Ianc Dorina, Oradea - 2019

GENERAL BASES OF PHYSIOTHERAPY

BASIC KINESIOLOGICAL TECHNIQUES

BASIC KINESIOLOGICAL TECHNIQUES

Classification of kinetic techniques departs from the recognition of the three fundamental properties of the locomotor apparatus:

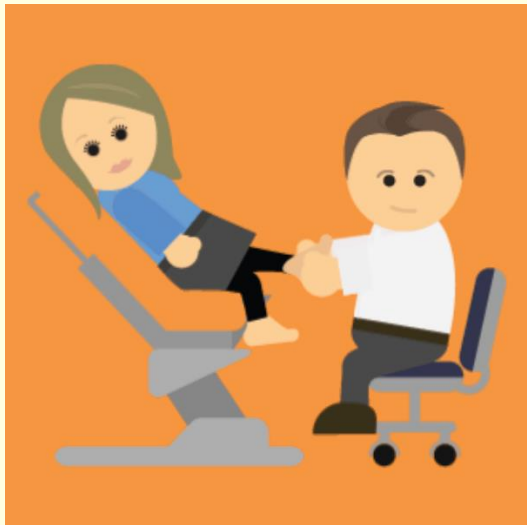
- ***resting state***

vis-a-vis de capacity

- ***to maintain a position***

or

- ***to be able to move*** (by applying an external force or - by dynamic muscle contraction).



KINESIOLOGICAL TECHNIQUES

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- specific to some occupational activities
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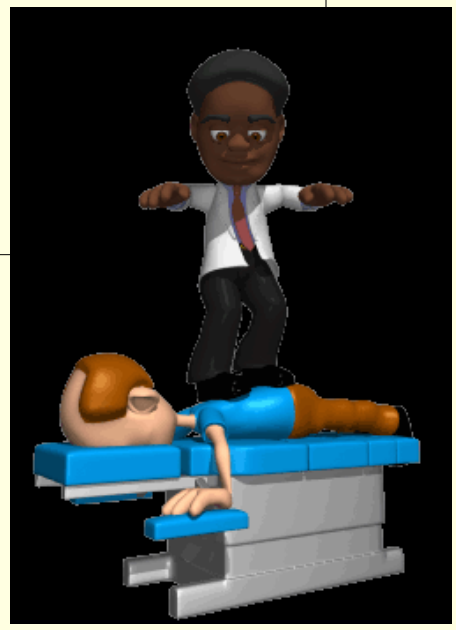
AKINETIC TECHNIQUES

- are based on the idea of suppression of joint movement and voluntary contractions

1. AKINETIC	**Immobilizations:** - for resting - contentious - correction	**Posture:** - correction - facilitation



AKINETIC TECHNIQUES- Immobilizations

is characterized by artificial preservation and fixation,

for certain periods of time

of the body or only one part

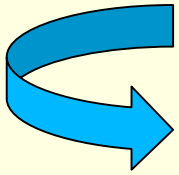
in a determined position,

with or without the help of some installations or devices

AKINETIC TECHNIQUES- Immobilizations

suspend:

- joint movement,
- voluntary dynamic contraction



but allow:

performing isometric contractions of the muscles around the respective joint.

AKINETIC TECHNIQUES- Immobilizations

total	if they involves the whole body
regional, segmental, local	if they involves just parts of the body.

AKINETIC TECHNIQUES- Immobilizations

Total immobilizations

It is generally made with special beds.

- **aims to achieve overall rest in:**
  - poly-trauma,
  - burns out,
  - serious cardiovascular disease,
  - paralysis etc.

AKINETIC TECHNIQUES- Immobilizations

***Regional*, segmental/local immobilizations**

realize

complete immobilization of some parts of the body,

while preserving the freedom of movement of the rest of the body.

Depending on the purpose, immobilizations can be:

for resting,

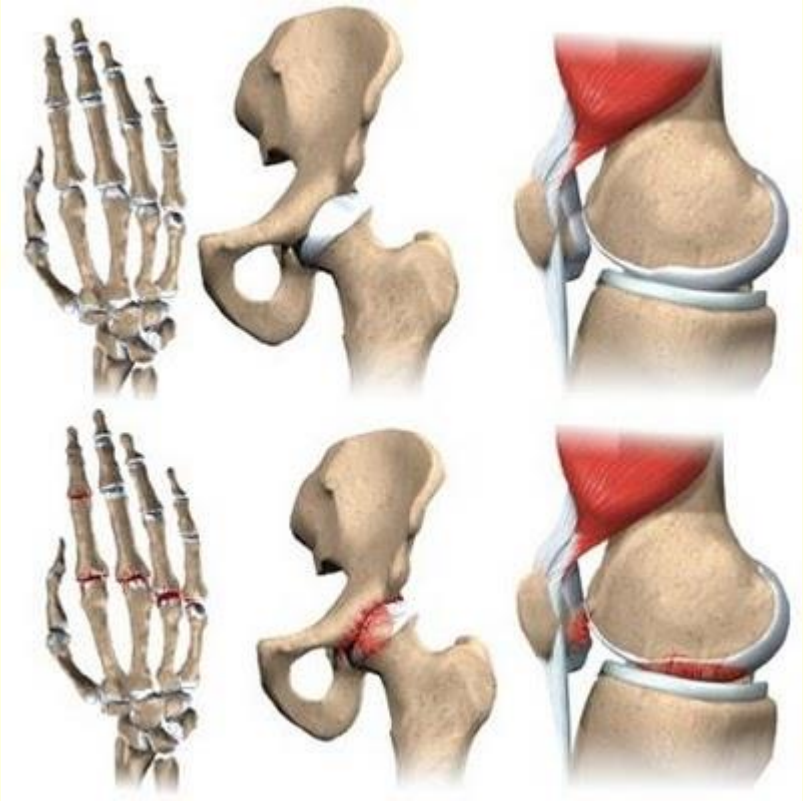
de contentious,

correction

AKINETIC TECHNIQUES –
Regional Immobilizations:

- ***For resting*** – are indicated in:

- traumas (craniocerebral, medullary, thoracic),
- localized inflammatory processes (arthritis, tendinitis, myositis, burns, phlebitis, etc.)
- other processes that cause pain to mobilize that segment.



It is made on the bed, on special supports, in scarves etc.

AKINETIC TECHNIQUES - *Regional Immobilizations*:

- ***contentious***
- used to consolidation of fractures, dislocations, arthritis, discopathy etc.
- It consists ***in keeping "head to head" the joints surfaces or bone fragments;***

This blocks a segment or part of a segment in an external fixation system - gypsum, chopper, orthosis, corsets

AKINETIC TECHNIQUES - *Regional Immobilizations*:

- ***For correction*** – used to correct some deficient attitudes or deviations of the spine;
- consists in maintaining correct, corrective and hypercorrective positions for certain periods of time;
- It is realizing with the same systems as well as contention.

Attention:

Only defective postures that belong to soft tissues (soft capsules, tendons, muscles) and never bone can be corrected.

Only when the bone is growing certain types of immobilization can influence its shape.

AKINETIC TECHNIQUES

- without joint movement
- without voluntary contractions

1. AKINETIC	**Immobilizations:** - for resting - contentious - correction	**Posture:** - correction - facilitation

AKINETIC TECHNIQUES - Posture

are attitudes imposed

- the whole body
- or just parts of the body

for therapeutic or prophylactic purposes

- to correct or prevent the installation of static deviations and vicious positions
- or to facilitate a physiological process

AKINETIC TECHNIQUES - Posture

correction

- is recommended for prevention in diseases whose prognosis is predicted, causing great dysfunctions.
- Ex: chronic inflammatory rheumatism, coxarthrosis, chronic lumbosacralgia, spine deviations or other segments.

facilitation

- induce effects on internal organs

AKINETIC TECHNIQUES – Corrective Posture

From a technical point of view, corrective postures can be:

free,

- attitudes imposed on the patient and voluntarily adopted by the patient.

free-helped,

- realized by scrolls, pillows, straps or hand

fixed

- restores joint mobility by using external weights

AKINETIC TECHNIQUES - Posture

Free corrective postures (autocorrective) – attitudes imposed on the patient and voluntarily adopted by the patient,

➔ for the progressive correction of the limitations of the joint amplitudes

- They are indicated, especially in musculo-tendon adaptive shortenings.

AKINETIC TECHNIQUES - Posture

Free corrective postures

Characteristics:

- does not require devices or installations,
- requires patient participation in the recovery act;

➔ *he must be aware of the vicious attitude to assume correct posture even if it is uncomfortable;*

- is especially used for the lower limb;
- the sessions are supplemented with massage of soft parts, cryotherapy, etc

AKINETIC TECHNIQUES - Posture

Free corrective postures (autocorrective)

Exemple:

- to reduce flexion of the knee, segmentary postures maintained by the weight of the lower limb

– the subject is in the ventral decubitus (prone position), with the knee outside the support table

- posture is maintained for 2-3 hours

AKINETIC TECHNIQUES - Posture

Free-helped corrective postures

– realized by scrolls, pillows, straps or hand.

- Manual postures represent elective techniques for the upper limb joints (fist, fingers, shelves) and those of the lower limb (tibiotarsian, medotarsian and subastral joints).

AKINETIC TECHNIQUES - Posture

Free-helped corrective postures

Applying these types of postures impose:

- knowledge and respect of joint biomechanics;
- Fixing the non-movable member segment in order to avoid compensatory intervention;

  ► this fixation can be done manually, on a sloping plane, in straps, rigid sleeves, etc.

AKINETIC TECHNIQUES - Posture

Fixed Postures - restores joint mobility by using external weights of the type below:

- directly (sandbag, scrolls, pillows) placed proximal or distal to the joint concerned;
- indirectly → applied by means of pulley assemblies.

Because these types of posture require joints, they are mainly used for large joints (knee, hip, etc), keeping the position for 15-20 minutes.

AKINETIC TECHNIQUES - Posture

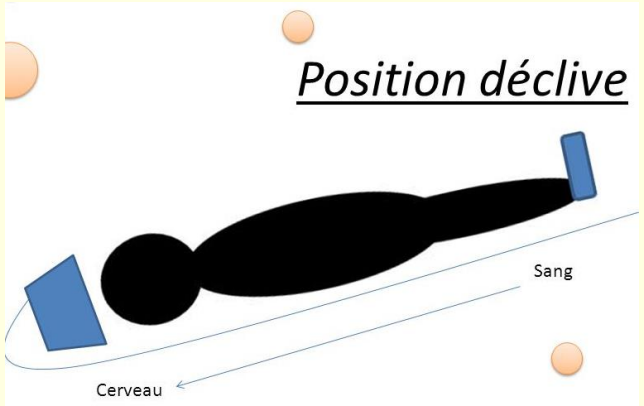
Facilitating postures induce internal organs effects, as is the case:

- cardiovascular system,
- respiratory system,
- digestive system.

AKINETIC TECHNIQUES - Posture

Facilitating postures which induce effects on the cardiovascular system:

- anti-declive (proclive) → facilitates the venous and lymphatic circulation of the extremities; have a beneficial role in stasis edema;
- declive (anti-gravitiy) → facilitates blood circulation in capillaries; are obtained by maintaining segments in a gravitational sense.

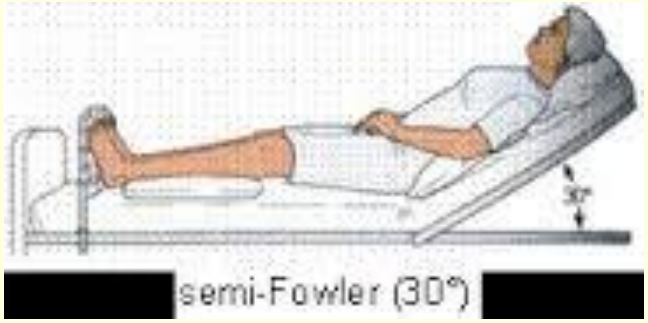


AKINETIC TECHNIQUES - Posture

Facilitating postures which induce effects on the respiratory system:

- prophylactic → prevents the development of pulmonary diseases secondary to ineffective ventilation of the lungs;

→ thus, in bed immobilizations, the trunk will gradually rise with pillows or lateral decubitus positions;

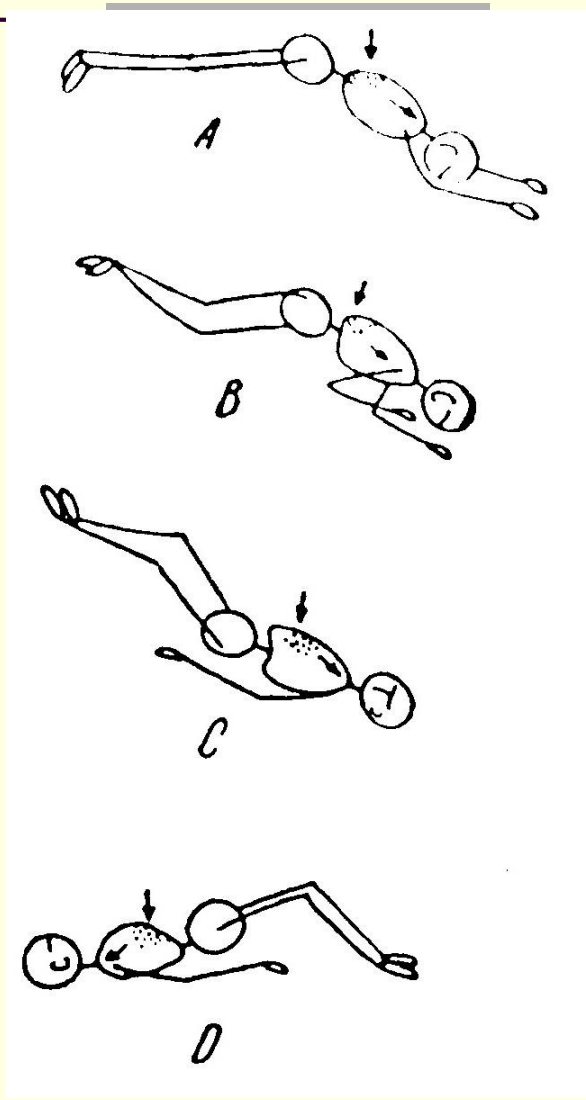


AKINETIC TECHNIQUES - Posture

Facilitating postures which induce effects on the respiratory system:

- therapeutic, bronchial drainage → favors the elimination of bronchial secretions from the lobes and affected lung segments in case of chronic bronchitis, bronchiectasis, pulmonary abscess etc;

→ positions are adopted in which the chest (lungs) are "raised" rather than the trachea / buccal orifice.



AKINETIC TECHNIQUES - Posture

Facilitating postures which induce effects on the digestive system:

→ for billiar drainage, it is recommended to adopt the lateral decubitus position on the right side.

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KINESIOLOGICAL TECHNIQUES

- are based on movement and / or contraction or muscle relaxation.

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STATIC KINESIOLOGICAL TECHNIQUES

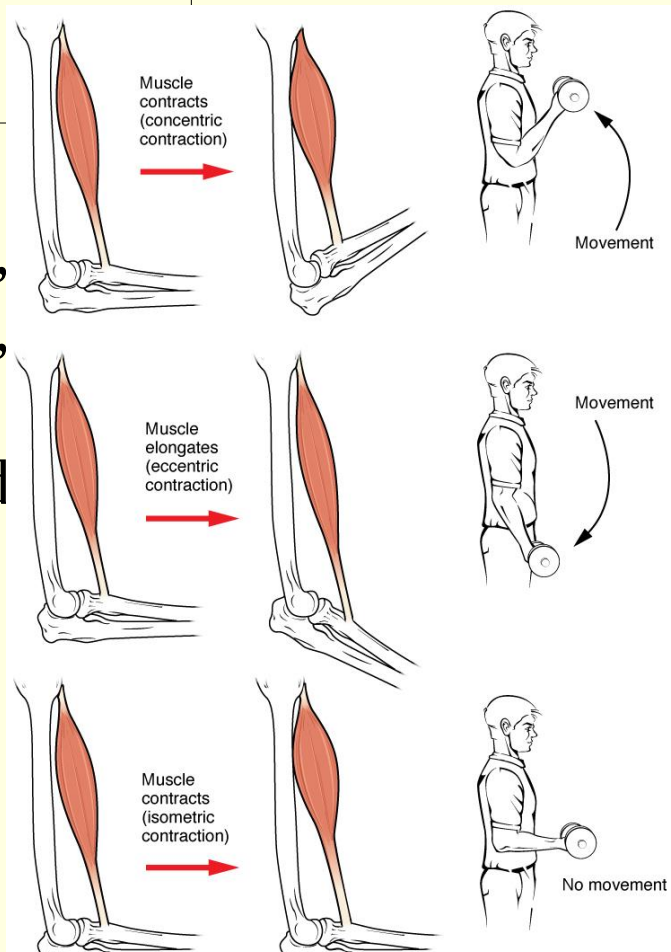
- is characterized by the change in muscle tone without causing movement of the segment.

2. KINETIC	**Static:** - isometric contraction - muscle relaxation - stretching

STATIC KINESIOLOGICAL TECHNIQUES – Isometric Contraction

2. KINETIC	**Static:** **- isometric contraction** - muscle relaxation - stretching

- is one in which the muscle is activated, but it is held at a constant length, without appreciable shortening or change in distance between muscle origin and insertion.



STATIC KINESIOLOGICAL TECHNIQUES – Isometric Contraction

Voluntary isometric contraction became ***maximum intensity*** when

➔ the opposite strength = the maximum force of the muscle

or

➔ work against a higher (and fixed) weight than the subject's force (which it can not overcome), but not mobile.

In reality, it is produced a micro-movement between the moment of muscular tension increasing and the relaxing moment.

STATIC KINESIOLOGICAL TECHNIQUES – Isometric Contraction

- Isometric contraction can be performed at various lengths of the muscle (at various joint angles).
- The force generated during an isometric contraction is wholly dependent on the length of the muscle while contracting.
- Maximal isometric tension is produced at the muscle's optimum length - it is found that in the "long" position of the muscle, isometry "gives the best results" (increases the force).

STATIC KINESIOLOGICAL TECHNIQUES – Isometric Contraction

- The maximum isometric contraction is maintained
- maximum 5 - 6 seconds
- For the persons trained maximum 12 secunde.

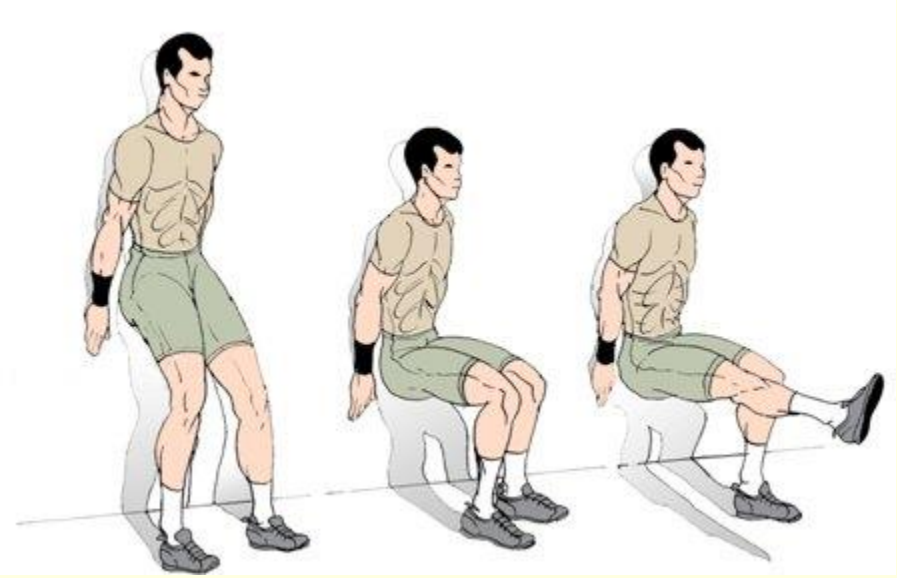
- the break between two repetitions is recommended to last twice as long as the contraction period.

$$t_{break} = 2x\ t_{contraction}$$

STATIC KINESIOLOGICAL TECHNIQUES – Isometric Contraction

Examples:

- Wall Sit
- Plank
- Pushing against a wall



PI: The patient in orthostatic position with the back to the wall, the arm in abduction at 90º.

The patient standing with the back to the wall, the arm in lateral.

Movement: Maintaining the position,

The verbal command "push in the wall!" (The patient pushes the arm backward into the wall).

PI: The patient in orthostatic position with the hip in extension (a fixed table behind the patient);

The patient standing with the foot raised back.

Movement: Maintaining the position,

The verbal command “extends the hip!”

(The patient pushes the thigs backward to the table).

PI: The patient in orthostatic position with the lower limbs slightly in abduction; a ball between the thighs in the distal third.

The patient standing with the feet slightly wider, a b between the thighs, above the knees.

Movement: Maintaining the position,

The verbal command “press your knees to one another!”

PI: The patient in ventral decubitus with lower limbs slightly in abduction and the hip and knees in flexion 90°; a ball between the calfs, in the distal third.

The patient in prone position with legs slightly wider and knees bent at 90º; a ball between the legs.

Movement: Maintaining the position,

The verbal command “press the ball between the legs!”

PI: The patient sitting with his forearm in slightly flexion; The PT ipsilateral of the patient, fix the arm proximal to the elbow, on the anterior face and oppose the resistance on the distal third of the forearm in the anterior face.

Movement: Maintaining the position;

The verbal command “Make the elbow flexion!”

PI: The patient sitting with his elbow flexed;
The PT ipsilateral of the patient, fix the arm proximal to the elbow, on the posterior face and oppose the resistance on the distal third of the forearm in the posterior face.

The patient sitting on the chair, the elbow bent.

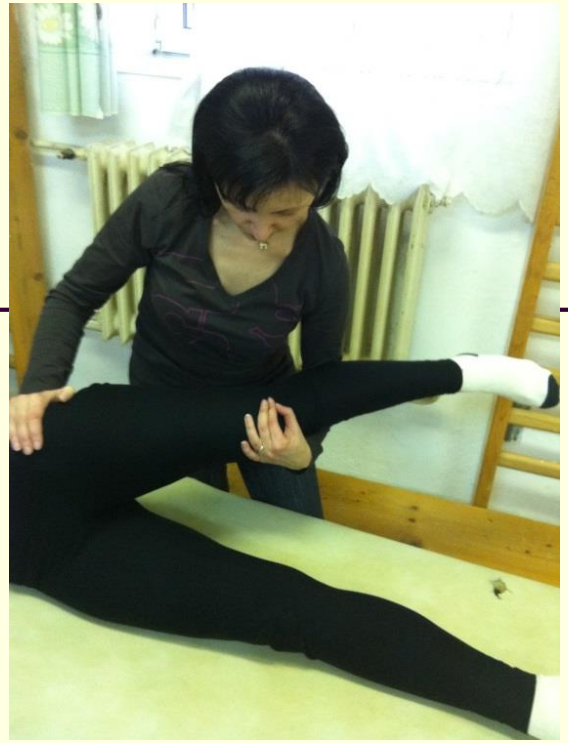
Movement: Maintaining the position;

The verbal command: “Make the elbow extension!”

PI: The patient sitting with his calfs haging on the edge of the bed;
The PT ipsilateral of the patient, fix the thigh proximal to the knee, on the anterior face and oppose the resistance on the distal third of the calf on the anterior face.

Movement: Maintaining the position;

The verbal command: “Make the knee extension!”



PI: The patient in contralateral decubitus with the hip extended;

The PT behind the patient, fix the basin and oppose the resistance on the distal third of the thigh, on the anterior face.

The patient lying sideways on the opposite side, the leg raised back;

Movement: Maintaining the position;

The verbal command: “Make the hip flexion!”

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

2. KINETIC	**Static:** - isometric contraction - ***muscle relaxation*** - stretching

- It is accomplished when the contraction tension of the respective muscle decreases, the muscle is not contracted.
- Even in the maximum relaxation state, a muscle retains a contraction tension called "muscle tone", maintained by the gamma loop.

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

- Muscle relaxation is not just a

→ **kinetic technique**,

but also

→ an important **kinetologic objective**,

of which involves

techniques, elements and specific methods.

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

- Relaxation represent a psycho-somatic process, because it is addressed in the same time to the increased muscle tension as to the high mental state, having in view the best tonic-emotional adjustment.

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

- From the point of view of the mechanisms involved in muscle relaxation, we have:

- **voluntary muscular relaxation**, in which P participates directly and consciously at his own relaxation *(Jacobson method, Schultz method, Codman method)*;

- **reflex muscle relaxation** induced by psychic mechanisms (suggestion, hypnosis) or neurophysiological mechanisms.

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

From the point of view of P's participation muscular relaxation we distinguish:

- **active muscular relaxation** → is achieved through a psychological voluntary effort (awareness of the kinetic relaxation sensation as a reverse state of muscle contraction) or physical (antagonist contraction, active stretching, etc.);

- **passive muscular relaxation** → is performed by PT *(segment posture, thermotherapy, passive stretching, vibrations applied to antagonistic muscles, etc.).*

STATIC KINESIOLOGICAL TECHNIQUES – *Muscle relaxation*

From the point of view of topography, muscle relaxation can be:

- **general**, of the whole body (in close connection with the mental relaxation);

- **local**, referring to a muscle or muscle group.

STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

2. KINETIC	**Static:** - isometric contraction - muscle relaxation - ***stretching***

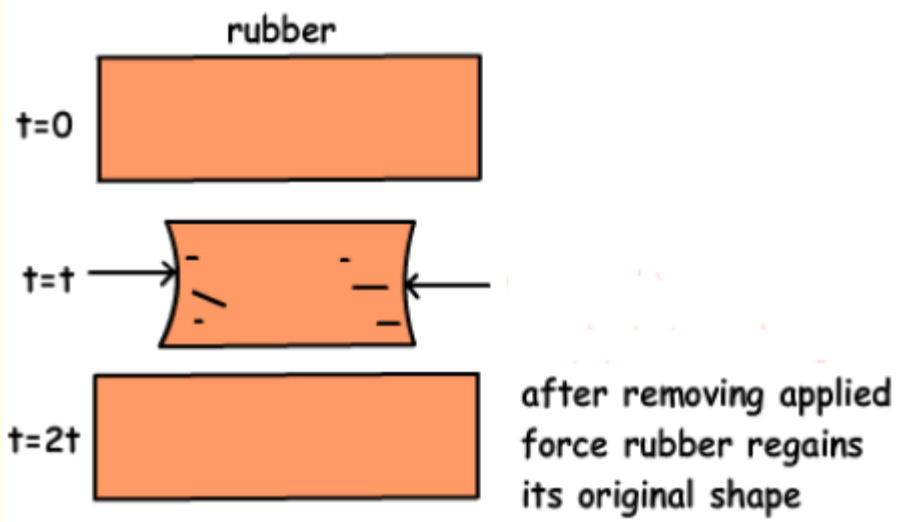
- Consists of prolongation of the soft tissue and the maintenance of this for a period.

STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

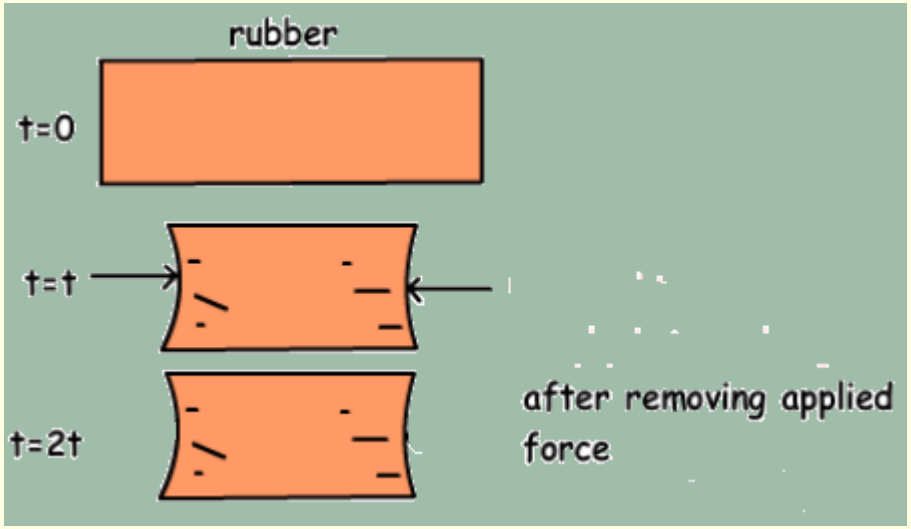
- The so-called stretching starts only after it reaches the movement amplitude limitation point.

STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

Elasticity = is the ability of a tissue to resist a distorting force and to return to its original size (length) and shape when that force is removed.

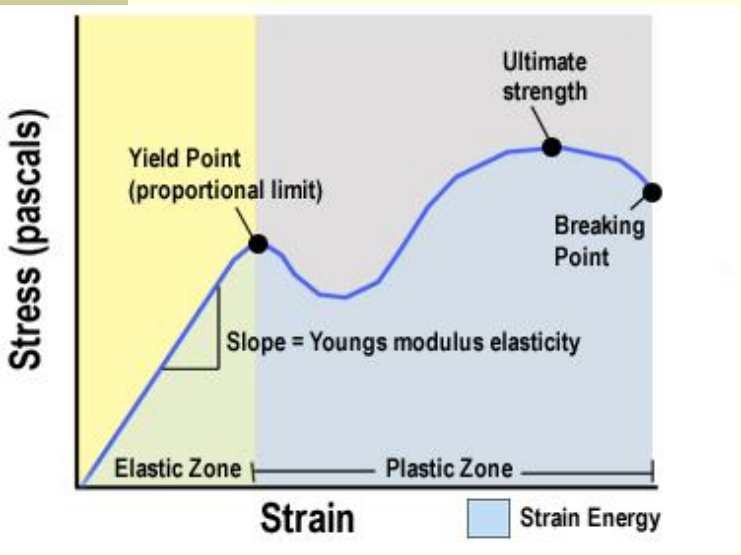


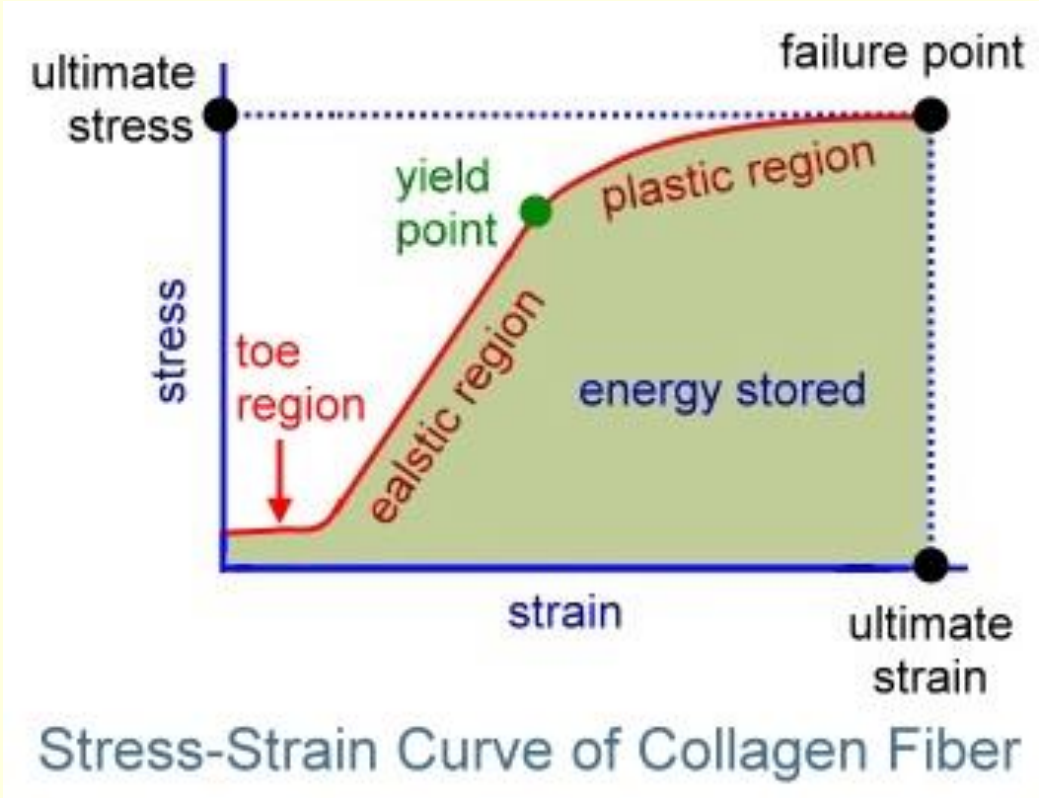
Plasticity = the tendency of a tissue to undergo permanent deformation under load.



STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

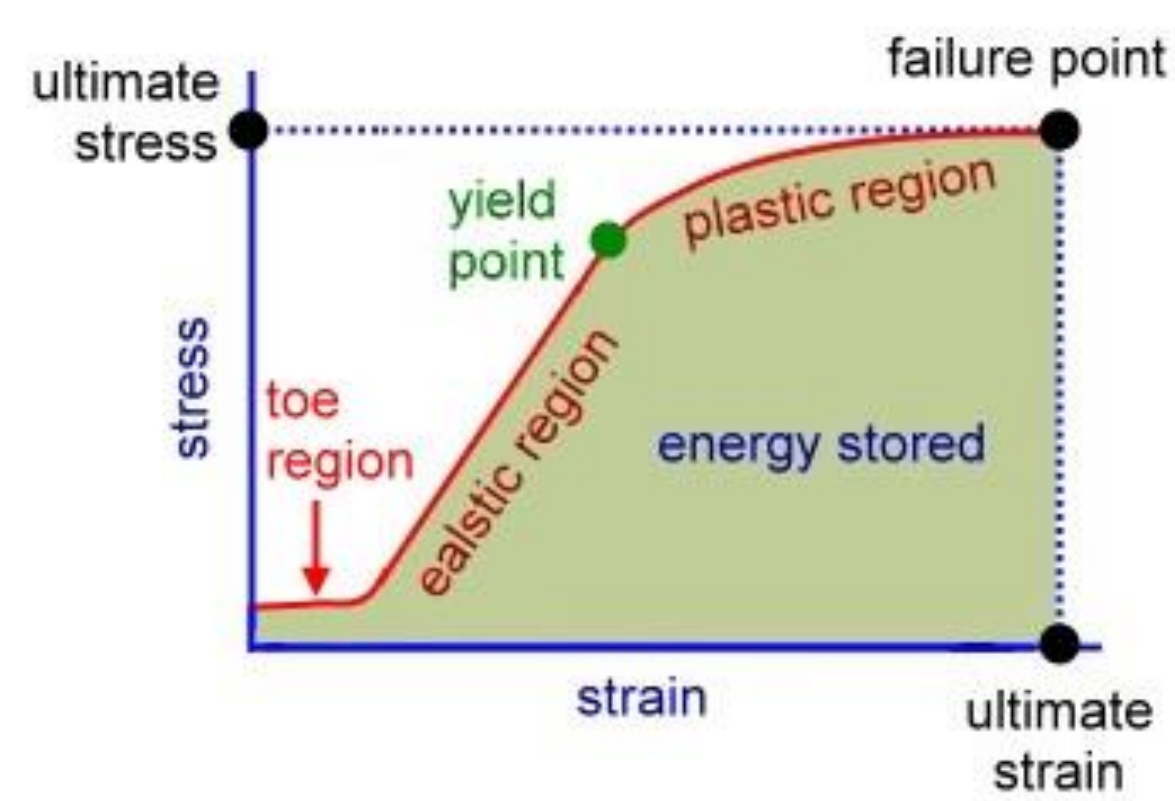
- stretching of the connective tissue progressively passes through an ***elastic stage***, then a ***plastic*** one, followed by a "bottleneck" point (***failure point***), after which any tension that tends to stretch the tissue causes its ***break-up***.





- **Stress** - The ratio of the tensile force to the increase in the section area of the tissue in question.

- **Strain** - the ratio of the degree of stretching (deformation) of tissue to its original length.

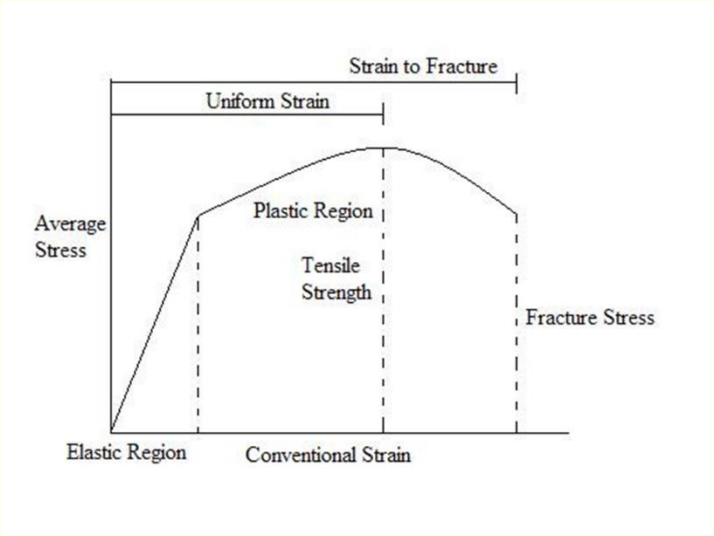


Stress-Strain Curve of Collagen Fiber

STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

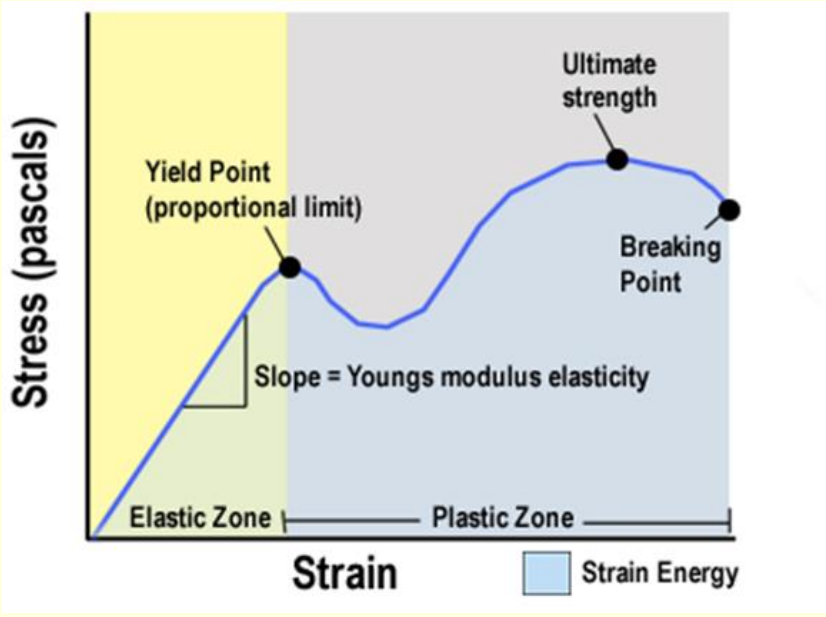
The failure point can be outlying, and the plastic area can be enlarged by applying heat to the tissue.

=> This is done during or about 10 minutes before the start of the stretching, after which the heat source is removed at the end of the stretching and the tissue is allowed to "cool" in the elongated position gained.



STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

- The tensile strength must be increased very slowly because when the tensile force is high and / or applied quickly there is a risk of breakage of the stretched structure;
- Stretching should lie within the plasticity area (but under the force that causes the fibers to break).



STATIC KINESIOLOGICAL TECHNIQUES – *Stretching*

- **Types of Muscle Stretching:**

1) Passive stretching
2) Dynamic stretching
3) Active stretching
4) Isometric stretching
5) Ballistic stretching

STATIC KINESIOLOGICAL TECHNIQUES – Passive stretching (static)

- Most commonly used in physiotherapy;
- A passive stretch is one where you assume a position and hold it with some other part of your body, or with the assistance of a partner or some other apparatus.

- performed slowly (to avoid stretch-reflex) with a hold of stretching in a point of slight discomfort for 20-60 seconds.

STATIC KINESIOLOGICAL TECHNIQUES – Passive stretching

- In the case of multi-articular muscles stretching is first applied analytically, beginning with the distal joint, ending with a global stretching for all joints.

- For stretching force grading considerations (especially in patients with increased fear of pain), but also for time-saving (and personal), ***auto stretch stretching*** is applied.

- ***auto stretch*** is one where you assume a position and hold it with some other part of your body.

STATIC KINESIOLOGICAL TECHNIQUES – *Active Stretching*

- is one where you assume a position and then hold it there with no assistance other than using the strength of your agonist muscles.
- In physiotherapy, pure active stretching is rarely used because it is difficult (and even contraindicated) to maintain an isometric contraction of the agonist at an effective intensity so that the antagonist muscle can be maintained in the plastic area.
- Active stretching increases active flexibility and strengthens the agonistic muscles.
- Active stretches are usually quite difficult to hold and maintain for more than 10 seconds and rarely need to be held any longer than 15 seconds.

STATIC KINESIOLOGICAL TECHNIQUES – *Isometric (or sporting) Stretching*

- ***Bob Anderson***, Bob Anderson, the parent of sports training stretching, recommends the following stretching formula (valid for any muscle):

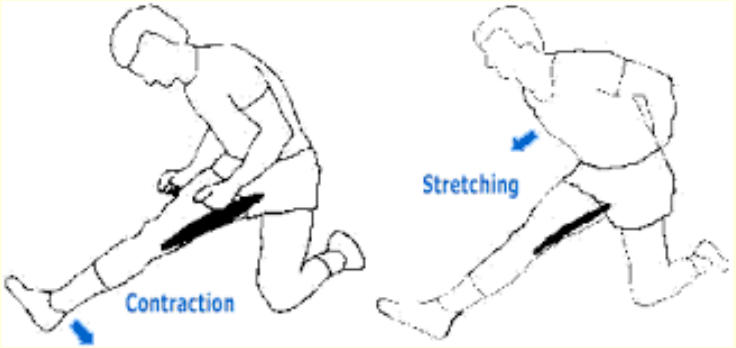
1. maximum isometric contraction (6 sec),

2. relaxation (3-4 sec),

*3. autostretching passive (*20-30 sec),

executed at the limit of pain

(that pain "Enjoyable", bearable).



STATIC KINESIOLOGICAL TECHNIQUES – *Ballistic Stretching*

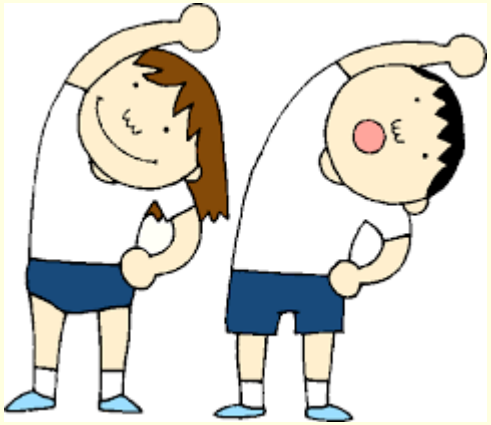
- is mainly applied to healthy people with a trained musculature.
- consists of dynamic, repetitive contractions motor muscle (agonists) designed for obtaining a short (short) stretch of antagonists.
- simple impulse movements, launched movements.

- The practice of these techniques has been reduced, however, because the repeated and sudden stretching of the muscles presents a potential hazard in the production of lesions.

STATIC KINESIOLOGICAL TECHNIQUES – *Dynamic Stretching*

- consists of dynamic, repeated contractions on the small amplitude of motor muscles (agonists) designed to obtain a short (rapid) stretch of antagonists.

- there are spring-time movements - arcs.



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- specific to some occupational activities
Neuro-proprioceptive Facilitation (PNF)</td></tr>
</table>

DYNAMIC KINESIOLOGICAL TECHNIQUES

- The dynamic kinetic techniques is accomplished with or without muscular contraction, but with the segment movement.
- The active movement is characterized by the implication of the ***muscular contraction*** of the segment that is being mobilized.

<table>
<tr><td rowspan="2">2. KINETIC</td><td rowspan="2">Static:
- isometric contraction
- muscle relaxation
- stretching</td><td colspan="2">Dynamic:</td></tr>
<tr><td>Passive:
- passive-active
- active-passive
- assisted
- autopasive
- tractions
- manipulations</td><td>Active:
- reflexe
- voluntary</td></tr>
</table>

DYNAMIC KINESIOLOGICAL TECHNIQUES
The reflex active movement

- Is accomplished by reflex muscular contraction, uncontrolled and that are not voluntary ordered by the patient;
- The movement are a replay to a sensitive –sensorial stimulation within the motor reflex arcs.
- The reflex contraction can be produced by medullar and over-medullar reflexes.

2. KINETIC	**Dynamic:**	
	Passive	***Active*** - reflexe - voluntary

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

- **Medullary reflexes**

***1. Myotatic reflex* =** stretch-reflex

a) Dynamic myotatic reflex

b) Static myotatic reflex

2. Tendon reflex

3. Flexor reflex

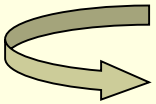
DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

- **Supramedullary reflexes**

Medullary reflex activity

 is in connection and permanent control



of the supramedular area

through

Postural reflexes

and

Locomotion reflex

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Righting reflexes

- is a reflex that corrects the orientation of the body when it is taken out of its normal upright position

- it is initiated by the vestibular system, which detects that the body is not erect and causes the head to move back into position as the rest of the body follows.

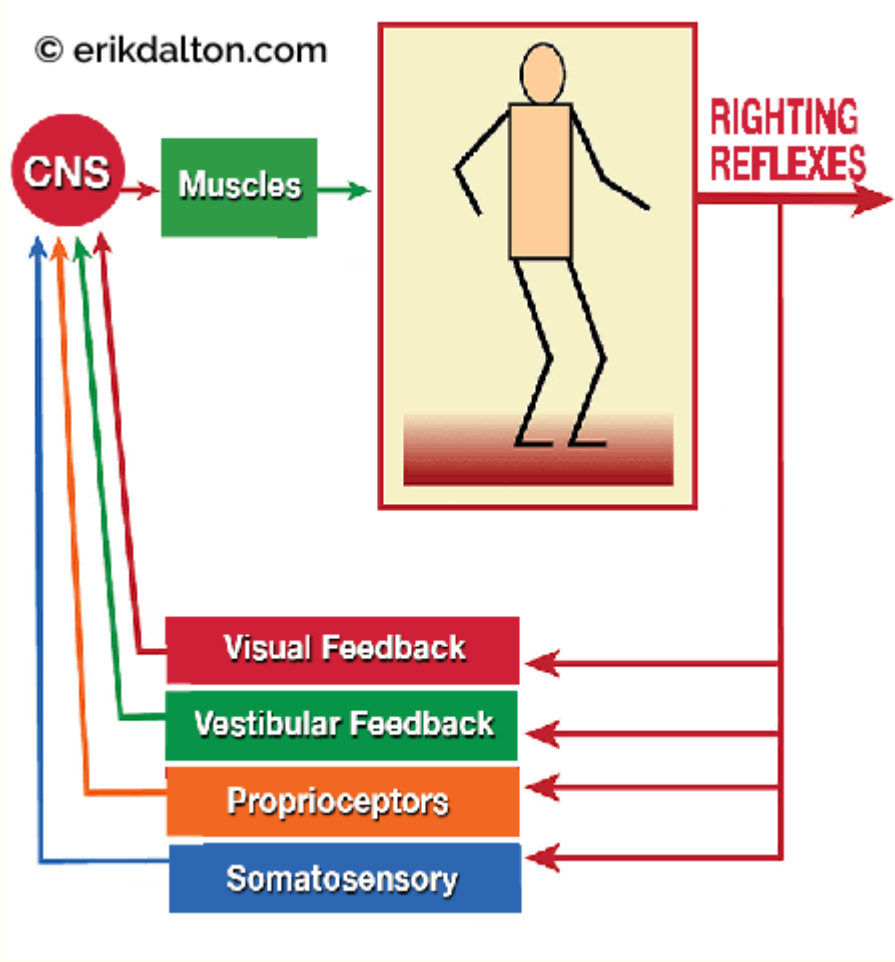
- righting reflex help to correct the position of the body when it goes off balance and falls down.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Righting reflexes

- the CNS righting reflexes from visual, vestibular, and somatosensory feedback work together to make instantaneous neuromuscular postural adjustments.



DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Righting reflexes

- ***Head righting is provided by***:
  - labyrinthine excitations,
  - exteroceptive excitations coming from the body (the part in contact with the support base),
  - optical excitation.

- ***Body righting is provided by***:
  - proprioceptive excitations from the neck muscles,
  - tactile exteroceptive excitations.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Righting reflexes

- are formed in the midbrain and are represented by:

- Optical righting reflex,
- Labyrinthine righting reflex,
- Head and body righting reflex

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

► ***Optical righting reflex***

- Occur in the first 2 months of life

- is triggered by visual stimuli that enable to maintain the correct position of the head in space, through contractions of the muscles of the neck and limbs.

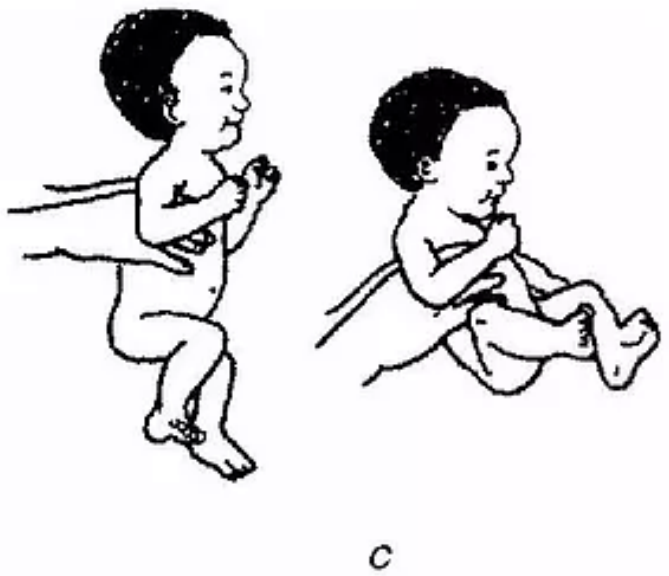
- visual stimuli –> righting of the head

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Labyrinthine Righting Reflex

- Infant is supported upright.
- Stimulus: tilt infant.
- Response: head moves to stay upright.



c

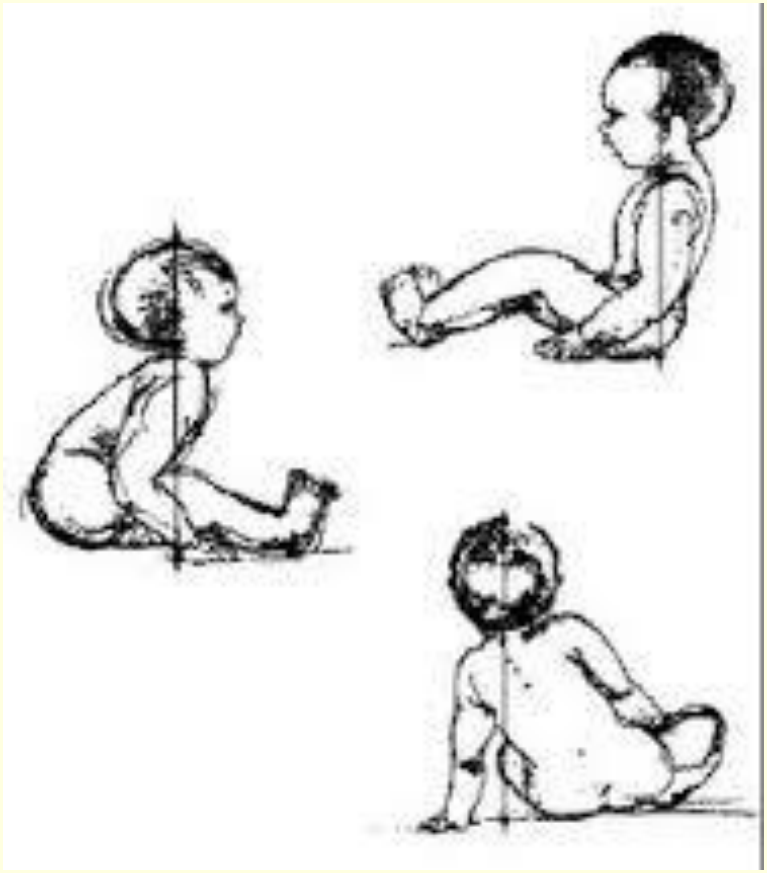
DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

► ***Labyrinthine righting reflex***

- Occur in the first 2 months of life

- Head righting allows the eyes to stay focused and still while the body moves.



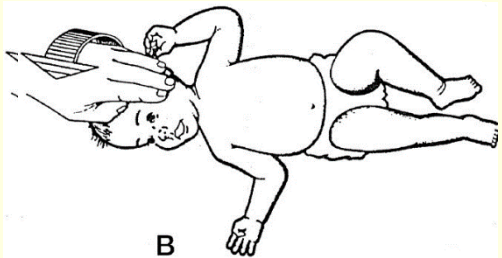
DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

► ***Head righting reflex***

- Occur in the first 4 - 6 months of life

IP: Supine position (dorsal decubitus position)
T1: *Head and neck passive flexion (slow)*
T2: *Turn head in either direction (Neck passive lateral rotation)* (*slow*),
T3: *Maintaining* – until the answer comes up: ***turning in a craniocaudal sequence of the body toward the head's rotation.*** (first turn the shoulders, then the trunk and finally the pelvis).



DYNAMIC KINESIOLOGICAL TECHNIQUES

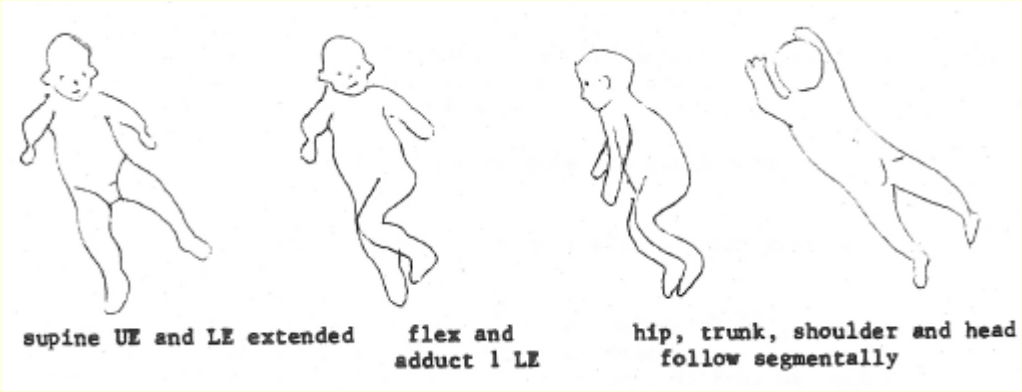
The reflex active movement - Supramedullary reflexes

► ***Body righting reflex***

- Occur in the first 4 - 6 months of life.

IP: Supine position (dorsal decubitus position);
T1: *Passive flexion of the hip of a lower limb (slow)*
T2: *Hip passive adduction*,
T3: *Maintaining* – until the answer comes up: ***turning in a caudocranioal sequence of the body toward the shifted lower limb.***

(first turn the shoulders, then the trunk and finally the pelvis).



DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

Postural reflexes

Help to maintain the body in upright and balanced position.

They also provide adjustments necessary to maintain a stable posture during voluntary activity.

Postural reflexes are two types:

- ***Static Reflexes***
- ***Statokinetic Reflexes***

DYNAMIC KINESIOLOGICAL TECHNIQUES

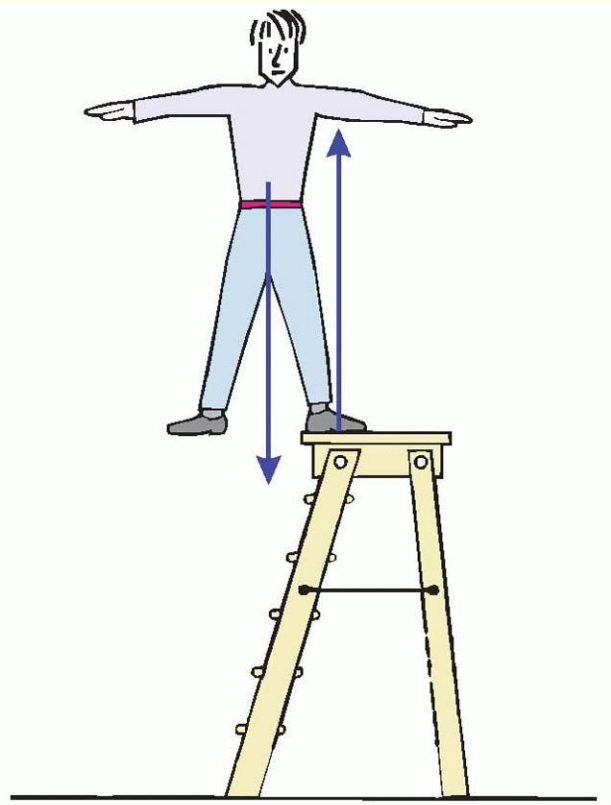
The reflex active movement

Static postural reflexes

Static reflexes are involved in adjustments to displacements produced by gravity.

Three are 3 types:

- Local static reflex
- Segmental static reflex
- General static reflex



DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

Local static reflex

- Used to support the body
- They exert their effect on the same limb from which the stimulus was initiated
- The center of local static reflex are located in spinal cord
- An important local static reflexes is:

Positive supporting reaction (magnet reaction)

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Local static reflex – Positive supporting reaction

- placing a finger on the sole of the foot will cause limb extention, that follows the finger as it is withdrawn

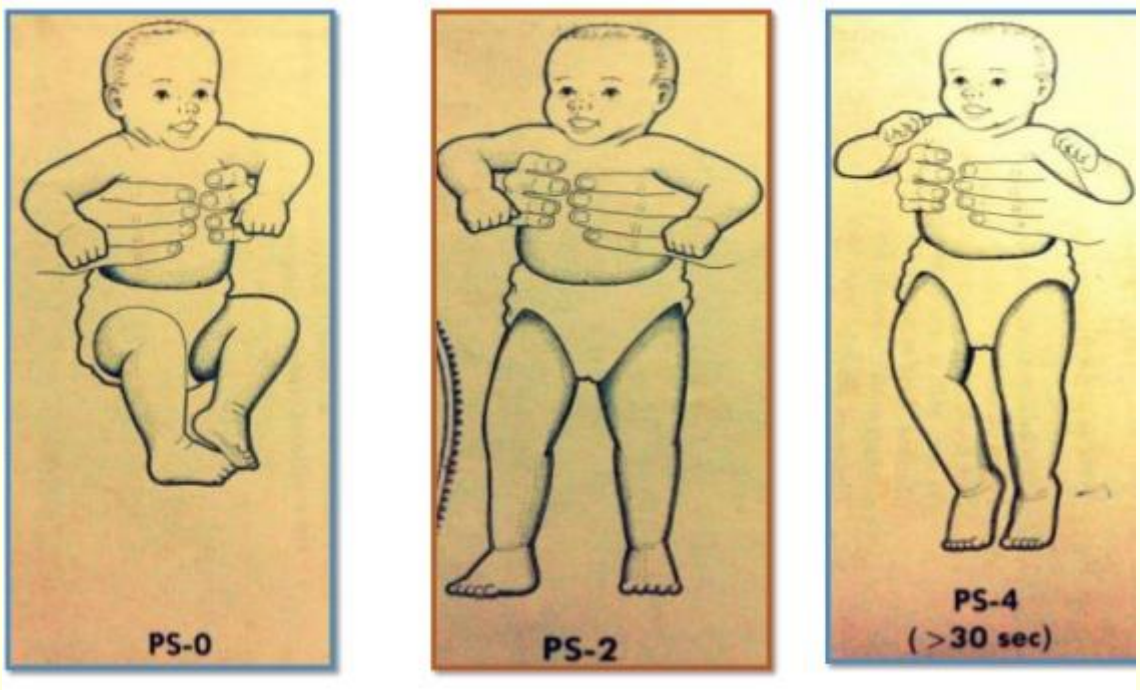
- transforms the limb into a rigid pillar that will resist gravity and provide postural support for 2-3 minutes

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

Local static reflex – Positive supporting reaction

- Is obtained when placing weight on the sole of the foot pressure is given against the sole of the foot resulting in extension of leg



DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

Segmental static reflex

- It is characterized by a bilateral reflex response when stimulus is applied to one limb

→ ***Crossed extensor reflex***

- response component of withdrawal reflex

- the action of the muscles of a member on the muscle of the opposite member's muscles

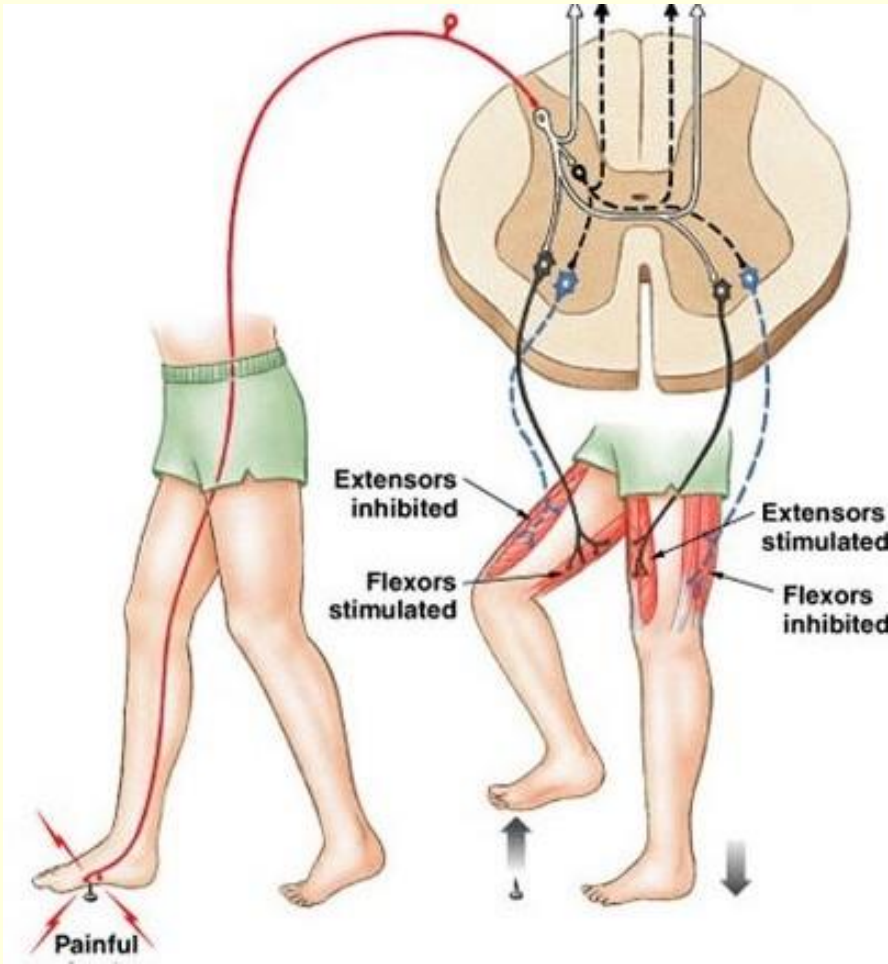
- The centre of this reflex is in spinal cord

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

*Segmental static reflex - **Crossed extensor reflex***

- Consists in increasing the extension (supporting) tone on one side when the opposite member flexed in response to a nervous stimulus.

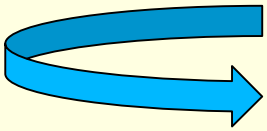


DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

General static reflex

It is characterized by a generalized effect from many muscle groups in the body in response to a stimulus that arises at one side of the body



Attitudinal reflexes

- They influence the general postures of the newborn, child or adult, usually called reflexes of attitude or tonics

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

General static reflex - Attitudinal reflexes

Tonic neck reflexes

Symmetrical tonic neck reflexes

Asymmetrical tonic neck reflexes

Labyrinthine reflexes

Symmetrical tonic labyrinthine reflexes

Asymmetrical tonic labyrinthine reflexes

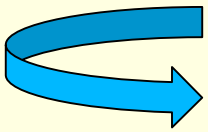
DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

*General static reflex - **Attitudinal reflexes***

Tonic neck reflexes

- These reflexes are produced in response to alternation in the position of head relative to the body
- Movement of the head in relation to the body alters the posture of the limbs.



the answer is the increase of the tonus of some limb muscle groups and implicitly the decrease of the muscle tone in the antagonist groups.

➢ Stimulus - stretch of neck muscles

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

General static reflex - Attitudinal reflexes

<u>Symmetrical tonic neck reflexes</u>

- are those in which flexion of the head → causes → - flexion of upper limbs and extension and adduction of lower limbs.

- and extension of the head causes extension and adduction of upper and flexion of lower limbs.

Figure 6.1 Symmetrical tonic neck reflex.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement - Supramedullary reflexes

General static reflex - *Attitudinal reflexes*

Symmetrical tonic neck reflexes

- Extension of the head causes extension of upper limbs and flexion of lower limbs.

- The reflexes can be voluntary suppressed.

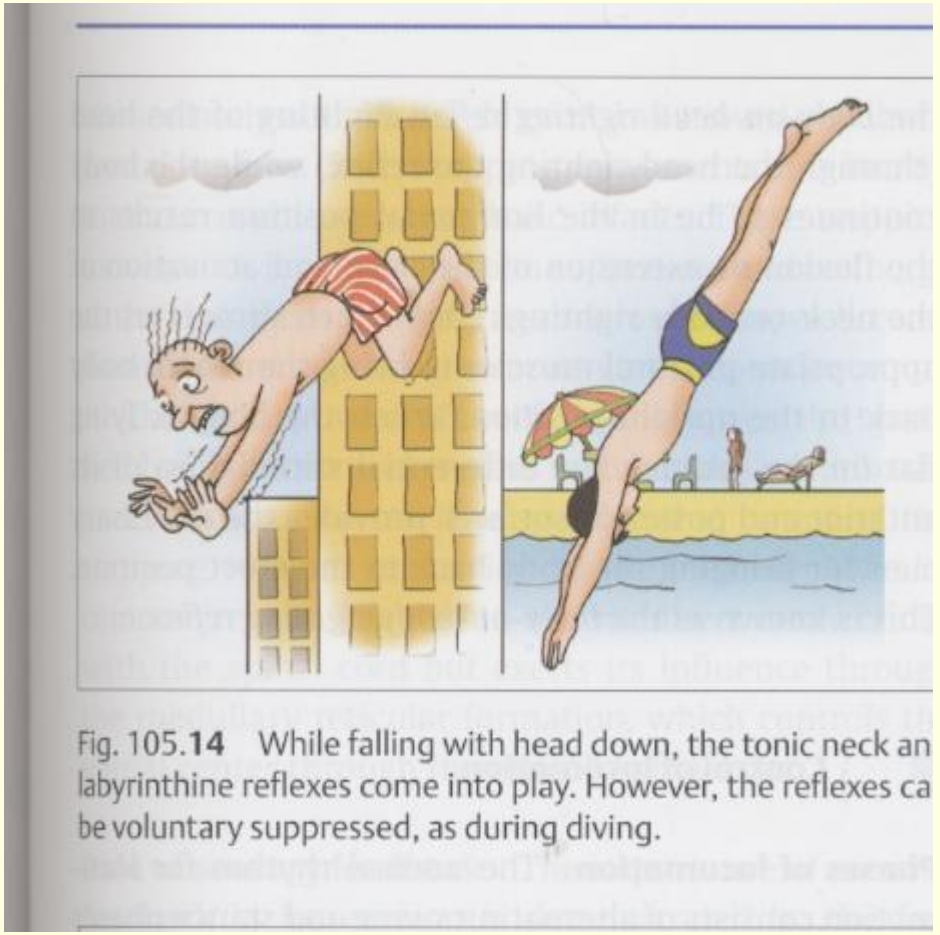


Fig. 105.**14** While falling with head down, the tonic neck an labyrinthine reflexes come into play. However, the reflexes ca be voluntary suppressed, as during diving.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

General static reflex - Attitudinal reflexes

Asymmetrical tonic neck reflexes

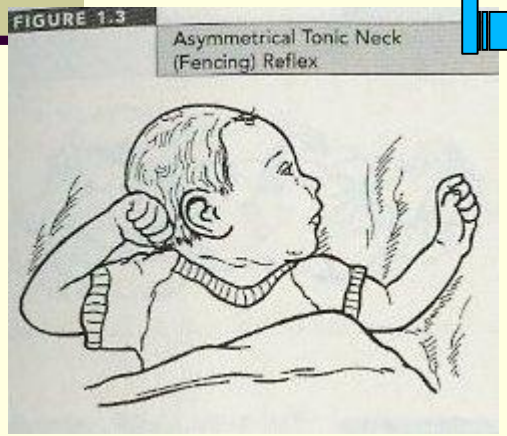
- are those in which lateral flexion with /or rotation of the head

causes

- increasing the tonus of the extensor muscles of the limbs on the side of the chin

and

- increasing the tone of the flexor muscles in the limbs on the side of the occiput.



The effect is more evident in the upper limbs than in the inferior limbs.

DYNAMIC KINESIOLOGICAL TECHNIQUES
The reflex active movement

General static reflex - Attitudinal reflexes

Tonic neck reflexes

Symmetrical tonic neck reflexes

Asymmetrical tonic neck reflexes

Labyrinthine reflexes

Symmetrical tonic labyrinthine reflexes

Asymmetrical tonic labyrinthine reflexes

- Appear in the first month of life and disappear around the age of 4 months.
- These reflexes are produced in response to alternation in position of head relative to horizontal plane

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

General static reflex - Attitudinal reflexes

Labyrinthine reflexes - ***Symmetrical tonic labyrinthine reflexes***

- Stimulus- is gravity

- From dorsal decubitus (supine position) the head extenson ➡

➡ reflex reponse ➡ contraction of extensor muscles of limbs.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

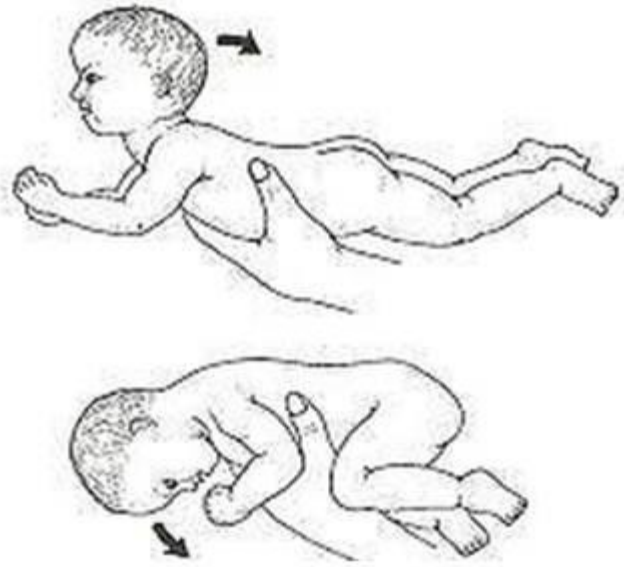
General static reflex - Attitudinal reflexes

Labyrinthine reflexes - ***Symmetrical tonic labyrinthine reflexes***

- From ventral decubitus (prone position) the head flexion

⇨ reflex reponse

⇨ increasing the tone of flexors in the limbs.



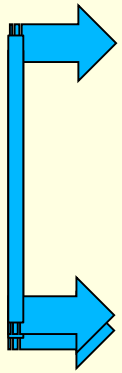
Tonic Labyrinthine - Prone Reflex

DYNAMIC KINESIOLOGICAL TECHNIQUES
The reflex active movement

General static reflex - Attitudinal reflexes

Labyrinthine reflexes - ***Asymmetrical tonic labyrinthine reflexes***

From lateral decubitus position:



- increasing the flexor muscle tone to the contralateral limbs (above)

and

- increasing the tonus of the extensor muscles to the ipsilateral limbs (in contact with the support surface).

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

Postural reflexes

- ***Static Reflexes***
- ***Statokinetic Reflexes***

- ***Statokinetic Reflexes*** **are part of the balancing reflexes**

The balancing reflexes occur when, to maintain a posture, static posture reflexes are overcome as efficiency.

DYNAMIC KINESIOLOGICAL TECHNIQUES

The reflex active movement

Balancing reflexes

- Au ca punct de plecare receptori aflaţi în tegument, structuri articulare, muşchi, labirintul urechii interne şi, printr-un joc continuu de contracţii musculare, se opun forţelor dezechilibrante.

- They are reflex movements that try to maintain balance, that is to keep the center of gravity of the body inside the support base, despite the disturbing factors.

DYNAMIC KINESIOLOGICAL TECHNIQUES
The reflex active movement

Balancing reflexes

Statokinetic reflexes:

Linear acceleration and deceleration reflexes

Angular acceleration and deceleration reflexes

Landing reflexes

Stabilization reflexes:

Dynamic strategies

The crunching reflexe

Increasing the support polygon

DYNAMIC KINESIOLOGICAL TECHNIQUES
The reflex active movement

Balancing reflexes

***Statokinetic reflexes*:**

- Is taking place very fast, being in fact adjustments to muscle tone as a result of information received from various receptors (mainly from the vestibulars).

- They aim at maintaining the position of the body and its segments during linear or angular displacement, active or passive.

- Provides adjustment of muscle tone and limbs position

DYNAMIC KINESIOLOGICAL TECHNIQUES

Statokinetic reflexes:

Linear acceleration and deceleration reflexes

- appear during a movement in a vehicle that accelerates or brakes suddenly, producing muscle tone changes that tend to resist inertial forces.

Exemples:

1. when braking the vehicle, when the subject is with the anterior face of the body oriented in the direction of movement, the tone of the muscles extensors of the body increases;

2. in elevator, at descend – up, the lower limbs extendes-flected.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Statokinetic reflexes:

Angular acceleration and deceleration reflexes

– appear during a movement on a curvilinear trajectory, causing muscle tone changes that tend to resist centrigugal force.

Exemple:

- in the curve, the motorcyclist increases the tone of the muscles of the lateral side of the body to the center of the circle arch.

DYNAMIC KINESIOLOGICAL TEC

Statokinetic reflexes:

Landing reflex *(*The parachute reflex)

- consists of adopting the prepared position for a jumping (the "ready for jumping" reflex).

- The child is suspended by the trunk and is suddenly lowered as if the child were falling for an instant. The child spontaneously throws out the arms as a protective mechanism.

- When the infant is off balance in any direction it stimulates a protective movement in the direction of the potential fall.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

***Stabilization reflexes*:**

Stability = the property of a body to regain its balance when the projection of the center of gravity of the body has exceeded the supporting polygon.

This regaining of balance is achieved through the intervention of the musculoskeletal system, through the entry into action of some stabilization reflexes.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

***Stabilization reflexes*:**

- Dynamic strategies
- Suspensory reflexe (The crunching reflexe)
- Increasing the support polygon

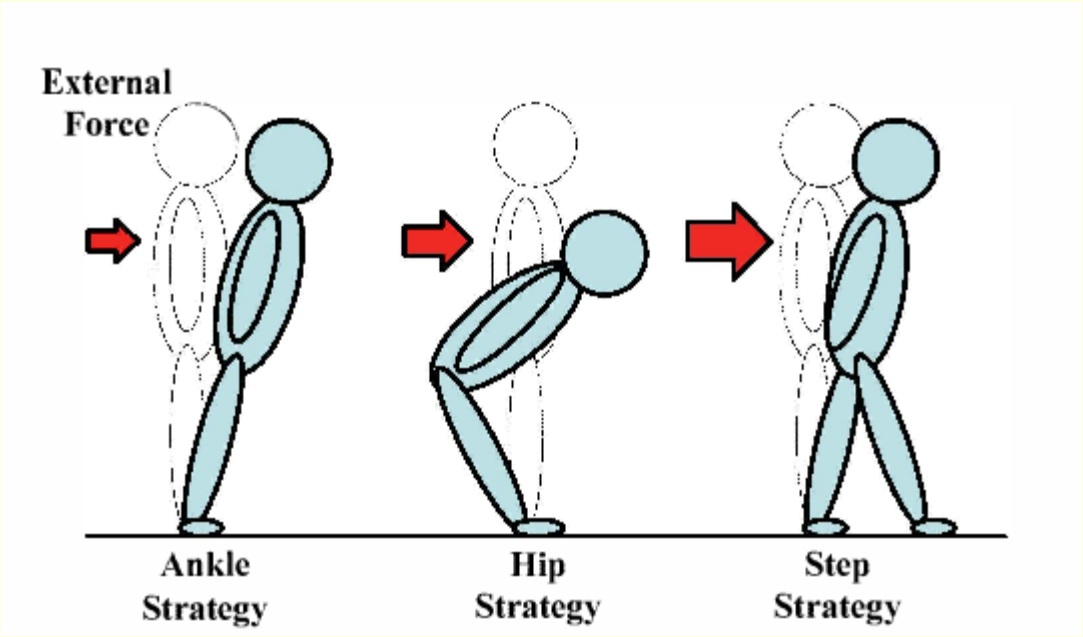
DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

Stabilization reflexes*: - *Dynamic strategies

- appear in the order determined by the intensity of the destabilizing factor, the next strategy coming into action when the antecedent becomes ineffective (except for the elderly, who responds in reverse order):

- ✓ ankle strategy
- ✓ hip strategy
- ✓ step strategy



DYNAMIC KINESIOLOGICAL TECHNIQUES
Balancing reflexes

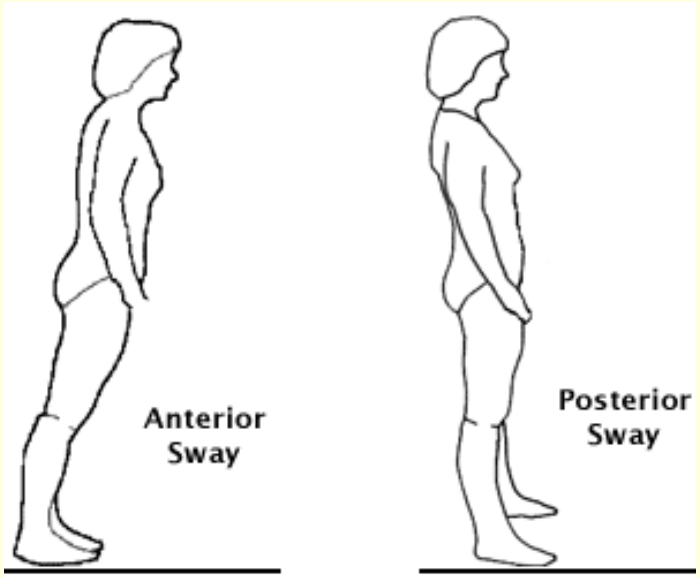
Stabilization reflexes:

Dynamic strategies*: *ankle strategy

- ✓ Is used when the perturbations is slow and low amplitude
- ✓ The legs being fixed to a firm support surface

body oscillations in the ankle joints are performed

with a distal -proximal direction of muscle contractions

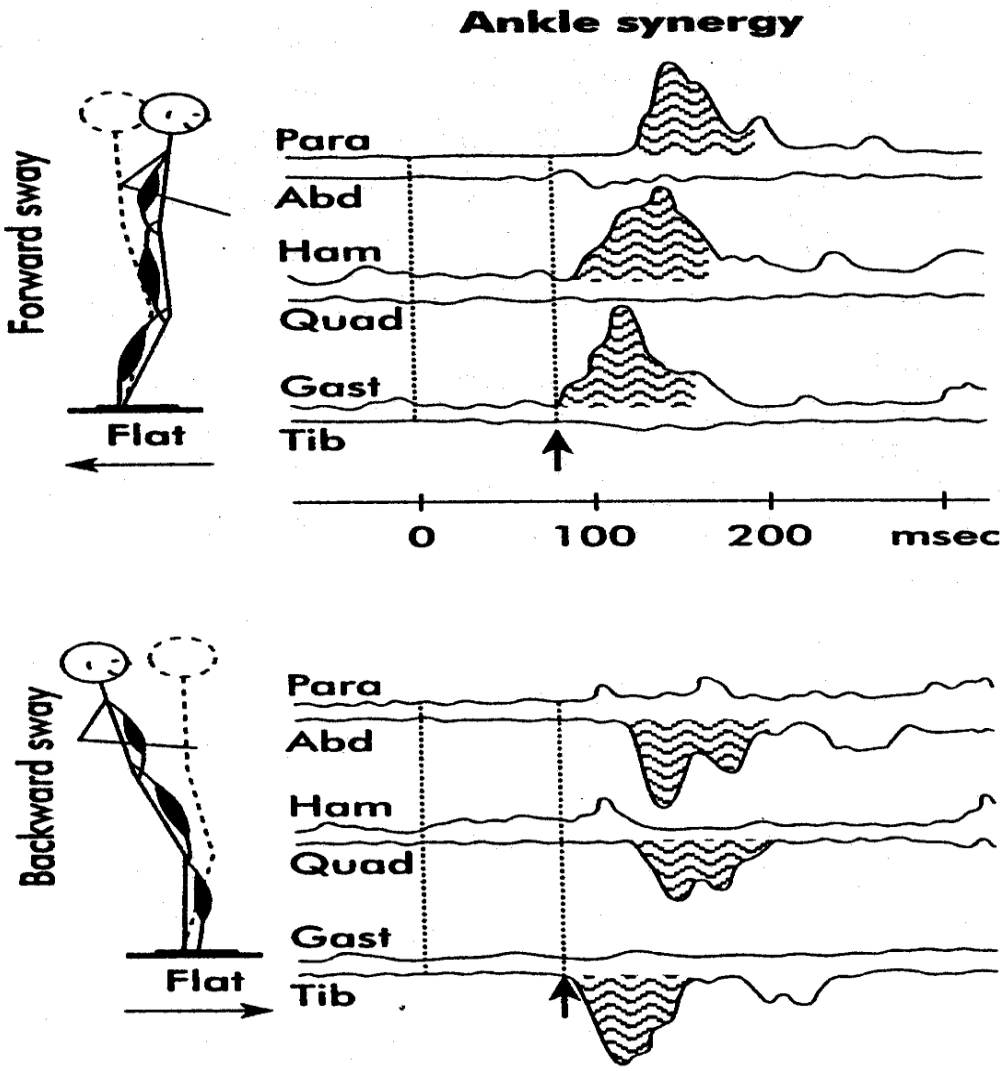


DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

Ankle strategy

- The muscle contractions occurs in a **distal**-to-**proximal** order



DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

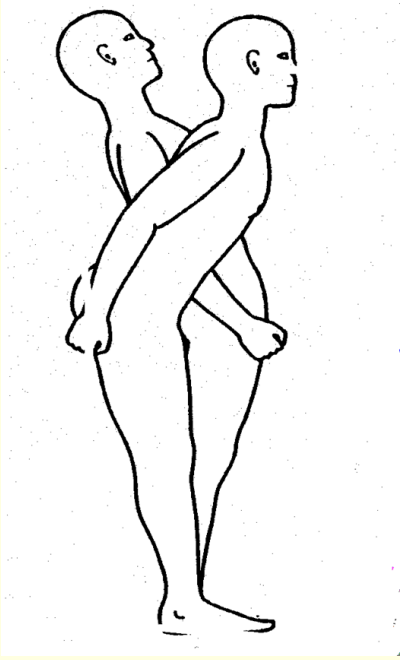
Stabilization reflexes:

Dynamic strategies*: *Hip strategy

- ✓ Is used when the perturbations is fast and and large amplitude
- ✓ Surface is unstable or shorter than feet

Large and fast body oscillations in the hip joints are performed

with a proximal - distal direction of muscle contractions

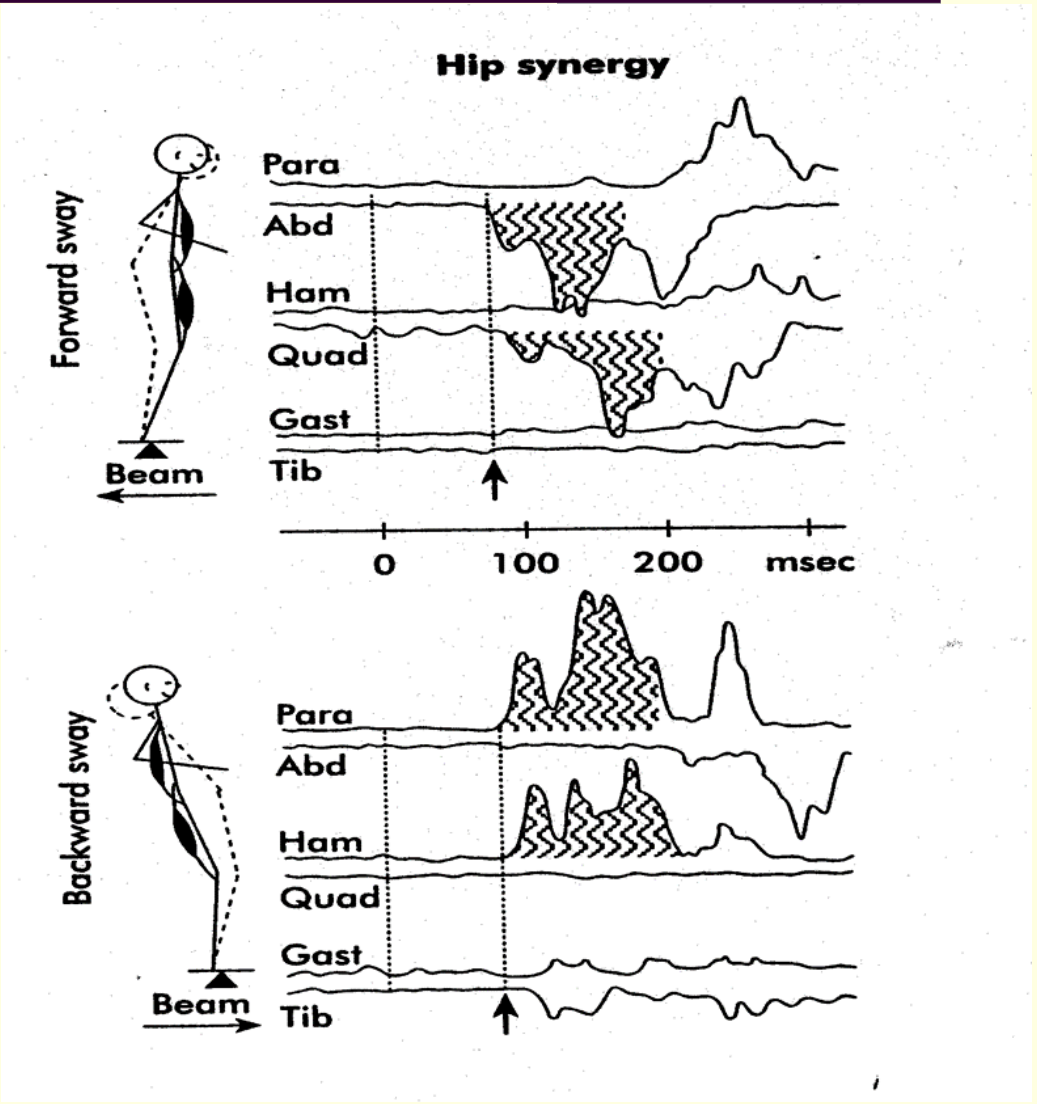


DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

Hip strategy

- The muscle contractions occurs in a **proximal** -to-**distal** order

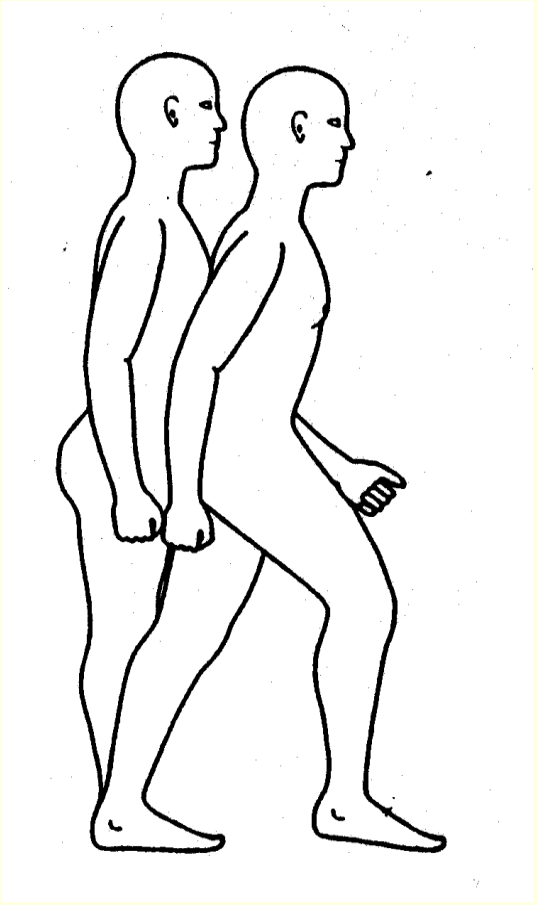


DYNAMIC KINESIOLOGICAL TECHNIQUES
Balancing reflexes

Stepping strategy

- Used to prevent a fall

- Used when perturbations are fast or large amplitude or when other strategies fail
- Consists in taking steps in the direction in which the center of gravity emerged from the support polygon.



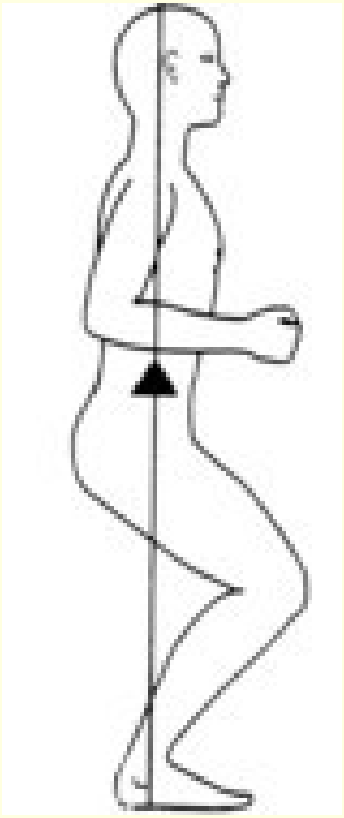
DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

***Stabilization reflexes*:** **Suspensory reflexe**

Suspensory strategy involves a lowering of the COG toward the base of support by bilateral lower-extremity flexion or a slight squatting motion.

By shortening the distance between the COG and the base of support, the task of controlling the COG is made easier.



DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes

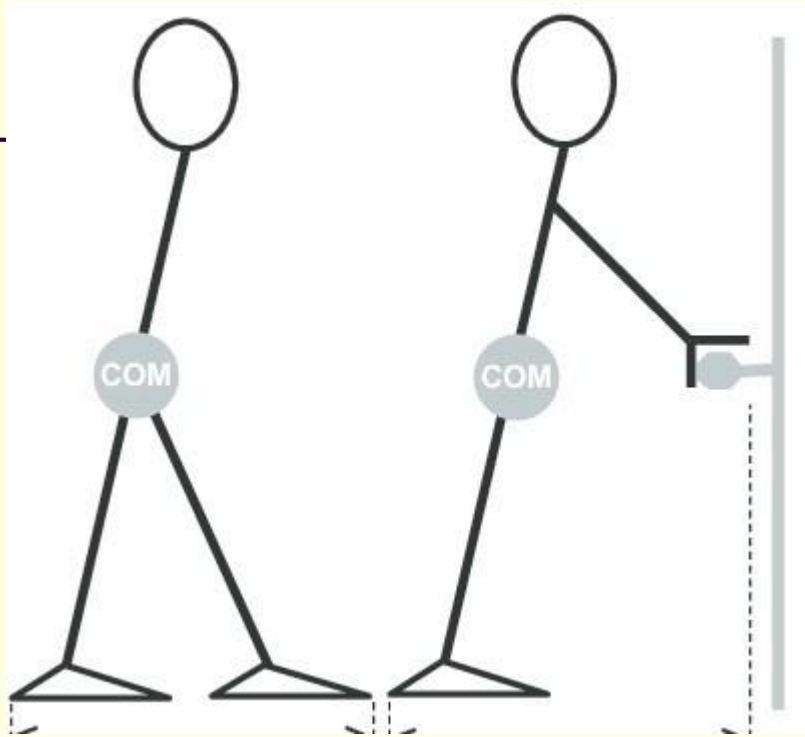
***Stabilization reflexes*: Suspensory reflexe**

This strategy is often used when a combination of stability and mobility is required, as in windsurfing.

May be after or before the action of the imbalance factor, but especially as an anticipatory strategy.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Balancing reflexes



***Stabilization reflexes*:**

a) Dynamic strategies: ankle, hip, step strategies

b) Suspensory reflexe

c) Increasing the support polygon

→ made →

↺ by supporting / grasping with the upper member a stable surface / object

or

↺ by moving and supporting a lower member towards the side where the imbalance occurs.

KINESIOLOGICAL TECHNIQUES

<table>
<tr><td>1. AKINETIC</td><td>Immobilizations:
- for resting
- contentious
- correction</td><td colspan="2">Posture:
- correction
- facilitation</td></tr>
<tr><td rowspan="2">2. KINETIC</td><td rowspan="2">Static:
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- stretching</td><td colspan="2">Dynamic:</td></tr>
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- tractions
- manipulations</td><td>Active:
- reflexe
- voluntary</td></tr>
<tr><td>3. SPECIFIC</td><td colspan="3">„Free active movements”:
- specific to some sporting procedures
- specific to some occupational activities
Neuro-proprioceptive Facilitation (PNF)</td></tr>
</table>

DYNAMIC KINESIOLOGICAL TECHNIQUES

2. KINETIC	**Static:** - isometric contraction - muscle relaxation - stretching	**Dynamic:**	
		Passive: - passive-active - active-passive - assisted - autopassive - tractions - manipulations	***Active:*** - reflexe - voluntary

The active movement is characterized by the involvement of the muscle contraction of the segment that is mobilized.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement

- is characterized by voluntary contraction that is realizing by muscle contraction and energy consumption;
- movement is isotonic, dynamic;
- between the adjacent bone segments a movement is recorded, the muscle changing its length

by
- closeness the insertion heads concentric contraction
- or
- remoteness the insertion heads excentric conrtaction

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement

- Objectives:

- increasing or maintaining the motion of a joint;
- increasing or maintaining muscle force and endurance;
- increasing training effort;
- recovery or development of neuromuscular coordination.

DYNAMIC KINESIOLOGICAL TECHNIQUES
Active voluntary movement

Technical modalities of realization:

- ***Free (pure active) mobilization*** - the movement is executed without any facilitating or opposing external intervention, except gravity;

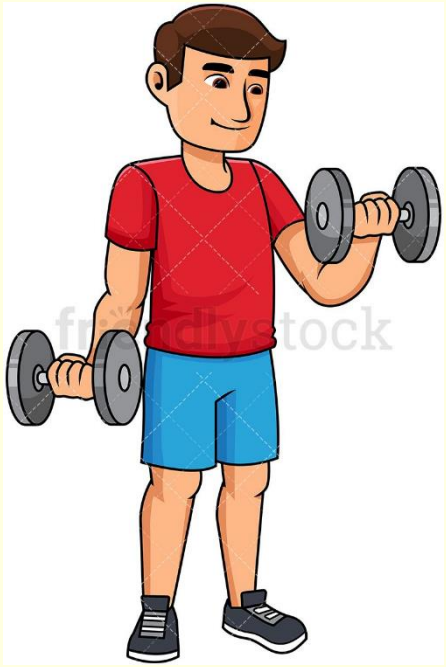
- ***Active mobilization with resistance*** - the external force partially opposes its own mobilizing force; in this way the muscles will develop a higher mechanicall work than the movement of the segment would require.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement

The practical ways of realization include use of:

- ***Gravity***
- ***PT hand***
- ***Weights***
- ***Water***



DYNAMIC KINESIOLOGICAL TECHNIQUES
Active voluntary movement

The practical ways of realization:

- ***gravity***

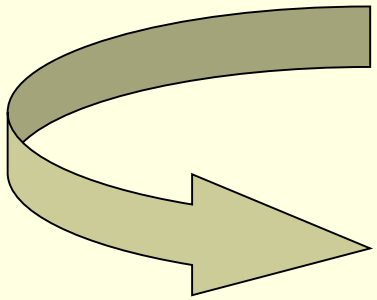
  → the movement is realized:

  - in the vertical plane
  - in planes inclined at different angles between the vertical and the horizontal.

DYNAMIC KINESIOLOGICAL TECHNIQUES
Active voluntary movement

The practical ways of realization:

- ***The hand*** or another PT's segments;



Mobilizing hand - realized by PT

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement

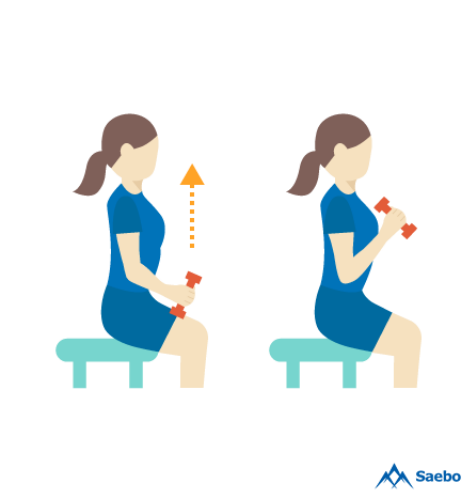
The practical ways of realization:

weights

→ used directly (dumbbells, weightlifting, various objects)

→ through devices,

→ using the elastic force that occurs when stretching or compressing materials (elastic strings, springs).



DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement

The practical ways of realization:

- ***water***

→ the movement against the archimedic force with the possibility of increasing the resistance →

- by attaching some floats,
- increasing speed
- opposing as large as possible sectional area of th segment to the travel direction.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

- has as main objective the increase of muscle strength and / or strength.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

When applying resistance, the following rules shall be taken into account:

- apply throughout the all active movement;
- the strength value is less than the muscle contraction force (except for the eccentric contraction);
- to be applied to the movement face of the segment thereby influencing by pressure the exteroceptors with a stimulating effect on the movement;

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

Rules:

- the rhythm of the active movement with resistance - is in accordance with the rule "high resistance - rare rhythm; low resistance - fast rhythm";
- it is very important to stabilize the segment on which the contracting muscle originates.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

- ***Internal race, or inside the contraction segment***

- when agonists work between insertion points on the normal motion arc.

- is realized when the muscle contracts and, from its normal stretch position, shortens by approaching the bone levers to which it is attached.

- such a contraction shortens the muscle and increases its volume.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

External race, or outside the contraction segment

- when agonists work beyond insertion points in the contraction segment for antagonists.
- is achieved only with those muscles that can be stretched over the rest limit.
- such a contraction develops elasticity, prolongs the muscle and increases the amplitude of the movement.

Medium race

- when the agonists have an medium length, at midpoint of the maximum amplitude, for a given move.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

From the point of view of the relationship between the muscle contraction and the modification of its length we have two types of muscle contraction:

- ***Concentric contraction***

R < Fm ; muscle lenght ↘

- ***Eccentric contracţie***

R > Fm ; muscle lenght ↗

DYNAMIC KINESIOLOGICAL TECHNIQUES

Mişcarea activă voluntară – with resistance

- ***Concentric contraction***

- the agonist overcomes an external resistance;

- resistance < muscle force;

- The muscle is shorter,

⇒ closeness of bone segments.

- ***Eccentric contraction***

- the agonist, although contracting, is defeated by external resistance;

- rezistance > muscle force;

⇒ the muscle gradually fail to a force that stretches it;

- The muscle is elongating,

⇒ remoteness of bone segments.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

- ***Concentric contraction***

- by repetition, concentric movements produce muscle hypertrophy, followed by increased force;

- at the joint level increase stability .

- ***Eccentric contraction***

- develop:
  - elasticity
  - rezistance

  } *Of the muscle*

- mobility. at the joint level increase

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

The rapport of the three types of muscular effort (static - isometric, dynamic - concentric and dynamic - eccentric) is:

- Depending on the ability to generate ***force***:

eccentric > isometric > concentric;

- Depending on the rapport of effect and ***energy consumption*** (efficiency):

isometric > eccentric > concentric;

- Depending on the joint pressures:

eccentric > concentric > isometric.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

Conclusions:

- Eccentric contraction is most effective for gaining muscle strength but is often avoided due to negative effects on the joint;

- Dynamic contractions, relative to static (isometric) contractions, determine:
  - better nervous coordination,
  - with fast action,
  - with equal training of all muscle fibers at all the angles of movement of the segment.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

Conclusions:

- Disadvantages of high-strength isotonic contractions:
  - stress the joint,
  - can trigger traumatic synovitis,
  - may prejudice the bone.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

- ***Isokinetic contraction***

- is the type of contraction realized by keeping constant the speed of shortening or elongation of the muscle over the entire range of motion.

- isokinesis can be done both on concentric contraction and on eccentric contraction.

DYNAMIC KINESIOLOGICAL TECHNIQUES

Active voluntary movement – with resistance

- ***Isokinetic contraction***

Natural movements do not have a constant speed due to:

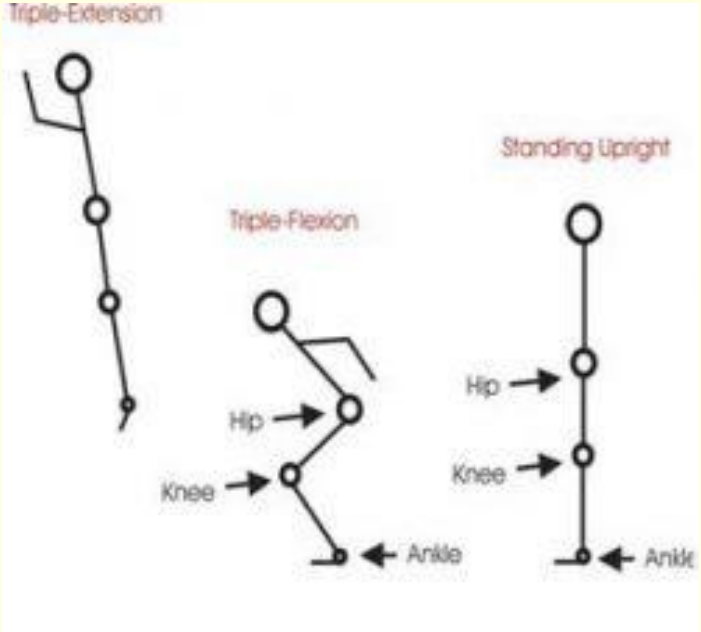
- the acceleration from the starting phases and deceleration of the stopping phase,
- change of position of the bone levers between the two reference positions (initial and final).

- isokinetic contraction can be realized just in laboratory, with special devices.

DYNAMIC KINESIOLOGICAL TECHNIQUES
Active voluntary movement

- ***Plyometric contraction*** is a combined contraction type, having:

- a first deceleration eccentric contraction time;
- a short isometric contraction;
- then an accelerated concentric contraction.



DYNAMIC KINESIOLOGICAL TECHNIQUES
Active voluntary movement

- ***Plyometric contraction***

- uses the effect of elastic energy accumulated in noncontracting structures (tendons, ligaments) in the elongation phase caused by eccentric contraction.

- is the best type of contraction for the development of detention (force in speed) and is therefore used more in exercises for lower limb muscles.