing hand switches on the dorsal face of the hand)*	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T4	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors

3. ***RC (Repeated Contractions)***

For strength 0-1

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

The mobilizing hand on the hand has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1 - 2	Wrist extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist flexors)*	Relax!	Passive movement
T3 - 4	Wrist extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist flexors)*	Contract! (Try to flex the wrist!)	Passive movement

For strength 2-3

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

The mobilizing hand on the hand has only guiding and stimulation role and does not resist the movement.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Hand flexion on the forearm 20º	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T2	Wrist extension - flexion on low range of motion (archings)	Continue to flex!	Passive movement

	(The physiotherapist performs repeated short stretches of the wrist flexors)		
T3	Hand flexion on the forearm 20º	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T4	Wrist extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist flexors)*	Continue to flex!	Passive movement
T5	It is continued on the entire range of motion.		

For strength 4-5
Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Hand flexion on the forearm – to the point where a hollow of strength can be felt	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T2	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T3	Maintaining	Relax!	Relaxation
T4	Wrist extension - flexion on low range of motion (archings)	Relax!	Passive movement

	(The physiotherapist performs repeated short stretches of the wrist flexors)		
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. ***AR (Agonistic reversal)***

Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Hand flexion on the forearm	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T2	Hand extension on the forearm at 20°	Hold, do not let me extend your wrist!	Eccentric contraction of the wrist flexors
T3	Hand flexion on the forearm	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T4	Hand extension on the forearm at 40°	Hold, do not let me extend your wrist!	Eccentric contraction of the wrist flexors
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the palmar face of the hand and the patient will try to push towards flexion!

5. ***TE (Timing for emphasis)***

Objective: toning the flexor muscles of the left wrist.

Variant 1 (bilateral)

Initial position:

Patient in sitting with the forearms in supine position, resting on a support and the hand outside the support, with the right wrist slightly flexed.

Physiotherapist, anterior to the patient, mobilizing hands on the palmar side of both hands, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining (right hand)	Push in my hand!	Isometric contraction for right wrist flexors
T2	Maintaining (right hand) + flexion of left hand on the forearm	Push in my hands! (Maintain right hand in the same position and flex your left wrist!)	Isometric contraction of the right wrist flexors + Concentric contraction of the left wrist flexors

Variant 2 (unilateral)

Initial position:

Patient in sitting, with the forearm flexed on the arm at 90° and supine.

Physiotherapist, ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the anterior face, and the other mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

We use the flexor muscles of the elbow which work into the triple flexion chain together with the wrist flexors.

Moving times	Movement	Verbal command	Technique
T1	Maintaining forearm position	Push in my hand!	Isometric contraction for the elbow flexors
T2	Maintaining forearm position + hand flexion on the forearm	Push in my hands! (Maintain the forearm in the same position and raise your hand!)	Isometric contraction of the elbow flexors + Concentric contraction of the wrist flexors

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand grasping the patient's hand on the palmar side, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Hand extension on the forearm *(The physiotherapist quickly takes the patient's hand in extension)*	Relax!	Passive movement
T3	Wrist extension - flexion on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist flexors)*	Relax!	Passive movement
T4	Hand flexion on the forearm	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors

7. ***RI (Rhythmic initiation)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand grasping the patient's hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Hand flexion on the forearm	Relax, let me move your hand!	Passive movement
T2	Hand extension on the forearm	Relax, let me move your hand!	Passive movement
T3	Hand flexion on the forearm	Move your hand together with me!	Concentric contraction of the wrist flexors – Passive-active movement
T4	Hand extension on the forearm	Move your hand together with me!	Concentric contraction of the wrist extensors – Passive-active movement
T5	Hand flexion on the forearm	Flex the wrist!	Concentric contraction of the wrist flexors – Active movement
T6	Hand extension on the forearm	Extend the wrist!	Concentric contraction of the wrist extensors – Active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the wrist flexors the technique is started with the wrist slightly flexed, while when we want to obtain its inhibition in order to increase the range of motion in extension, the technique is started in the limitation point of the movement, i.e., with the wrist extended.

PNF techniques for Wrist Flexors Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand grasping the patient's hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Wrist pronation	Relax, let me move your hand!	Passive movement
T2	Wrist supination	Relax, let me move your hand!	Passive movement
T3	Wrist pronation	Move your hand with me!	Passive-active movement
T4	Wrist supination	Move your hand with me!	Passive-active movement
T5	Wrist pronation	Rotate the forearm with the palm down!	Active movement
T6	Wrist supination	Rotate the forearm with the palm up!	Active movement

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, so are the wrist flexors in this case*)

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Maintaining	Relax!	Relaxation
T3	Hand extension on the forearm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the wrist flexors
T4 - T6	Repeat times 1 - 3.		

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, so are the wrist extensors in this case*)

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension 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 on the dorsal side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Maintaining	Relax!	Relaxation
T3	Hand extension on the forearm	Relax! *(The physiotherapist tries to overcome the*	Passive stretch of the wrist flexors

		initial point of mobility limitation)	
T4 - T6	Repeat times 1 - 3		

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Maintaining	Relax!	Relaxation
T3	Hand extension on the forearm	Extend the wrist! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the wrist extensors (Active stretching of the wrist flexors)
T4 - T6	Repeat times 1 - 3		

Version: Agonist HR-C
Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension 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 on the dorsal side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Maintaining	Relax!	Relaxation

T3	Hand extension on the forearm	Extend the wrist! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the wrist extensors (Active stretching of the wrist flexors)
T4 - T6	Repeat times 1 - 3		

5. ***CR (Contract - Relax)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the anterior face, and mobilizing hand grasping the patient's hand, on the palmar side.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Maintaining extension wrist position + wrist pronation	Flex the wrist and let me rotate your hand!	Isometric contraction of the wrist flexors + wrist pronation passive movement
T3	Maintaining extension wrist position + wrist supination	Flex the wrist and let me rotate your hand!	Isometric contraction of the wrist flexors + wrist supination passive movement
T4	Maintaining extension wrist position + wrist pronation	Flex the wrist and rotate the hand with the palm down with me!	Isometric contraction of the wrist flexors + wrist pronation passive-active movement
T5	Maintaining extension wrist position + wrist supination	Flex the wrist and rotate the hand with the palm up with me!	Isometric contraction of the wrist flexors + wrist supination passive-active movement

6. ***RS (Rhythmic Stabilization)***

Alternative version

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the palmar side of the hand, at the level of the metacarpals, and the other mobilizing hand on the dorsal side of the hand.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the palmar face of the hand)*	Push in my hand, towards flexion!	Isometric contraction of the wrist flexors
T2	Maintaining *(The physiotherapist opposes resistance on the dorsal face of the hand)*	Push in my hand, towards extension!	Isometric contraction of the wrist extensors
T3	Maintaining *(The physiotherapist pushes the patient's hand toward both flexion and extension, alternating more and more rapidly between the two directions)*	Hold, don't let me move your hand!	Cocontraction of the wrist flexors and extensors
T4	Maintaining	Relax!	Relaxation

Simultaneous version

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the wrist in extension at the point of mobility limitation.

Physiotherapist, anterior to the patient with one mobilizing hand on the palmar side of the hand, at the level of the metacarpals, and the other mobilizing hand on the dorsal side of the fingers.

We use the fact that the extensor muscles of the fingers also participate in the extension of the wrist, thus acting as antagonist of the wrist flexors as well.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Flex the wrist an extend the fingers!	Isometric contraction of the wrist flexors and fingers extensors (Cocontraction)
T2	Maintaining	Relax!	Relaxation

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for wrist stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for toning the Wrist Extensors

Action: Hand extension on the forearm (wrist extension)
Synergist muscles: Extensor carpi radialis longus, Extensor carpi radialis brevis, Extensor carpi ulnaris
Accessory muscles: Extensor digitorum, Extensor digit minimi, Extensor indicis, Extensor policis longus
Other actions: Radial deviation (Extensor carpi radialis longus), Ulnar deviation (Extensor carpi ulnaris)

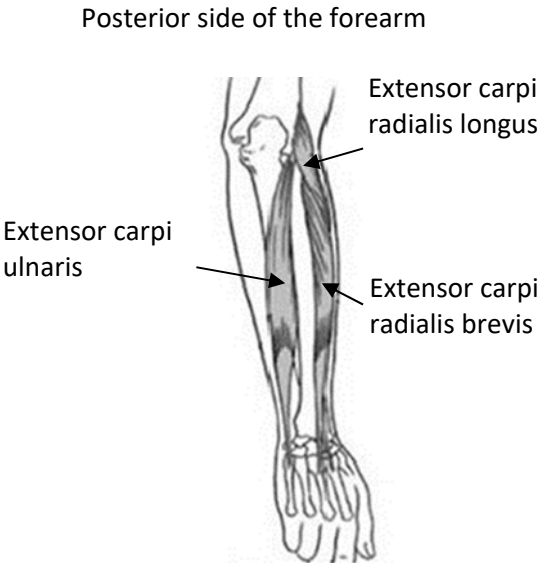

Fig. 144. Extensor muscles of the wrist (15)

1. *SR (Slow reversals)*

Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the palmar side of the hand, at the level of the metacarpals, and stabilizing hand on the distal third of the forearm, anterior face.

The technique starts on the antagonist (on the wrist flexors).

Moving times	Movement	Verbal command	Technique
T1	Hand flexion on the forearm	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T2	Hand extension on the forearm *(Mobilizing hand switches on the dorsal face of the hand)*	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors

2. ***SRH (Slow reversals hold)***

Initial position:

Patient in sitting with the forearm supine, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals, and stabilizing hand on the distal third of the forearm, anterior face.

Moving times	Movement	Verbal command	Technique
T1	Hand extension on the forearm	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T2	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T3	Hand flexion on the forearm *(Mobilizing hand switches on the palmar face of the hand)*	Push in my hand! (Flex the wrist!)	Concentric contraction of the wrist flexors
T4	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors

3. ***RC (Repeated Contractions)***

For strength 0-1

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals, and stabilizing hand on the distal third of the forearm.

Moving times	Movement	Verbal command	Technique
T1	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Relax!	Passive movement
T2	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Contract! Try to extend the wrist!	Passive movement

For strength 2-3

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals, and stabilizing hand on the distal third of the forearm.

Moving times	Movement	Verbal command	Technique
T1	Hand extension on the forearm 20º	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors

T2	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Continue to extend the wrist!	Passive movement
T3	Hand extension on the forearm 20º	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T4	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Continue to extend the wrist!	Passive movement
T5	It is continued on the entire range of motion.		

For strength 4-5

Initial position:

Patient in sitting with the forearm in prone position, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals and stabilizing hand on the distal third of the forearm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Hand extension on the forearm – to the point where a hollow of strength can be felt	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T2	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T3	Maintaining	Relax!	Relaxation

T4	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Relax!	Passive movement
T5 - 8	It is continued with T1 until a new hollow of strength is felt and T2 – T4 are repeated		

4. *AR (Agonistic reversal)*

Initial position:

Patient in sitting with the forearm in prone position, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist ipsilateral to the patient, with mobilizing hand on the dorsal side of the hand, at the level of the metacarpals, and stabilizing hand on the distal third of the forearm, the posterior face.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Hand extension on the forearm	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T2	15° hand flexion on the forearm	Hold, do not let me flex your wrist!	Eccentric contraction of the wrist extensors
T3	Hand extension on the forearm	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors
T4	30° hand flexion on the forearm	Hold, do not let me flex your wrist!	Eccentric contraction of the wrist extensors
T5 ….	T1 and T2 are repeated and gradually so is the range of motion in which the eccentric contraction is performed, until it is performed on the entire range of motion.		

Attention: During the entire technique, the mobilizing hand remains on the dorsal face of the hand and the patient will try to push towards extension!

5. ***TE (Timing for emphasis)***

Objective: toning the extensor muscles of the left wrist.

Variant1 (bilateral)

Initial position:

Patient in sitting with the forearms in prone position, resting on a support and the hand outside the support, with the right wrist slightly extend.

Physiotherapist, ipsilateral to the patient, mobilizing hands on the dorsal side of both hands, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining (right hand)	Push in my hand (Try to extend the right wrist)!	Isometric contraction of the right wrist extensors
T2	Maintaining (right hand) + extension of left hand on the forearm	Push in my hands! (Maintain right hand in the same position and extend the left wrist!)	Isometric contraction of the right wrist extensors + concentric contraction of the left wrist extensors

Variant 2 (unilateral)

Initial position:

Patient in sitting, with the forearm prone and flexed on the arm at 90°, resting on a support and the hand outside the support, with the wrist flexed.

Physiotherapist, ipsilateral to the patient, one mobilizing hand on the distal third of the forearm, the posterior face, and the other mobilizing hand on the dorsal side of the hand, at the level of the metacarpals.

We use the extensor muscles of the elbow which work into the triple extension chain together with the wrist extensors.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining forearm position	Push the forearm in my hand!	Isometric contraction of the elbow extensors

T2	Maintaining forearm position + Hand extension on the forearm	Push in my hands! (Maintain the forearm in the same position and extend the wrist!)	Isometric contraction of the elbow extensors + concentric contraction of the wrist extensors

6. ***HRAM (Hold-relax Active Movement)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist slightly extended.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm, the posterior face, and mobilizing hand on the dorsal side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Hand flexion on the forearm *(The physiotherapist quickly takes the patient's hand in flexion)*	Relax!	Passive movement
T3	Wrist flexion - extension on low range of motion (archings) *(The physiotherapist performs repeated short stretches of the wrist extensors)*	Relax!	Passive movement
T4	Hand extension on the forearm	Push in my hand! (Extend the wrist!)	Concentric contraction of the wrist extensors

7. ***RI (Rhythmic initiation)***

Initial position:

Patient in sitting with the forearm in prono supine position, resting on a support.

Physiotherapist, ipsilateral to the patient, stabilizing hand underneath, on the distal third of the arm, supporting it, and mobilizing hand grasping the patient's hand on the dorsal side, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Hand flexion on the forearm	Relax, let me move your hand!	Passive movement
T2	Hand extension on the forearm	Relax, let me move your hand!	Passive movement
T3	Hand flexion on the forearm	Move your hand together with me!	Concentric contraction of the wrist flexors – Passive-active movement
T4	Hand extension on the forearm	Move your hand together with me!	Concentric contraction of the wrist extensors – Passive-active movement
T5	Hand flexion on the forearm	Flex the wrist!	Concentric contraction of the wrist flexors – Active movement
T6	Hand extension on the forearm	Extend the wrist!	Concentric contraction of the wrist extensors – Active movement

Observation: It is then continued with the SR technique, the physiotherapist resisting the movement.

The technique is performed in the same way as for the flexor muscles of the wrist.

8. ***RS (Rhythmic stabilization)***

- It is described at inhibition techniques, this technique being able to be used for both purposes (toning and inhibition). The difference is that when we want to obtain the toning of the wrist extensors the technique is started with the wrist slightly extended, while when we want to obtain its inhibition, in order to increase the range of motion in flexion, the technique is started in the limitation point of the movement, i.e., with the wrist flexed.

PNF techniques for Wrist Extensors Inhibition

1. ***RI (Rhythmic initiation)***

- It is described in techniques for muscle toning, this technique can be used for both purposes (toning and inhibition).

2. ***RR (Rhythmic Rotation)***

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 and mobilizing hand grasping the patient's hand on the dorsal side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Wrist pronation	Relax, let me move your hand!	Passive movement
T2	Wrist supination	Relax, let me move your hand!	Passive movement
T3	Wrist pronation	Move your hand with me!	Passive-active movement
T4	Wrist supination	Move your hand with me!	Passive-active movement
T5	Wrist pronation	Rotate the forearm with the palm down!	Active movement
T6	Wrist supination	Rotate the forearm with the palm up!	Active movement

3. ***HR (Hold-Relax)***

Version: Antagonist HR (*the antagonist is the muscle that opposes the limited movement, as the wrist extensors in this case*)
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 on the dorsal side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Maintaining	Relax!	Relaxation
T3	Hand flexion on the forearm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the wrist extensors
T4 – T6	Repeat times 1- 3.		

Version: Agonist HR (*the agonist is the muscle that performs the limited movement, as the wrist flexors in this case*)
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 anterior face, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Maintaining	Relax!	Relaxation
T3	Hand flexion on the forearm	Relax! *(The physiotherapist tries to overcome the initial point of mobility limitation)*	Passive stretch of the wrist extensors
T4 - T6	Repeat times 1- 3		

4. ***HR-C (Hold-Relax-Contraction)***

Version: Antagonist HR-C
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 on the dorsal side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Maintaining	Relax!	Relaxation
T3	Hand flexion on the forearm	Flex the wrist! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the wrist flexors (Active Stretching of the wrist extensors)
T4 - T6	Repeat times 1- 3.		

Version: Agonist HR-C
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 anterior face, and mobilizing hand on the palmar side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist flexors
T2	Maintaining	Relax!	Relaxation
T3	Hand flexion on the forearm	Flex the wrist! *(Trying to overcome the initial point of mobility limitation)*	Concentric contraction of the wrist flexors (Active Stretching of the wrist extensors)
T4 – T6	Repeat times 1- 3		

5. *CR (Contract - Relax)*

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.

Moving times	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

6. ***RS (Rhythmic Stabilization)***

Alternative version

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, anterior to the patient with one mobilizing hand on the palmar side of the hand, at the level of the metacarpals and the other mobilizing hand on the dorsal side of the hand.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the palmar face of the hand)*	Push in my hand, towards flexion!	Isometric contraction of the wrist flexors
T2	Maintaining *(The physiotherapist opposes resistance on the dorsal face of the hand)*	Push in my hand, towards extension!	Isometric contraction of the wrist extensors
T3	Maintaining *(The physiotherapist pushes the patient's hand toward both flexion and*	Hold, don't let me move your hand!	Cocontraction of the wrist flexors and extensors

	extension, alternating more and more rapidly between the two directions)		
T4	Maintaining	Relax!	Relaxation

Simultaneous version
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 with one mobilizing hand on the dorsal side of the hand, at the level of the metacarpals, and the other mobilizing hand on the distal third of the forearm, the anterior face.

We use the fact that the main antagonist of the wrist extensors (flexor carpi radialis) also participate in the elbow pronation.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining	Extend the wrist and pronate the forearm!	Isometric contraction of the wrist extensors and flexors (Cocontraction)
T2	Maintaining	Relax!	Relaxation

7. ***ICS (Isometric contraction in a short zone)***

- It is described in techniques for wrist stability; this technique can be used for both hypertonic muscle inhibition and joint stability.

PNF techniques for increasing Wrist Stability

1. ***ICS (Isometric contraction in a short zone)***

Initial position:

Patient in sitting, with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm and mobilizing hand on the dorsal side of the hand, at the level of the metacarpals.

Moving times	Movement	Verbal command	Technique
T1	Maintaining	Push in my hand!	Isometric contraction of the wrist extensors
T2	Hand flexion on the forearm *(The physiotherapist takes the patient's hand to the point where the wrist flexors are maximally shortened)*	Relax!	Passive movement
T3	Maintaining *(The physiotherapist opposes resistance on the palmar face of the hand)*	Push in my hand!	Isometric contraction of the wrist flexors
T4	Return to zero position and radial deviation of the hand on the forearm *(The physiotherapist takes the patient's hand to the point where the wrist abductors are maximally shortened)*	Relax!	Passive movement
T5	Maintaining *(The physiotherapist opposes resistance on the lateral face of the hand)*	Push in my hand!	Isometric contraction of the wrist abductors

T6	Ulnar deviation of the hand on the forearm *(The physiotherapist takes the patient's hand to the point where the wrist adductors are maximally shortened)*	Relax!	Passive movement
T3	Maintaining *(The physiotherapist opposes resistance on the medial face of the hand)*	Push in my hand!	Isometric contraction of the wrist adductors

2. ***AI (Alternating isometrics)***

Initial position:

Patient in sitting, with the forearm in prono supine position, resting on a support and the hand outside the support, with the wrist extended.

Physiotherapist ipsilateral to the patient, stabilizing hand on the distal third of the forearm and mobilizing hand on the dorsal side of the hand, at the level of the metacarpals.

Moving times	**Movement**	**Verbal command**	**Technique**
T1	Maintaining *(The physiotherapist opposes resistance on the dorsal face of the hand)*	Push in my hand!	Isometric contraction of the wrist extensors
T2	Maintaining *(The physiotherapist opposes resistance on the palmar face of the hand)*	Push in my hand!	Isometric contraction of the wrist flexors
T3	15° hand flexion on the forearm	Relax!	Passive movement
T4	Maintaining *(The physiotherapist opposes resistance on*	Push in my hand!	Isometric contraction of the wrist extensors

	the dorsal face of the hand)		
T5	Maintaining *(The physiotherapist opposes resistance on the palmar face of the hand)*	Push in my hand!	Isometric contraction of the wrist flexors
T6	15° hand flexion on the forearm	Relax!	Passive movement
T6 – T9	It is continued with isometries on wrist extensors and flexors in each point of the movement arch until maximum flexion.		
T10	Return to zero position and radial deviation of the hand on the forearm *(The physiotherapist takes the patient's hand to the point where the wrist adductors are maximally shortened)*	Relax!	Passive movement
T11	Maintaining *(The physiotherapist opposes resistance on the lateral face of the hand)*	Push in my hand!	Isometric contraction of the wrist abductors
T12	Maintaining *(The physiotherapist opposes resistance on the medial face of the hand)*	Push in my hand!	Isometric contraction of the wrist adductors
T13	15° ulnar deviation of the hand on the forearm	Relax!	Passive movement
T14	Maintaining *(The physiotherapist opposes resistance on the lateral face of the hand)*	Push in my hand!	Isometric contraction of the wrist abductors

T15	Maintaining *(The physiotherapist opposes resistance on the medial face of the hand)*	Push in my hand!	Isometric contraction of the wrist adductors
T16….	It is continued with isometries on wrist adductors and abductors in each point of the movement arch until maximum adduction.		

3. RS (Rhythmic stabilization)

It is described in techniques for inhibition.

Following the pattern of PNF techniques on the shoulder, elbow, wrist, these techniques can also be performed on the fingers.

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ISBN: 978-606-37-0902-9