



UNIVERSITY OF PÉCS
FACULTY OF HEALTH SCIENCES

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FUNDAMENTAL EXERCISE THERAPY: THEORY AND PRACTICE



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THEORY AND PRACTICE**

Melinda JÁROMI

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FUNDAMENTAL EXERCISE THERAPY: THEORY AND PRACTICE

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Introduction

Exercise therapy employed by physiotherapists has not changed considerably over time. Nowadays there is a more pronounced trend to rely on the research findings of biomechanics and human kinesiology. As a result, the protection of joints has been put into focus, exercises are now grouped according to different organizing principles and the design of exercises has also changed to a certain extent.

This volume has been compiled with the purpose of introducing the theoretical background of exercise therapy and presenting a collection of exercises that form the basis of physiotherapy.

The book is recommended specifically to students majoring in physiotherapy, but it may also prove beneficial for any professional whose work involves exercises and exercise therapy. Terminology used in the field of sports, physiotherapy, sport therapy or recreation is anything but homogenous. Becoming familiar with the special jargon used in interrelated professions may facilitate communication between the individual fields, and this particular book uses both the terminology prevalent in the field physiotherapy and a special language used in the communication exchanges between patients and physiotherapists.

The volume is made up of two parts: Part 1 introduces the fundamentals of exercise therapy in terms of theory and with a focus on human anatomy, while Part 2 is a collection of exercises discussing the movements of the limbs, the trunk; aerobic exercises and, finally, offering a selection of movements to improve breathing and mimics. The exercises are further elucidated with the help of photos and videos.

An English version of this volume will also be published, which will be expected to offer assistance for physiotherapists teaching the subject in English in the framework of physiotherapy training. The English edition may also be valuable for Hungarian physiotherapy teachers and students in acquiring the relevant English terminology of their profession. In the practical part of the book, the exercises are described in two different ways: the explanation of the exercises reflect communication between professionals, while the exercise instructions demonstrate communication between patient and therapist.

1. THE FUNDAMENTALS OF EXERCISE THERAPY (BÁLINT MOLICS, MÁRTA HOCK, ELEONÓRA LEIDECKER, MELINDA JÁROMI)

1.1. The Fundamentals of Anatomy (Bálint Molics)

1.1.1. Planes, Axes

Planes:

- Sagittal plane: divides the human body lengthwise into identical right and left sections (median sagittal plane) A plane parallel to the median plane is called the paramedian plane.
- Frontal plane: divides the human body into front and back.
- Transverse/horizontal plane: divides the body horizontally into upper and lower sections.

Axes:

- Sagittal axis: runs from front to back.
- Transverse axis: runs sideways from right to left.
- Vertical axis: runs from top to bottom.

1.1.2. Joint Movements

Joint movements change the position of bones and the angle between the articulating bones. The plane of motion is the plane of the moving bone and its axis is always perpendicular to the plane. The degree of a joint movement is expressed by the angle of motion relative to the normal standing position. The position of the joints in the normal standing position is regarded as the 0° position. The main types of joint movements of the human body starting from a neutral position are the following:

- flexion, which is a movement in the sagittal plane, decreasing the angle at the moving joint,
- extension, which is a movement in the sagittal plane, increasing the angle at the moving joint,
- adduction, which is a movement in the frontal plane, decreasing the distance of the bone relative to the midline of the body or the distance between parallel body parts, such as fingers,

- abduction, which is a movement in the frontal plane, increasing the distance of the bone relative to the midline of the body or the distance between parallel body parts,
- rotation, which is a rotating movement of the bone around its own longitudinal axis and can be external or internal, depending on the direction. In the normal position of the forearm the forward–backward rotation of the palm or in the bent position of the elbow joint the upward–downward rotation of the palm is called supination–pronation,
- circumduction, which is a combination of movements, referring to the conical movement of a body part or its section.

Joint movements can be described by other definitions as well, such as anteflexion–retroflexion, which is the movement of the shoulder joint in the sagittal plane.

Open-packed (neutral or central) joint position: positions that a joint would assume naturally. The joint surfaces are loose, the joint capsule and the ligaments are lax, the stability of the joint is reduced. In practice, the open-packed joint position is used for therapeutic purposes.

Table 1/1: Neutral position of joints

Name of joint	Position of joint
spine	optimal curvatures
art. Temporomandibularis	slightly open mouth
art. humeri	55° abduction with 30° horizontal adduction
art. acromioclavicularis	arms relaxed at side
art. sternoclavicularis	arms relaxed at side
art. cubiti (ulna - humerus)	70° flexion with 10-35° supination
art. cubiti (radius - humerus)	full extension, full supination
art. cubiti (proximalisradioulnaris)	70° flexion with 10-35° supination
art. radioulnarisdistalis	10-30° supination
art. intercarpea	slight flexion
art. radiocarpea	neutral position, slight ulnar deviation
art. carpometacarpeapollicis	neutral position
artt. metacarpophlangeae (I-V)	slight flexion
artt. interphalangeae (I-V)	slight flexion
art. coxae	30° flexion with 30° abduction, slight external rotation
art. genus (femoropatellar joint)	full extension

art. genus	25° flexion
art. tibiofibularis	flexion-extension mid-position, 10° plantarflexion
syndesmosis tibiofibularis	10° plantarflexion
art. talocruralis	10° plantarflexion, inversion-eversion mid-position
art. subtalaris	neutral position / supination/pronation mid-position
art. tarsi transversa	neutral position
artt. tarsometatarsales	leg supination
artt. metatarsophalangeae (I-V)	neutral position
artt. interphalangeae (I-V):	slight flexion

Closed joint position: opposite of the neutral position, where the joint surfaces are very close to each other, the joint capsule and the ligaments are stretched to the maximum, therefore the joint stability is also at its maximum and the width of the joint space is at its minimum. In practice this position serves diagnostic purposes.

Table 1/2: Closed position of joints

Name of joint	Position of joint
spine	extension
art. temporomandibularis	clenched jaw
art. humeri	abduction, full external rotation
art. acromioclavicularis	90° shoulder joint abduction
art. sternoclavicularis	maximum elevation of the arm
art. cubiti (ulna - humerus)	full extension, full supination
art. cubiti (radius - humerus)	90° flexion, forearm 5° supination
art. cubiti (proximal radioulnar)	forearm 5° supination
art. radioulnarisdistalis	forearm 5° supination
art. intercarpea	full extension
art. radiocarpea	full extension (dorsiflexion) and radial deviation
art. carpometacarpeapollicis	full opposition
artt. metacarpophalangeae (II-V)	full flexion
art. metacarpophalangeapollicis	full extension
artt. interphalangeae	full extension
art. coxae	full extension and internal rotation (abduction)
art. genus (femoropatellar joint)	90° flexion

art. genus	full extension, external rotation
art. tibiofibularis	maximum dorsiflexion
syndesmosis tibiofibularis	maximum dorsiflexion
art. talocruralis	maximum dorsiflexion
art. subtalaris	inversion
art. tarsi transversa	inversion, leg supination
artt. tarsometatarsales	leg supination/plantarflexion
artt. metatarsophalangeae (I-V)	full extension
artt. interphalangeae (I-V)	full extension

1.1.3. The Basics of Myology

Table 1/3

Joints of the skull base		
Joints of the skull base - art. atlantooccipitalis - artt. atlantoaxialis	ventral flexion	m. longus capitis, m. rectus capitis anterior
	dorsiflexion	m. trapezius p. superior, m. sternocleidomastoideus <i>superficial occipital muscles:</i> m. longissimus capitis, m. semispinalis capitis, m. splenius capitis <i>occipital section of the deep muscles of the back:</i> m. spinalis capitis <i>suboccipital muscles:</i> m. rectus capitis post. minor et major, m. obliquus capitis superior et inferior
	lateral flexion	same, but only on one side, except for the midline muscles
	rotation	same, but only on one side, with increased contraction

Spine		
Cervical section - artt. intervertebrales	ventral flexion	<i>lateral group of deep cervical muscles: m. scalenus anterior, media, posterior</i> <i>m. longus colii</i> <i>+ muscles listed under the joints of the skull</i> <i>base: when stabilising or after moving the head</i>
	dorsiflexion	<i>m. longissimus c., m. semispinalis c., m. splenius c., m. spinalis c., m. multifidus</i> <i>m. levator scapulae</i> <i>+ muscles listed under the joints of the skull</i> <i>base: when stabilising or after moving the head</i>
	lateral flexion	same, but only on one side, except for the midline muscles
	rotation	same, but only on one side, with increased contraction

Dorsal-lumbar section - artt. intervertebrales	ventral flexion	<i>of the abdominal muscles:</i> m. rectus abd, m. obliquus externus abd., m. obliquus internus abd. <i>of the hip muscles:</i> m. psoas major
	dorsiflexion	<i>of the axial back muscles:</i> m. longissimus th., m. semispinalis th., m. spinalis th., mm. multifidi, m. iliocostalis th/l. <i>of the abdominal muscles:</i> m. quadratus lumborum <i>of the iliac muscles:</i> m. gluteus maximus
	lateral flexion	<i>of the abdominal muscles:</i> m. rectus abd., m. obliquus externus abd., m. obliquus internus abd., m. quadratus lumborum <i>of the axial back muscles:</i> m. longissimus th., m. iliocostalis th/l.
	rotation	<i>of the abdominal muscles:</i> m. obliquus internus abd. (to the same side), m. obliquus externus abd. (to the opposite side) <i>of the axial back muscles:</i> transversospinales (to the opposite side): mm. rotatores, mm. multifidi, m. semispinalis th., spinotransversales (to the same side)

Upper limb		
shoulder girdle - art. sternoclavicularis - art. acromioclavicularis	elevation	m. trapezius p. superior, m. levator scapulae, m. romboideus minor et major
	depression	m. pectoralis minor, m. trapezius p. inferior
	protraction	m. pectoralis minor, m. serratus anterior
	retraction	m. trapezius, m. romboideus minor et major
	external rotation	m. trapezius p. superior et inferior, m. serratus anterior
	internal rotation	m. romboideus minor et major, m. pectoralis minor, m. levator scapulae
art. humeri	anteflexion	m. pectoralis major, m. biceps brachii c. longum, m. coracobrachialis, m. deltoideus p. clavicularis
	retroflexion	m. teres major, m. latissimus dorsi, m. deltoideus p. acromialis, m. triceps brachii c. longum,
	abduction	m. deltoideus, m. supraspinatus, m. biceps brachii c. longum
	adduction	m. pectoralis major, m. latissimus dorsi, m. triceps brachii c. longum, m. biceps brachii c. breve
	external rotation	m. supraspinatus, m. infraspinatus, m. teres minor, m. deltoideus p. spinalis
	internal rotation	m. subscapularis, m. pectoralis major, m. latissimus dorsi, m. deltoideus p. acromialis, m. teres major
art. cubiti	flexion	m. biceps brachii, m. brachialis, m. brachioradialis, m. pronator teres
	extension	m. triceps brachii
	supination	m. supinator, m. biceps brachii
	pronation	m. pronator teres, m. pronator quadratus

art. radiocarpea	dorsiflexion	m. extensor carpi radialis longus et brevis, m. extensor digitorum, m. extensor indicis, m. extensor digitiminimi, m. extensor pollicis longus
	palmar flexion	m. flexor carpi ulnaris, m. flexor carpi radialis, m. flexor digitorumsc. et prof., m. flexor pollicis longus, m. abductor pollicislognus
	radial deviation	m. extensor carpi radialis longus, m. flexor carpi radialis, m. abductor pollicis, m. extensor pollicis longus, m. flexor pollicis longus
	ulnar deviation	m. extensor carpi ulnaris, m. flexor carpi ulnaris, m. extensor digitiminimi
thumb - art. carpometacarpea I. - art. metacarpophalangea I. - art interphalangea I.	flexion	m. flexor pollicis longus et brevis
	extension	m. extensor pollicis longus et brevis
	abduction	m. abductor pollicis longus et brevis
	adduction	m. adductor pollicis
	opposition	m. opponenspollicis
	reposition	m. extensor pollicis longus et brevis, m. abductor pollicis longus
(II-V.) fingers - art metacarpophalangea II-V. - art interphalangea II-V. (PIP, DIP joints)	flexion	m. flexor digitorumsc. et prof., mm. lumbricales (in the MCP joint), mm. interosseiplamares et dorsales (in the MCP joint)
	extension	m. extensor digitorum, m. extensor indicis, m. extensor digitiminimi, mm. lumbricales (in the PIP, DIP joints), mm. interosseiplamares et dorsales (in the PIP/DIP joints)
	abduction	mm. interosseidorsales
	adduction	mm. interosseipalmares

little finger - art. carpometacarpea V. - art metacarpophalangea V. - art interphalangea V. (PIP, DIP joints)	flexion	see above + flexor digiti minimi
	extension	
	abduction	m. abductor digitiminimi
	adduction	mm. interosseipalmares
	opposition	m. opponensdigitiminimi
Lower limb		
art. coxae	anteflexion	m. iliopsoas, m. tensor fasciae lata, m. pectineus, m. adductor longus et brevis, m. gracilis, m. rectus femoris, m. sartorius
	retroflexion	m. gluteus maximus, m. gluteus medius et minimus posterior fibres, m. semimembranosus, m. semitendinosus, m. biceps femoris c. longum, m. piriformis, m. adductor magnus
	abduction	m. gluteus medius et minimus, m. tensor fasciae lata, m. sartorius, m. piriformis,
	adduction	m. adductor magnus, m. adductor minimus, m. adductor longus, m. adductor brevis, m. gracilis, m. pectinues,
	external rotation	m. gluteus maximus, m. quadratus femoris, m. piriformis, m. gemellus superior et inferior, m. obturator internus et externus, m. iliopsoas, m. gluteus medius et minimus posterior fibres, m. sartorius
	internal rotation	m. gluteus medius et minimus anterior fibres, m. tensor fasciae lata, m. adductor magnus, m. pectineus (next to adducted thigh)
art. genus	extension	m. quadriceps femoris
	flexion	m. semimembranosus, m. semitendinosus, m. biceps femoris, m. gracilis, m. sartorius, m. gastrocnemius

art. talocruralis	plantarflexion	m. triceps surae, m. peroneus longus et brevis, m. tibialis posterior, m. flexor digitorum longus, m. flexor hallucis longus
	dorsiflexion	m. tibialis anterior, m. extensor digitorum longus, m. extensor hallucis longus
art. talotarsalis	pronation	m. peroneus longus et brevis, m. extensor digitorum longus (m. peroneus tertius),
	supination	m. triceps surae, m. tibialis anterior et posterior, m. flexor hallucis longus, m. flexor digitorum longus
toes		similarly to the hands, with the addition of two “dorsal” muscles, which perform the extension of the toes (m. extensor hallucis brevis, m. extensor digitorum brevis)
big toe - art. metatarsophalangea I. - art interphalangea I.	flexion	m. flexor hallucis longus et brevis,
	extension	m. extensor hallucis longus et brevis
	abduction	m. abductor hallucis
	adduction	m. adductor hallucis
(II-V.) toes - art. metatarsophalangea II-V. - art interphalangea II-V (PIP, DIP)	flexion	m. flexor digitorum longus et brevis, mm. lumbricales, m. flexor digiti minimi
	extension	m. extensor digitorum longus et brevis
	abduction	mm. interossei dorsales, m. abductor digiti quinti,
	adduction	mm. interossei palmares

1.2. Types of Muscle Activity, Muscle Strength Testing, Exercise Types

(Eleonóra Leidecker, Melinda Járomi)

1.2.1. Muscle Strength Testing, Types of Muscle Activity, Exercise Types (Melinda Járomi)

Muscle strength is assessed using the 0 to 5 scale of the British Medical Research Council. Muscles can be strengthened and mobilised using different forms of movements and exercises for the different levels of muscle strength (Table 1/4).

Table 1/4: Muscle strengthening and mobilization

muscle strength	definitions	muscle strengthening movement	mobilising movement
0	no muscle contraction, no activity, no visible or palpable muscle contraction	passive movement with patient activity	passive movement
1	palpable muscle contraction, no joint motion	isometric exercises, reflexes, righting reflexes, statokinetic reflexes, „as if” exercises	passive movement
2	palpable muscle contraction, joint movement, active/assisted active movement along full ROM, perpendicularly (on ordinary or exercise table) to the direction of the gravitational force during gravity eliminated testing	assisted active exercises, active movement perpendicularly to the direction of the gravitational force	passive movement
3	full ROM muscle movement parallel with the direction of the gravitational force, but to the opposite direction	active exercises against gravity	active movement, assisted active movement perpendicularly to the direction

			of the gravitational force
4	full ROM muscle movement against the gravitational force and against a small resistance	active exercises against a small resistance (manual, spring and elastic resistance, pliable material, weight, water or auto resistance, PNF-proprioceptive neuromuscular facilitation)	active movement against the gravitational force and/or against resistance
5	full ROM muscle movement against the gravitational force and against a large resistance	active exercises against larger resistance (manual, spring and elastic resistance, pliable material, weight, water or auto resistance, PNF-proprioceptive neuromuscular facilitation)	active movement against the gravitational force and/or against resistance

Source: Bálint és Bender 1997. Balogh 1999.

Table 1/5: Types of Muscle Activity.

type of muscle activity	definition, example
isometric muscle activity	muscle is active, but the muscle length does not change, static muscle contraction, for example the isometric exercise of the m. quadriceps femoris: sit with legs extended forward, press knees into the floor
isotonic muscle activity	muscle is active, the muscle length changes, for example the isotonic exercise of the m. rectus abdominis: in supine position lift your head and trunk
concentric muscle activity	isotonic muscle activity is concentric when the muscle change involves the shortening of the muscle and the origin and/or insertion of the muscle move closer together, for example the isotonic concentric exercise of the m. quadriceps femoris (rectus femoris): sit on a chair and extend your knee from a 90° flexion
eccentric muscle activity	isotonic muscle activity is eccentric when the muscle change involves the lengthening of the muscle and the origin and/or insertion of the muscle move further apart, controlled lengthening of the muscle against the gravitational force, for example: in prone position, with head and trunk lifted slowly, move your trunk back to the floor
direct	isotonic concentric muscle activity, when the insertion moves towards the origin of the muscle, for example the direct isotonic concentric contraction of the elbow flexors: extended arms along the body, then bend your arms

inverse	isotonic concentric muscle activity, when the origin moves towards the insertion of the muscle, for example the inverse isotonic concentric contraction of the elbow flexors: part of the press up, when your chest moves towards the floor
isokinetic muscle activity	the angular velocity is constant during the ROM, isokinetic dynamometer – Cybex, Biodex
isoinertial muscle activity	muscle activity against a constant force, for example when using fitness equipment in the gym

Source: Balogh, 1999, Bálint and Bender, 1999, Huszár et al, 2000.

Subgroups of Conventional Muscle Strength Testing

1+ when the patient is able to move through less than one half of the available ROM with gravity eliminated.

2-when the patient is able to move through greater than one half of the available ROM with gravity eliminated.

2+when the patient is able to move through less than 50% of the available ROM against gravity.

3- when the patient is able to move through greater than one half of the available ROM against gravity (less than full ROM)

3+ when the patient is able to move through greater than one half of the available ROM against a parallel gravitational force and against a small resistance (Bálint and Bender,1999, Huszár et al, 2000).

Isometric Muscle Strength Testing:

A 3-5 grading system is used for isometric muscle strength testing. Grade 3: when the muscle is able to hold the position/limb against gravity Grade 3+: when the muscle is able to hold the position against gravity and against minimal resistance. Grade 4-: when the muscle is able to hold the position/limb against gravity and against a small resistance. Grade 4: when the muscle is able to hold the position/limb against gravity and against medium resistance. Grade 5 (normal): when the muscle is able to hold the position against gravity and against maximum resistance (Huszár et al, 2000).

Table 1/6: Special types of movement and exercises for exercise therapy.

types of movement	definition
passive movement	movement is produced by an external force instead of the patient, for example manually by the therapist, in a suspension frame, CPM device, in a subaquatic environment
active movement without motion effect	during movement the muscle is active, but the joint does not move, for example innervation, isometric exercises
active movement with motion effect	during movement the muscle is active and there is movement in the joint, for example assisted active movement, movement against gravity and resistance exercises
involuntary active movement	for example reflex movements, righting reflexes, statokinetic reflexes
forms of exercises	definition
single phase exercises	The patient performs the joint movement actively and expressly in one direction. The movement in the other direction, which can be a contraindicated movement, is performed passively by the therapist, for example the isotonic concentric elbow flexion exercise is not recommended for stroke patients with elbow flexor spasm or the concentric phase of the plantar flexion/standing on tiptoes is not recommended for stroke patients with equinus deformity of the foot.
two-phase exercises	the patient performs the joint movement actively and expressly in both directions
combined exercises	movement of one joint in more than one plane or the simultaneous movement of more than one joint
complex exercises	spiral or diagonal movements, such as proprioceptive neuromuscular facilitation

closed kinetic chain exercises	the last joint of the limb is fixed, moving “against resistance”, for example during push-ups
open kinetic chain exercises	the last joint of the limb is free, not fixed, “not moving against an external force, except for the weight of the limb and the resistance of the air”, for example stand in the normal position and extend your arm upwards

Source: Balogh, 1999, Bálint and Bender, 1999.

1.2.2. Passive movement – Passive Osteokinematic Mobilization (Eleonóra Leidecker)

Manually performed joint mobilization technique. Its goal is to increase the ROM of the joint, to prevent and treat contractions. Primarily it increases the elasticity and flexibility of the periarticular and intraarticular tissues, but it also improves the extensibility of muscle tissues and connective tissues.

The patient is examined before using this method. The indications and contraindications of the therapy must be assessed.

Application: unconscious, paralysed, weak patients, patients unable to move their joints, during prolonged bed rest, for the prevention of complications arising during immobilization, for the treatment of articular contractions.

The main contraindications of this method:

- acute arthritis,
- hypermobile or weak joints,
- acute injury,
- pain that increases with movement.

Execution:

As suggested by the name, the patient is in a passive, relaxed position. The patient rests comfortably, according to his/her condition. The joints are protected as required. The joints are placed in a closed position, using pillows or other support. This is to ensure that no abnormal load or shearing stress is placed on the immobile joints.

The joint cavity of the treated joint is stabilised and the articular head is mobilised relative to the joint cavity. The stabilisation is usually done manually, but straps can also be used to stabilise a larger limb or the pelvis. The stabilisation should be proximal, as close to the joint as possible. The mobilising hand should also apply force on the joint as proximally as possible.

The passive movement is always performed according to the anatomical structure of the joint, along its axes and according to the normal physiological movements (planes and ranges) of the joint. The joint is moved in the full current ROM from starting to end position. No pain should be caused, but the sensation of strain in the tissue may be felt at the end of the ROM. The movement is performed slowly, at an even pace, repeating the same movement minimum 5 or 6 times.

We differentiate between *isolated passive movement*, when the movement is performed along a given axis and in a given plane, and *complex passive movement*, when the movement is performed in several planes and joints simultaneously by moving the limb.

The therapist using this method should follow the required joint protection protocol.

Effects of joint mobilization:

- preserving the joint function,
- preserving the passive ROM,
- preserving and increasing the flexibility of the joint capsule and the ligaments,
- preserving the flexibility and elasticity of the muscles,
- improving the circulation of the intraarticular and periarticular tissues,
- improving the metabolism of the synovial membrane and the joint cartilage,
- alleviating the pain,
- aiding the tissue regeneration processes,
- preserving joint proprioception.

The continuous passive movement of joints can be performed by using machines (CPM - Continue Passive Motion).

1.2.3. Positions with reduced load and assisted movements (Eleonóra Leidecker)

Positions with reduced load

During the active movement of the patient the load on one or more joints may need to be reduced fully or partially. Positions with reduced load protect the joints from the gravitational force, the patient's own weight or the weight of the limb.

Positions with reduced load on the spine include horizontal positions (e.g. being on hands and knees), lying positions, horizontal support of the trunk, floating on water or the full suspension of the trunk. Positions with reduced load on the limbs include lying positions, sitting positions, support, movement in water, suspension.

The force on the joint can be reduced by traction during movement.

Assisted movements:

An assisted movement is performed when the gravitational pull is switched off by supporting the limb, but the patient performs the movement actively. During movement the limb can be supported by hand or by a device.

It is most often used with Grade 2 muscle strength, when the patient is unable to move the weight of the limb against gravity, but he/she is capable of active movement. It may have other indications also, when we wish to reduce the force on the joint during movement in order to avoid pain. Further indications include the complex sensory and motor involvement in neurological disorders.

Limbs must be supported according to the joint protection protocol by supporting each segment of the limb.

Suspension frame

Suspension frames can be used for reducing the load on limbs and their joints, as well as the trunk fully or partially during muscle strengthening or joint mobilization. Suspension must be carried out according to strict physical and mechanical criteria. The suspension point determines the direction, plane and range of the movement, as well as the amount of load placed on or relieved from the joint and the involvement of the muscles.

1.2.4. Subaquatic Therapy (Eleonóra Leidecker)

The submersion of the body in varying depths of water can be used for different therapeutic purposes, such as muscle strengthening, stretching, joint mobilization, reducing the load on the joint, improving balance, walking reeducation, complex development of movement.

Goals and indication

The use of subaquatic environment for therapeutic purposes can help recovery from functional damage, within which special goals can be set for the patient and the therapist:

- increasing and restoring ROM, improving tissue flexibility,
- alleviating pain,
- introducing resistance training,
- increasing muscle strength,
- muscle tone regulation,
- making the patient aware of the his/her body weight load,
- relieving the load on the joints during movement,
- may be used to help or modify the use of manual techniques,

- improves movement in three dimensions,
- activating proprioception,
- improving coordination and balance,
- stabilising the trunk and the gait,
- increasing the cardiovascular capacity,
- introducing the restoration of functional activity and increasing functional capacity,
- minimising the risk of injury during rehabilitation,
- helping to relax,
- reducing oedemas and swelling,
- facilitating motor activity during the treatment of deconditioning,
- improving the integrated functions of the sensorium (neurology, paediatric rehabilitation)

Contraindications:

- fever,
- cardiac failure, angina,
- respiratory dysfunction, when the vital capacity is less than 1 litre (COPD),
- severe peripheral vascular diseases,
- haemorrhagic conditions,
- severe nephropathy,
- skin injuries, wounds, ulcers, stoma, skin conditions,
- fecal and urinary incontinence,
- infectious diseases,
- mental disorders.

Relative contraindications:

- aquaphobia,
- can be used with milder ataxia, with the therapist also in the water,
- treatment of Multiple Sclerosis, when the water temperature is below 33°C,
- patients with controlled epilepsy, in a good condition.

Properties of Water

Water has physical and chemical properties. This chapter focuses on the physical properties of water. These are proven to affect the human body both in static and dynamic positions. They can be beneficial for and adapted to the patient, depending on the therapeutic purposes. The physical properties of water include buoyancy, hydrostatic pressure, density (resistance), hydrodynamics, temperature. During movement in water the physiological benefits of immersion and movement both apply.

The main physiologic benefits of water (when the body is immersed in water):

Circulation:

- facilitates venous flow,
- centralises peripheral blood flow, increasing the amount of blood pumped back from the lower limbs to the chest,
- increases the stretching of the myocardium, thus facilitating stronger cardiac contraction,
- improves systolic function by 23% and stroke volume by 35%, has a bradycardic effect,
- increases peripheral resistance in the arteries, elevates blood pressure, especially the diastolic value by 10-15% in the case of cold water

Respiration:

- results in chest and abdominal wall compression,
- immersion in water affects the respiratory mechanism, making the lungs work up to 60% more,
- the mass of the water makes inhalation more difficult, reduces vital capacity by 10% (when the body is immersed up to the neck)

Renal function:

- increases diuresis,
- reduces plasma volume,
- increases the mobilization of the extracellular fluid.

Nervous system:

- reduces sympathetic activity,
- vestibular system can be activated easily.

Buoyancy

It acts in the opposite direction of the force of gravity. Any object, wholly or partially immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object (Archimedes' principle).

Clinical impact:

- it reduces some of the load on the joints (a person immersed in water up to the waist can lose up to 50% of his/her body weight; this ratio is 60% when immersed up to the sternum and 90% when immersed up to the neck),
- it reduces the stress on weight-bearing joints,
- it reduces the pain caused by the active movement of the joints,
- it makes active movement easier and facilitates movements carried out in the same direction
- it helps to improve three-dimensional movements,
- it can be used as resistance, when the movement is carried out against the direction of buoyancy.

Clinical application:

e.g. arthrosis of the lower limbs, obesity treatment, strengthening weak muscles.

Hydrostatic pressure

The pressure of the water mass is exerted on the immersed body. The amount of pressure depends on the depth of immersion and the pressure is applied on the entire surface of the body.

Clinical impact:

- it compresses the chest, abdominal wall and the blood vessels,
- it facilitates body movement and stability.

Clinical application:

e.g.: General medical conditions (facilitates exhalation), respiratory training of athletes, retention of balance, treatment of oedemas.

Water density

Since water has a greater density than air, it acts as resistance against movement. When water is used as a medium, cohesive force and viscosity also influence the level of the forces

applied on the body. We can increase the level of resistance proportionally by increasing the speed of movement. Various devices can be used to increase the surface area of the body part involved in the movement, thus increasing the resistance of the water.

Clinical impact:

- applies resistance to any active movement,
- improving proprioception,
- stabilising the joint during movement.

Clinical application:

E.g.: muscle strengthening, training athletes, obesity treatment.

Hydrodynamics

It refers to the mechanical impact of the movement of water.

The movement of fluid has the following elements:

- Laminar flow: fluid molecules flow in parallel with each other; this is a typically slow movement.
- Turbulence: fluid molecules do not flow in parallel with each other any more; this is a fast fluid flow.
- Turbulence and the cumulative effect of the water's viscosity also affect the body during the movement of water.

Clinical impact:

- the movement of water makes the position of the immersed body more difficult to maintain,
- the movement of water increases the resistance exerted by the water,
- devices used to increase the surface area of the body part increase the force/resistance exerted by the movement of water.

Clinical application:

E.g.: improving proprioception, balance and coordination, developing awareness of body position, stabilising walking.

Water temperature:

In general a thermos-neutral temperature is used for therapeutic purposes (33 C°). The recommended water temperature for cardiovascular exercises and aerobic training is 26-28 C°.

Questions:

1. Describe the muscle strength types from grade 0 to 5.
2. What does muscle strength 1+, 2-, 2+, 3-, 3+ mean?
3. What type of movement can be used for muscle strengthening for a patient with grade 0 muscle strength?
4. What type of movement can be used for muscle strengthening for a patient with grade 1 muscle strength?
5. What type of movement can be used for muscle strengthening for a patient with grade 2 muscle strength?
6. What type of movement can be used for mobilising a patient with grade 3 muscle strength?
7. What type of movement can be used for mobilising a patient with grade 4 muscle strength?
8. What does the term “single phase exercises” mean? When can a single phase exercise be used?
9. Which movements belong to the group of “involuntary active movements”?
10. Which types of movements belong to the group of active movements without motion effect?
11. List the mechanical impacts of water.
12. What are the indications for passive movement?
13. Describe assisted movements in detail.
14. What are the impacts of buoyancy?
15. Describe in detail how to carry out passive movement.

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2. Bálint G., Bender T. (1999) A fizioterápia elmélete és gyakorlata [Physiotherapy: Theory and Practice], Springer, Budapest, 65-81, 303-304.
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4. Reichel HS, Groza-Nolte R (2001) Fizioterápia [Physiotherapy]. Medicina, Budapest
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1.3. The Rules of Exercise Instruction (Márta Hock)

Precise and proper exercise instruction helps patients to understand and learn the exercises and also prevents patients from memorising the exercises incorrectly. Improper exercise instruction requires a time-consuming correction process, it takes longer for the patients to learn the exercises, discourages them, leads to loss of motivation, which may reduce the effectiveness of the applied exercise therapy.

Types of exercise instruction:

There are basically three options:

- *verbal instruction*, which is the most common method

- we give the instructions and the patients are performing the exercise simultaneously

- *mixed (verbal and visual) exercise presentation and instruction* for more complex exercises which are harder to understand

- we describe the exercise and perform it ourselves simultaneously

- *visual presentation* in certain special cases, when we perform the exercise only

- first we show the exercise then ask the patient to perform it

Verbal instructions must be brief, clear and down to the point, helping the patient to do the exercise properly. They should be tailored to the patient's age, mental and sensory capacities. Articulate properly, using the right level of volume and intonation. Choose your words carefully, use words that are colourful, motivating, but also help to relax the patient. The volume of your speech should be adjusted to the size of the therapy room and the noise level, especially during group therapy, as well as the aspects of the treatment of the particular problem. (Bálint 1997) During verbal exercise instruction the imperative can also be used apart from the indicative mood. (E.g.: we lift the arm or lift the arm) Exercise instruction should follow the rules of grammar and use the proper terminology. We can give our instruction in the first person singular, first person plural or using a general (impersonal) subject. E.g.: I am raising my arm up to shoulder height. We are raising the arm up to shoulder height. The arm is raised to shoulder height.) Make sure that you always stress the part of the exercise that is most important in terms of the patient's condition. Exercise instruction should never be monotonous. You can engage the patient by changing your tone and raising or lowering your voice. It is important to use varied terms and instructions to maintain the patient's attention. Use encouraging words, focus on the positive changes and the improvement when the exercises are performed correctly, praise the patient, but always

keep in mind his/her age, gender etc. The tempo of physical therapy exercises is usually tailored to the individual's needs. Fast paced exercises can be assisted by using music or clapping in the same tempo.

Each exercise should include a clear starting position, the description of the exercise and the movements, and the exact end position. As the therapy is meant to treat or manage medical conditions or problems, correction is essential. Correction can be given as follows:

- verbally: by repeating and stressing part of the exercise that needs to be corrected
- manually: guiding the patient with our hands in order to perform the exercise correctly

The most important element of correction is to correct mistakes that could lead to accidents, followed by any other necessary corrections. It is important to focus on the cause of the mistake and choose the most suitable correction method. During correction focus on the proper execution with as much explanation as possible. Try not to stress the mistake alone or overemphasise it, because it would be detrimental to the patient's commitment. Instead briefly explain the possible consequences of the mistake. Correction instruction should be incorporated into the flow of the exercise instruction, making it clear and easily identifiable.

Instructions and corrections should be chosen according to the following:

- aim of the exercise (warm-up, playing)
- group structure (homogenous-heterogeneous)
- complexity of the exercise (simple, complex)
- intensity (easy or intensive)
- size of the available space (individual therapy room, gym)

The position of the therapist can be important both for exercise instruction and correction. During both group and individual therapy sessions the therapist should make sure that everyone can see and hear him/her properly and the therapist can check each patient from all directions to make sure that they perform the exercises correctly. The therapist should present the exercises as the patient's "mirror image", thus making it easier for the patient to perform the exercise. Exercise instruction should be firm and clear, but also enjoyable, reinforcing and encouraging. Before using any devices or equipment, explain the aim and method of application, as well as any risks of accidents due to improper use. (Always use clean and undamaged devices.) Exercise instruction should be concluded with a positive reinforcement, saying goodbye to the patient, telling him/her that we are looking forward to the next therapy session. (Honfi 2011; Gardi 2000)

The basics of exercise instruction for breathing exercises

There are two main methods:

- direct
- indirect

Direct exercise instruction: for patients with respiratory conditions we should emphasise the breathing movement by using the following expressions: e.g. for chest (thoracic) breathing: chest is expanding, for abdominal (diaphragmatic) breathing: abdomen is pushed out. Always start with exhalation in order to get rid of the used air. The correct breathing involves inhalation through the nose and exhalation through the mouth. The nasal cavity and the accessory nasal sinuses filter and warm up the inhaled air, while the correctly performed exhalation through the mouth presents a smaller resistance to the exhaled air. Breathing should never be forced.

In *other clinical areas* these restrictions do not apply. We can use instructions more freely and in a simpler way, e.g.: using terms like we blow out, we exhale. Special techniques that affect the breathing are always discussed under the relevant physiotherapy section for the particular clinical area.

Indirect exercise instruction: we plan and instruct the movement so that the patient can only perform the breathing element of the exercise the way it is best suited for its purpose.

During intensive muscle contraction (running, using weights) the body requires more oxygen, making the breathing deeper, quicker and changing its frequency. In such instances we do not give exercise instructions. (Zaletnyik 2001, www.edzestervezes.hu)

Questions:

1. List the basic forms of exercise instructions.
2. Define the correct order of exercise instructions.
3. List the main aspects of verbal instructions.
4. Describe the basics of breathing exercise instructions.
5. Describe the main principles of correction.

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2. UPPER LIMB EXERCISES (ELEONÓRA LEIDECKER)

2.1. Shoulder girdle exercises

Shoulder girdle depression – isometric exercise, muscle strengthening equivalent to muscle strength 1



(SP)



(EP)

Starting position (SP): Patient lying on stomach, arms extended near body on each side.

Movement description: As if shoulder girdle was to move downwards in the direction of the pelvis, in parallel to the bed (the direction of the movement should be demonstrated manually).

End position (EP): No actual movement.

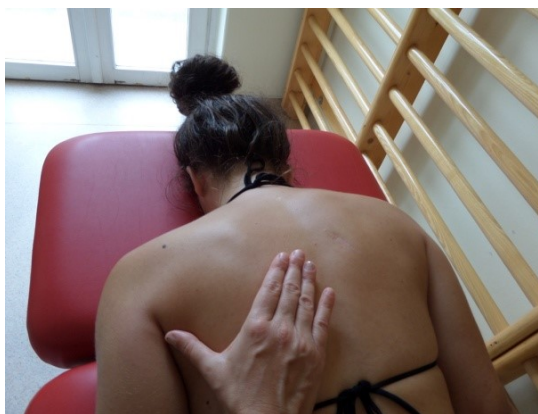
Communication, exercise instructions: Imagine and try to bring your shoulder girdle closer to your pelvis.

Note: The therapist's hand demonstrates the direction of the movement at the inferior angle of the scapula.

Shoulder girdle depression – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient lying on stomach, arms extended near body on each side, shoulder girdle in neutral position (or in elevation if the muscle is in extended position).

Movement description: Unassisted movement, shoulder girdle slides on the bed to move closer to the pelvis (manual support is possible).

End position: The shoulder blade is in a deep, lower position on the posterior thoracic wall.

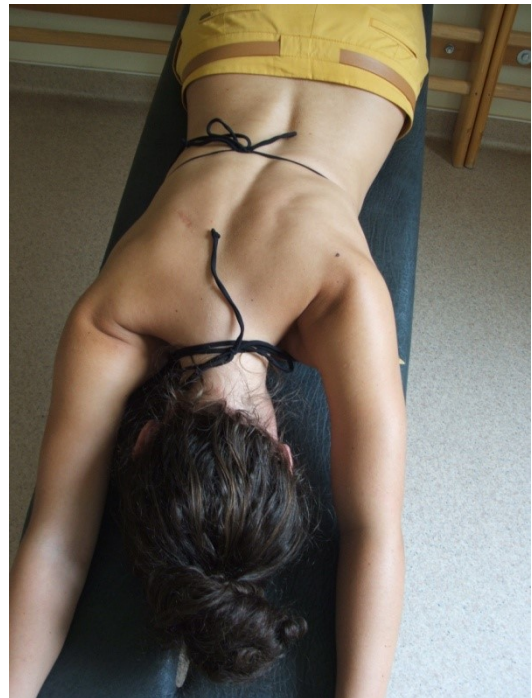
Communication, exercise instructions: Slide your shoulder girdle downwards in the direction of your pelvis.

Note: The therapist's hand demonstrates the direction of the movement at the inferior angle of the scapula.

Shoulder girdle depression – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle in neutral position (or in elevation if the muscle is in extended position), arms extended near ears resting on bench.

Movement description: The shoulder blade moves towards the pelvis against gravity.

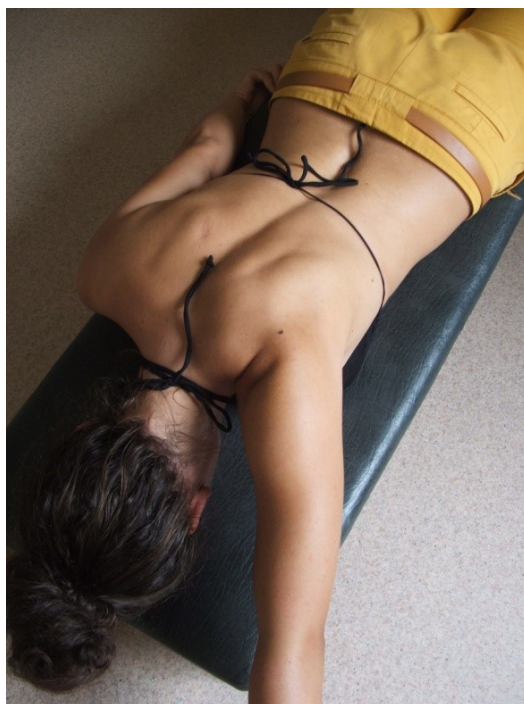
End position: The shoulder girdle is in a deep position closer to the pelvis.

Communication, exercise instructions: Pull your shoulder girdle towards your pelvis.

Shoulder girdle depression – concentric exercise, muscle strengthening equivalent to muscle strength 4



(SP)



(EP)

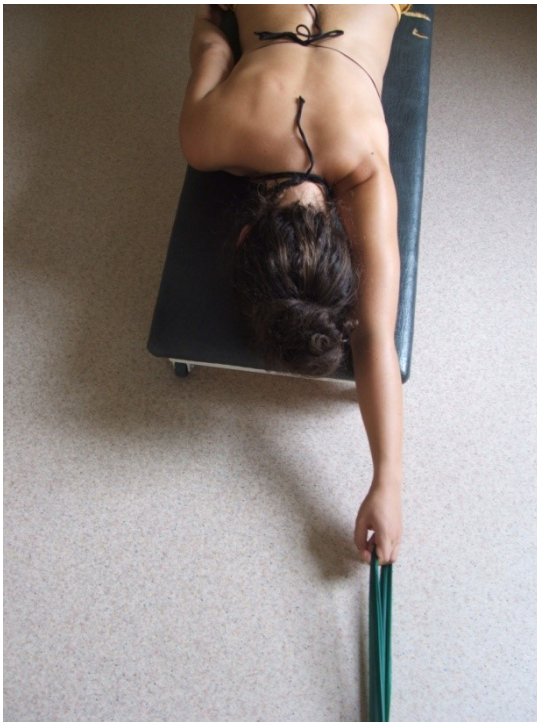
Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle in neutral position (or in elevation if the muscle is in extended position), arms extended near ears in the air not supported by bench.

Movement description: The shoulder blade moves towards the pelvis against gravity while holding the weight of the upper limb.

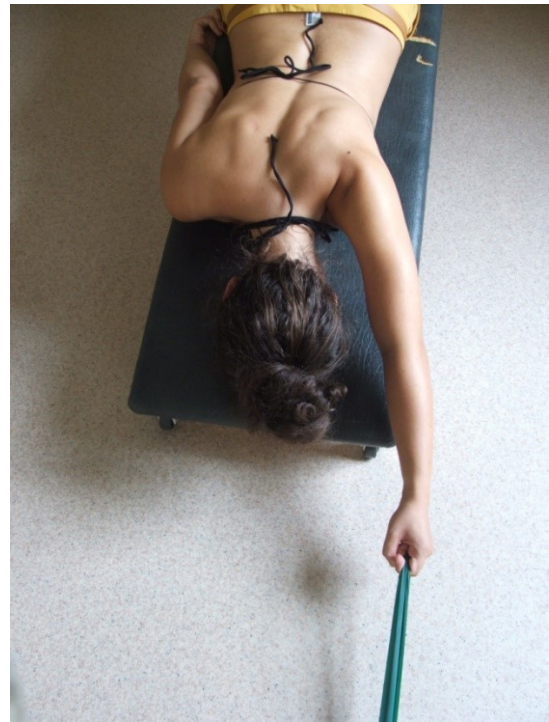
End position: The shoulder girdle is in a deep position, closer to the pelvis, arm remains near the ear in the air.

Communication, exercise instructions: Pull your shoulder girdle towards your pelvis keeping your extended arm near your ear.

Shoulder girdle depression – concentric exercise, muscle strengthening equivalent to muscle strength 5 (with flexible resistance)



(SP)



(EP)

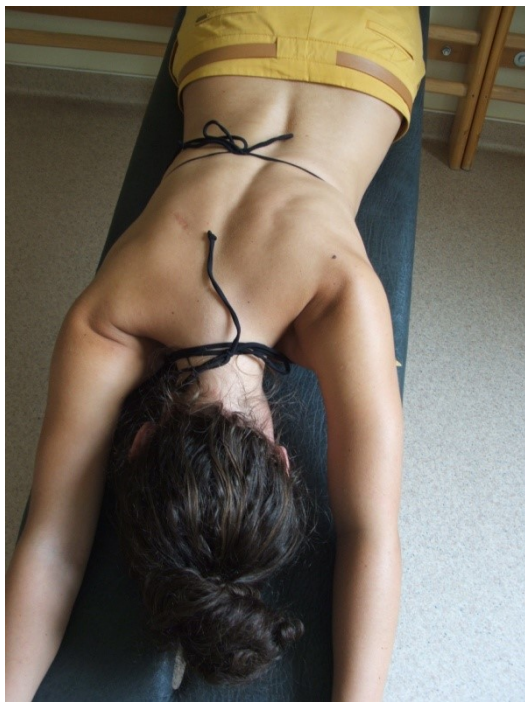
Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle in neutral position (or in elevation if the muscle is in extended position), arms extended near ears not supported by bench. Resistance band in hand from the direction of head.

Movement description: The shoulder blade moves towards the pelvis against gravity and the resistance of the band while holding the weight of the upper limb.

End position: The shoulder girdle is in a deep position, closer to the pelvis, arm remains near the ear in the air, resistance band stretched.

Communication, exercise instructions: Pull your shoulder girdle towards your pelvis keeping your extended arm near your ear. Stretch the resistance band.

Shoulder girdle depression – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

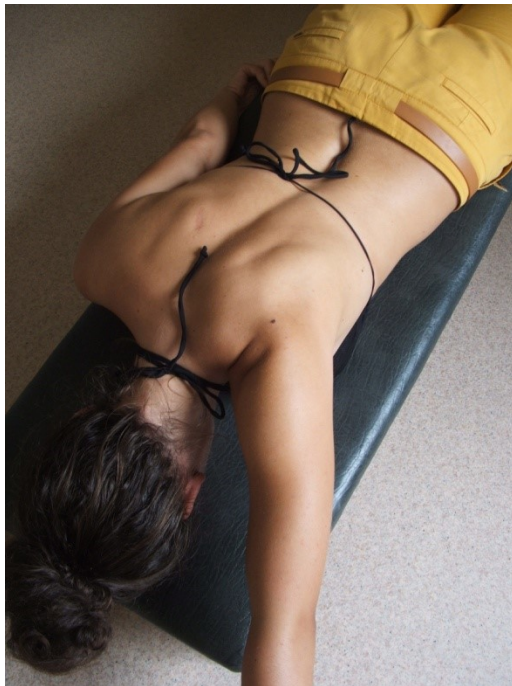
Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle in neutral position (or in depression), arms extended near ears resting on bench.

Movement description: The shoulder blade moves slowly towards the ear against gravity.

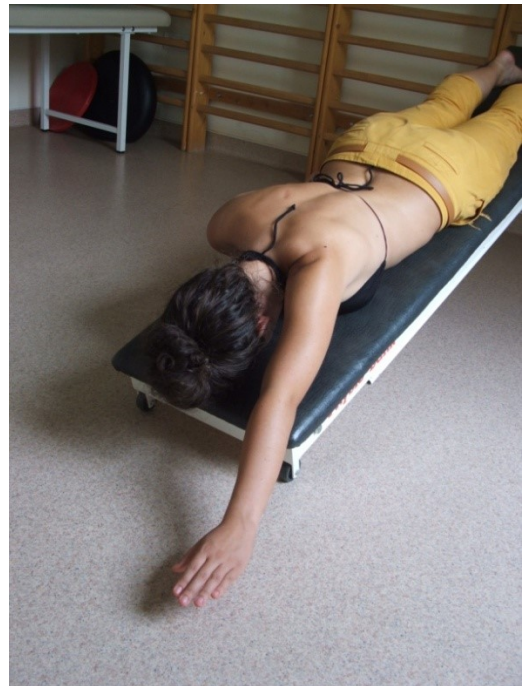
End position: The shoulder girdle is closer to the ears.

Communication, exercise instructions: Allow your shoulder girdle to sink slowly towards your ears. Control the speed.

Shoulder girdle depression – eccentric exercise, muscle strengthening equivalent to muscle strength 4



(SP)



(EP)

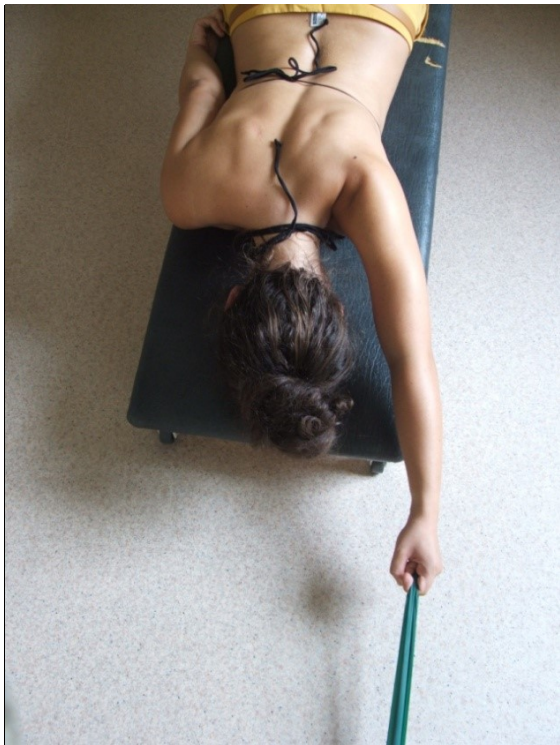
Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle pushed closer to pelvis, arms extended near ears not supported by bench.

Movement description: The shoulder blade moves slowly towards the ears while holding the weight of the upper limb.

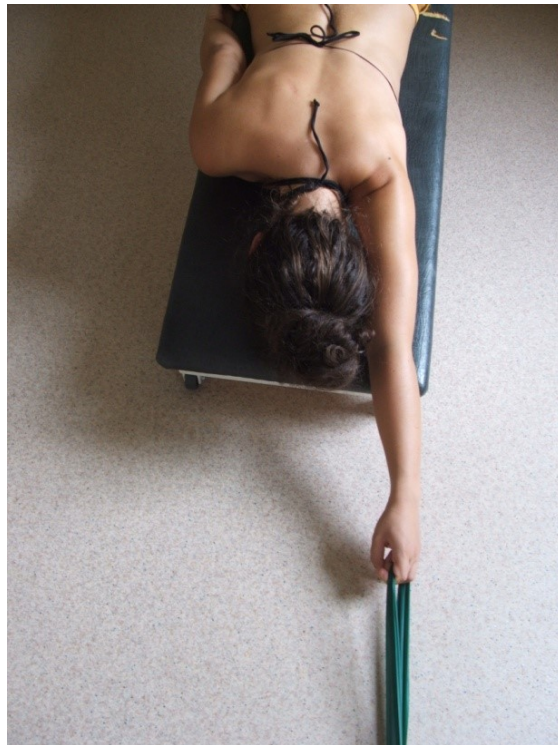
End position: The shoulder girdle is closer to the ears, the arms remain in the air, extended near the ears.

Communication, exercise instructions: Allow your shoulder girdle to sink towards your ears with your arms extended near your ears.

Shoulder girdle depression – eccentric exercise, muscle strengthening equivalent to muscle strength 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient lying on stomach on incline bench (head is closer to floor than legs), shoulder girdle pushed closer to pelvis, arms extended near ears, held in the air from the edge of bench by patient, resistance band firmly stretched at head level.

Movement description: The shoulder blade moves towards the ears while holding the weight of the upper limb and slowing down the movement against the resistance of the band.

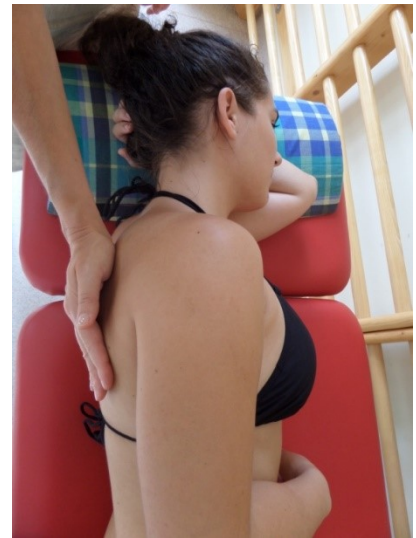
End position: The shoulder girdle is closer to the ears, the arms remain near the ears in the air, the resistance band is loose.

Communication, exercise instructions: Allow your shoulder girdle to sink slowly while keeping your hands near your ears. Allow the resistance band to move back slowly, control the speed.

Shoulder girdle retraction – isometric exercise, muscle strengthening equivalent to muscle strength 1



(SP)



(EP)

Starting position: Patient lying on side with arm on top resting on body, shoulder girdle in neutral position.

Movement description: As if the shoulder girdle was to move backwards (the direction of the movement should be demonstrated manually).

End position: No actual movement.

Communication, exercise instructions: Imagine and try to bring your shoulder girdle backwards by squeezing your shoulder blades together.

Note: The therapist's hand demonstrates the direction of the movement at the margomedialis.

Shoulder girdle retraction – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient sitting at table, arm stretched out on table at shoulder level, shoulder girdle in neutral position (or in protraction if muscle is in extended position).

Movement description: Unassisted movement, the shoulder blades move closer together, the arms slide on the table to follow the movement. The shoulder blades are squeezed together in the back (manual support is possible).

End position: The shoulder girdle is closer in the back, extended arms slide back on the table.

Communication, exercise instructions: Slide back your extended arms on the table by pulling the shoulder blades backwards and squeezing them together at the endpoint of the movement.

Shoulder girdle retraction – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient lying on stomach, arms extended near body, shoulder girdle in neutral position (or in protraction if the muscle is in extended position).

Movement description: The shoulder girdle moves upwards, in the direction of the ceiling while the shoulder blades are squeezed together in the back.

End position: The shoulder girdle is in closed position against gravity.

Communication, exercise instructions: Lift your shoulder girdle high towards the ceiling and try to close your shoulder blades in the back.

Shoulder girdle retraction – concentric exercise, muscle strengthening equivalent to muscle strength 4



(SP)



(EP)

Starting position: Patient lying on stomach, arm extended hanging straight from the edge of bed, shoulder girdle pushed forward.

Movement description: The shoulder girdle moves upwards in the direction of the ceiling while holding the weight of the arm, the shoulder blades close in the back.

End position: The shoulder girdle, shoulder blades are closer in the back resisting the weight of the arm.

Communication, exercise instructions: Lift your shoulder girdle high towards the ceiling, hold the weight of your arm and squeeze your shoulder blades together.

Shoulder girdle retraction – concentric exercise, muscle strengthening equivalent to muscle strength 5 (with weight)



(SP)



(EP)

Starting position: Patient lying on stomach, arm extended hanging straight from the edge of bed, shoulder girdle pushed forward.

Movement description: The shoulder girdle moves upwards in the direction of the ceiling while holding the weight of the arm and the shoulder blades are squeezed together in the back, the arms remain hanging straight.

End position: The shoulder girdle, shoulder blades are closer in the back resisting the weight of the arm and the weight.

Communication, exercise instructions: Lift your shoulder girdle high in the direction of the ceiling while holding the weight, squeeze your shoulder blades together with your arms hanging straight.

Shoulder girdle retraction – concentric exercise, muscle strengthening equivalent to muscle strength 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient lying on stomach, arm extended hanging straight from the bed, one end of resistance band held in hand, shoulder girdle pushed forward.

Movement description: The shoulder girdle moves upwards in the direction of the ceiling while the shoulder blades are squeezed together in the back resisting the resistance band, arm remains hanging straight.

End position: The shoulder girdle, shoulder blades are closer in the back resisting the arm and the resistance band. The resistance band is taut.

Communication, exercise instructions: Stretch the resistance band, lift your shoulder girdle high in the direction of the ceiling and squeeze your shoulder blades together while arm remains hanging straight.

Shoulder girdle retraction – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient lying on stomach, arms extended near body, shoulder girdle pulled backwards.

Movement description: The shoulder girdle slowly sinks towards the bed against gravity.

End position: The shoulder girdle is in neutral position.

Communication, exercise instructions: Allow your shoulders to slowly drop on the bed.

Shoulder girdle retraction – eccentric exercise, muscle strengthening equivalent to muscle strength 4



(SP)



(EP)

Starting position: Patient lying on stomach, shoulder girdle pulled backwards, arm hanging straight from the bed.

Movement description: The shoulder girdle sinks slowly to neutral position resisting the weight of the arm while holding the weight of the arm and controlling the speed.

End position: The shoulder girdle slowly returns to neutral position, arm remains hanging straight from the bed.

Communication, exercise instructions: Allow your shoulders to slowly drop on the bed, keep your arm hanging straight and control the speed.

Shoulder girdle retraction – eccentric exercise, muscle strengthening equivalent to muscle strength 5



(SP)



(EP)

Starting position: Patient lying on stomach, arm extended hanging straight from the bed, shoulder girdle pulled backwards, weight held in hand.

Movement description: The shoulder girdle slowly sinks towards the bed while holding the weight of the arm resisting the weight, the muscles control the speed of the movement.

End position: The shoulder girdle returns to neutral position resisting the weight of the arm and the weight.

Communication, exercise instructions: Allow your shoulder girdle to slowly sink on the bed while holding the weight, keep your arm hanging straight and control the speed.

Shoulder girdle retraction – eccentric exercise, muscle strengthening equivalent to muscle strength 5



(SP)



(EP)

Starting position: Patient lying on stomach, arm extended hanging straight from the bed, shoulder girdle pulled backwards, resistance band held in hand firmly stretched. Resistance is secured under the bed.

Movement description: The shoulder girdle sinks slowly downwards in the direction of the bed while holding the weight of the arm against the resistance of the band, the muscles control the speed.

End position: The shoulder girdle returns to neutral position resisting the arm and the resistance band.

Communication, exercise instructions: Slowly release the resistance of the band, allow your shoulder girdle to slowly sink on the bed, keep your arm hanging straight and control the speed.

Shoulder girdle protraction – isometric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(SP)

Starting position (SP): Patient walk standing facing wall, holding ball at shoulder level on the wall, extended arm leaning on ball, shoulder girdle in neutral position.

Movement description: The ball is pressed into the wall with extended arm while the shoulder girdle is protracted, position is maintained for 10 seconds against the resistance of the ball.

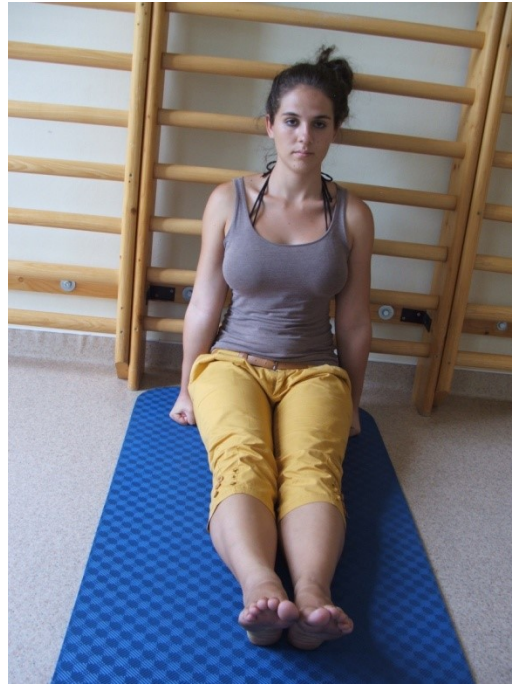
End position: The ball is pressed into the wall with arm extended while the shoulder girdle moves into a protracted position.

Communication, exercise instructions: The ball is pressed into the wall with arm extended while the shoulder girdle moves into a protracted position.

**Shoulder girdle depression – closed kinematic chain exercise, muscle strengthening
equivalent to muscle strength 4, 5**



(SP)



(EP)

Starting position: Patient sitting on floor, hands clenched resting on floor, arms extended, shoulder girdle pulled towards ears.

Movement description: The shoulder girdle sinks downwards in the direction of the pelvis as the body is lifted from the ground leaning on clenched hands.

End position: The shoulder girdle is pushed downwards, body is lifted from the ground leaning on clenched hands.

Communication, exercise instructions: Lift yourself up from the ground a small amount leaning on your extended arms while pulling your shoulders downwards. The pelvis rises, the legs stay on the floor.

Shoulder girdle protraction – mobilization exercise



(SP)



(EP)

Starting position: Patient sitting on chair, arms extended in front of chest with fingers laced together, shoulder girdle in neutral position.

Movement description: The arms are pushed forward at shoulder level, the shoulder girdle moves into protracted position, the shoulder blades are pulled further apart in the back.

End position: The two shoulder girdles are moved into protracted position, the shoulder blades are pulled further apart in the back.

Communication, exercise instructions: Stretch forward with your arms laced together while your shoulder blades are strongly pulled apart.

**Shoulder girdle combined exercise – with accessory, muscle strengthening
equivalent to muscle strength 4, 5**



(SP)



(EP)

Starting position: Patient walk standing facing wall bars, resistance band in one hand (resistance comes from the front/above from wall bars) arm is in front lifted position, shoulder girdle forward close to ears.

Movement description: Resistance band is extended by pulling arm and shoulder girdle down and backwards.

End position: Taut resistance band moves the arm and the shoulder girdle into a depressed and retracted position.

Communication, exercise instructions: Pull your arm and shoulder blades strongly back and down, firmly stretch the band.

Shoulder girdle complex exercise – muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: Patient walk standing with back facing wall bars, resistance band in one hand (resistance comes from behind/below from wall bars), arm extended behind body, shoulder girdle pulled back and down. Palm facing backwards.

Movement description: Arm stretching resistance band reaching across body.

End position: Taut resistance band moves the arm and shoulder girdle into protracted and elevated position. Palm facing backwards.

Communication, exercise instructions: Lift your arm up and ahead reaching across your body, stretch the band firmly.

2.2. Shoulder joint exercises

Shoulder joint flexion – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient lying on side, arm on top and shoulder in neutral position.

Movement description: Try to lift arm forward (the direction of the movement should be demonstrated manually).

End position: No actual movement.

Communication, exercise instructions: Imagine and try to lift your arm forward.

Note: The therapist's hand demonstrates the direction of the movement at the front of the upper arm.

Shoulder joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient lying on side, shoulder joint in neutral position, elbow joint bent.

Movement description: Unassisted movement, the arm is lifted forward parallel to the bed, the arm is held from below and weight is manually supported.

End position: The arm is moved forward near the ear parallel to the bed.

Communication, exercise instructions: Lift your arm forward near your ear.

Shoulder joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting, arm bent at right angle near body, shoulder joint in neutral position (or in extension of the muscle is in extended position).

Movement description: The arm rises forward with elbow bent near the ear against gravity.

End position: Arm bent is in the front, near the ear.

Communication, exercise instructions: Lift your arm with your elbow bent near your ear.

Shoulder joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting, arm extended near body, weight in hand, shoulder joint in neutral position (or in extension if the muscle is in extended position).

Movement description: Extended arm rises near the ear with weight in hand.

End position: The extended arm is moved near the ear resisting the weight.

Communication, exercise instructions: Lift the weight near your ear with your arm extended.

Shoulder joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: Patient sitting, arm extended near body, shoulder joint in neutral position (or in extension if the muscle is in extended position), resistance band secured under patient's foot.

Movement description: Arm extended rises near the ear, resistance band is taut.

End position: The extended arm is near the ear, resistance band is taut.

Communication, exercise instructions: Lift your arm extended near your ear and firmly stretch the band.

Shoulder joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting, arm near ear bent at right angle.

Movement description: The arm slowly sinks in the direction of the body against gravity.

End position: The shoulder joint is in neutral position, arm near the body.

Communication, exercise instructions: Slowly lower your arm with your elbow bent near your body, control the speed.

Shoulder joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: Patient sitting, arm extended near ear, weight in hand.

Movement description: The arm slowly sinks holding and controlling the weight and its own weight with elbow extended near the body.

End position: The shoulder joint is in neutral position, arm is near the body, weight is in hand.

Communication, exercise instructions: Slowly lower your arm and the weight near your body, control the speed.

Shoulder joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting, arm extended near ear, one end of resistance band in hand and taut, other end secured under patient's foot.

Movement description: The extended arm slowly sinks toward the body resisting the band and controlling the speed.

End position: The shoulder joint is in neutral position, the arm is near the body, the band is loose.

Communication, exercise instructions: Slowly lower your arm near your body gradually releasing the resistance of the band.

**Shoulder joint external rotation – isometric exercise, muscle strengthening
equivalent to muscle strength 1**



Starting position: Patient sitting at table, forearm resting on table, elbow bent, shoulder in neutral position.

Movement description: Patient trying to slide forearm away from the body on the table, elbow close to the body, shoulder joint was to move in the direction of external rotation (the direction of the movement should be manually demonstrated).

End position: No actual movement.

Communication, exercise instructions: Imagine and try to slide your forearm on the table away from your body keeping your elbow against your body.

Note: The therapist's hand demonstrates the direction of the movement on the back of the forearm.

**Shoulder joint external rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Patient sitting, forearm resting on table with elbow bent, shoulder joint in neutral position.

Movement description: Unassisted movement, elbow remains stable in one point near the body, the forearm slides away from the body (manual support is possible).

End position: The shoulder joint is in external rotation parallel to the table.

Communication, exercise instructions: Slide your forearm away from your body on the table keeping your elbow stable in one point.

Shoulder external rotation – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, upper arm parallel to table, shoulder joint in neutral position (or in internal rotation if the muscle is in extended position).

Movement description: The forearm rises keeping elbow close to the body against gravity in the direction of external rotation.

End position: The shoulder joint is in external rotation, elbow is kept against the body.

Communication, exercise instructions: Lift your forearm away from your body keeping your elbow stable in one point.

**Shoulder joint external rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with weight)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, upper arm parallel to table, shoulder joint in neutral position (or in internal rotation if the muscle is in extended position) weight in hand.

Movement description: The forearm rises keeping elbow close to the body against the resistance of the weight in the direction of external rotation.

End position: The shoulder joint is in external rotation, elbow is kept against the body.

Communication, exercise instructions: Lift your forearm and the weight away from your body keeping your elbow close to your body.

**Shoulder joint external rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with flexible resistance)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, upper arm parallel to table, shoulder joint in neutral position (or in internal rotation if the muscle is in extended position) one end of resistance band is stretched forward, other end is secured under patient's body.

Movement description: The forearm rises keeping elbow close to the body against the resistance of the band in the direction of external rotation.

End position: The shoulder joint is in external rotation, elbow is kept close to the body, the band is taut.

Communication, exercise instructions: Lift your forearm away from your body keeping your elbow close to your body and firmly stretch the resistance band.

**Shoulder joint external rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, shoulder joint in neutral position or in external rotation (forearm is perpendicular to body).

Movement description: The forearm slowly sinks in front of the body against gravity with elbow kept against the body, patient controls speed in the direction of internal rotation.

End position: The forearm rests on the body, the shoulder joint is in internal rotation, elbow remains close to the body.

Communication, exercise instructions: Allow your forearm to slowly sink in front of your body keeping your elbow stable in one point and controlling the speed.

**Shoulder joint external rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 4, 5**



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, shoulder joint in neutral position or in external rotation (forearm is perpendicular to body) weight in hand.

Movement description: The forearm slowly sinks in front of the body against the resistance of the weight with elbow kept against the body, patient controls speed in the direction of internal rotation.

End position: The forearm and the weight rest on the body, the shoulder joint is in internal rotation.

Communication, exercise instructions: Allow your forearm to slowly sink with weight in hand in front of your body keeping your elbow stable in one point and controlling the speed.

**Shoulder joint external rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with flexible resistance)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm resting on body, elbow bent at right angle, upper arm parallel to table, shoulder joint in neutral position or in external rotation, one end of resistance band is secured under patient's body, other end is held in hand firmly stretched.

Movement description: The forearm slowly sinks in front of the body against the resistance of the band with elbow kept close to the body, patient controls speed in the direction of internal rotation.

End position: The forearm rests on the body, the shoulder joint is in internal rotation, elbow remains close to the body, the band is loose.

Communication, exercise instructions: Allow your forearm to slowly sink against the resistance of the band keeping your elbow stable in one point on the body and controlling the speed.

**Shoulder joint internal rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 1**



Starting position: Patient sitting, forearm resting on table with elbow bent, shoulder joint in neutral position.

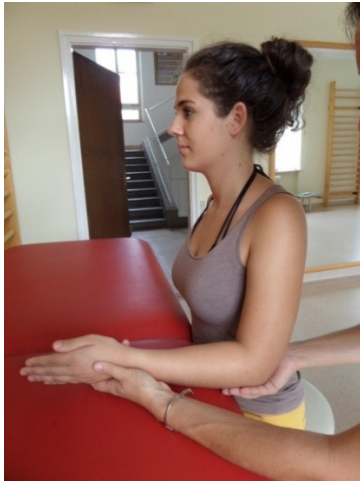
Movement description: The forearm moves closer to the body on the table, parallel to the table, in the direction of internal rotation (the direction of the movement should be demonstrated manually).

End position: No actual movement.

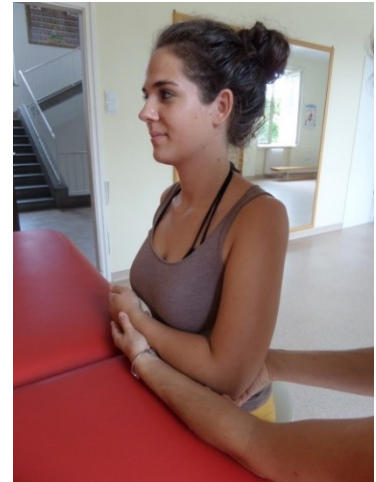
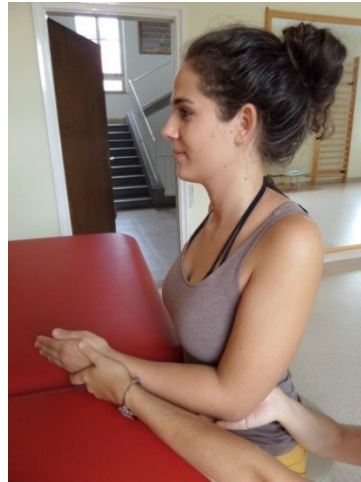
Communication, exercise instructions: Imagine and try to slide your forearm in the direction of your body with your elbow kept close to your body.

Note: The therapist's hand demonstrates the direction of the movement on the inside of the forearm.

**Shoulder joint internal rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Patient sitting, forearm resting on table with elbow bent, shoulder joint in neutral position.

Movement description: Unassisted movement, elbow is kept close to the body in one point, forearm moves closer to the body on the table, parallel to the table (manual support is possible).

End position: Shoulder joint is in internal rotation, forearm is parallel to the table.

Communication, exercise instructions: Slide your forearm in the direction of your body on the table keeping your elbow stable in one point.

**Shoulder joint internal rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Patient lying on side, upper arm underneath resting on bed with elbow bent at right angle, forearm hanging from bed, shoulder joint in neutral position (or in external rotation if the muscle is in extended position).

Movement description: The forearm moves in the direction of the body and internal rotation of the shoulder joint against gravity.

End position: The shoulder joint is in internal rotation, forearm is in front of the body.

Communication, exercise instructions: Lift your forearm keeping your elbow stable in one point, bring your forearm closer to your body.

**Shoulder joint internal rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with weight)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm underneath resting on bed with elbow bent at right angle, forearm hanging from bed, shoulder joint in neutral position (or in external rotation if the muscle is in extended position), weight in hand.

Movement description: The forearm moves closer to the body, in the direction of internal rotation against gravity.

End position: The shoulder joint is in internal rotation, forearm is in front of the body.

Communication, exercise instructions: Lift your forearm holding the weight and keeping your elbow stable in one point, bring your forearm closer to your body.

**Shoulder joint internal rotation – concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with flexible resistance)**



(SP)



(EP)

Starting position: Patient lying one side, upper arm underneath resting on bed with elbow bent at right angle, forearm hanging from bed, shoulder joint in neutral position (or in external rotation if the muscle is in extended position), one end of resistance band is secured under bed, other end is in hand stretched.

Movement description: The forearm moves closer to the body, in the direction of internal rotation, against the resistance of the band.

End position: The shoulder joint is in internal rotation, the forearm is close to the body.

Communication, exercise instructions: Lift your forearm keeping your elbow stable in one point, bring your forearm close to your body firmly stretching the resistance band.

**Shoulder joint internal rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Patient lying on side, upper arm underneath resting on bed with elbow bent at right angle, forearm kept close to body, shoulder joint in internal rotation.

Movement description: Patient lying on side, upper arm underneath resting on bed with elbow bent at right angle, the forearm moves away from the body, the shoulder joint is in external rotation.

End position: The shoulder joint is in external rotation, the forearm is away from the body.

Communication, exercise instructions: Allow your forearm to slowly sink keeping your elbow stable in one point, move your forearm away from your body.

**Shoulder joint internal rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with weight)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm underneath resting on bed with elbow bent at a right angle, forearm kept close to body, shoulder joint in internal rotation, weight in hand.

Movement description: The forearm slowly sinks in the direction of external rotation, controlling the speed against the resistance of the weight.

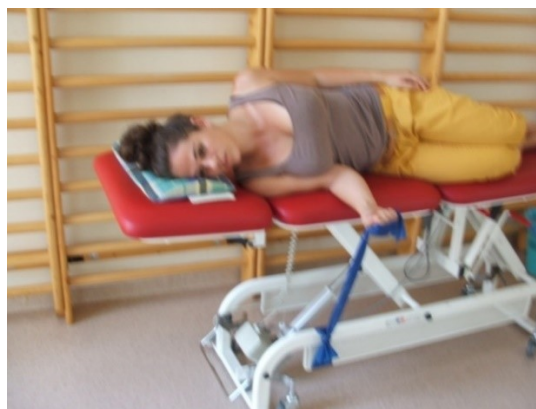
End position: The shoulder joint is in external rotation, the forearm is away from the body, the weight is in hand.

Communication, exercise instructions: Allow your forearm to slowly sink keeping your elbow stable in one point and holding the weight, move your forearm away from your body. Control the speed.

**Shoulder joint internal rotation – eccentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with flexible resistance)**



(SP)



(EP)

Starting position: Patient lying on side, upper arm underneath resting on bed with elbow bent at right angle, forearm kept close to body, shoulder joint in internal rotation, resistance band firmly stretched, one end secured under bed.

Movement description: The forearm slowly sinks in the direction of external rotation, controlling the speed against the resistance of the band.

End position: The shoulder joint is in external rotation, the forearm is away from the body, the resistance band is loose.

Communication, exercise instructions: Allow your forearm to slowly sink keeping your elbow stable in one point, move your forearm away from your body against the resistance of the band, control the speed.

Shoulder joint abduction – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient lying on back, arms extended near body.

Movement description: Arm was to move sideways away from the body (movement should be demonstrated manually).

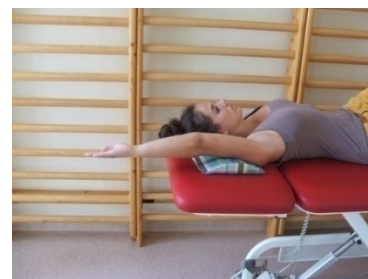
End position: No actual movement.

Communication, exercise instructions: Imagine and try as if you were to move your arm sideways away from your body.

Shoulder joint abduction – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

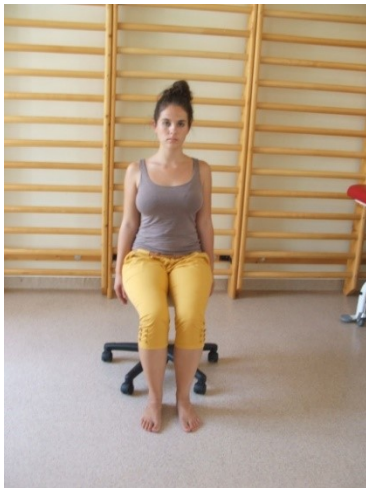
Starting position: Patient lying on back, arms extended near body.

Movement description: The extended arm moves away from the body sideways sliding parallel to the bed or the floor (manual support is possible).

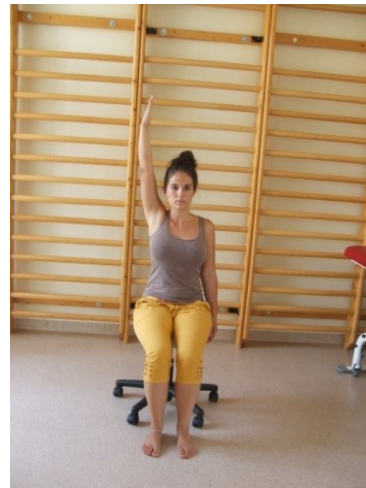
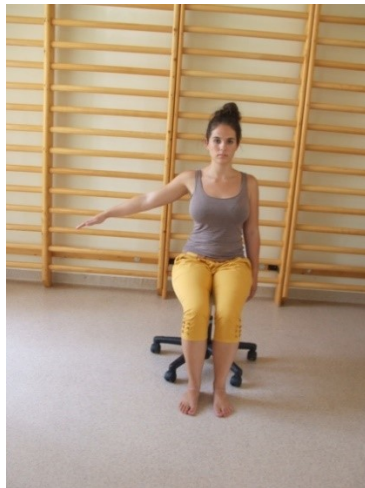
End position: Arm is extended near the ear.

Communication, exercise instructions: Slide your arm on the bed sideways up to your ear.

Shoulder joint abduction – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting or standing, arm extended near body.

Movement description: The extended arm moves away from the body to the ear resisting gravity.

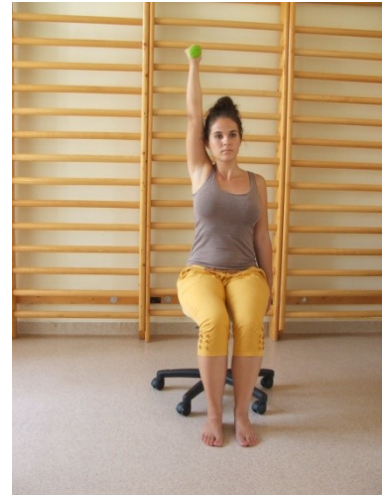
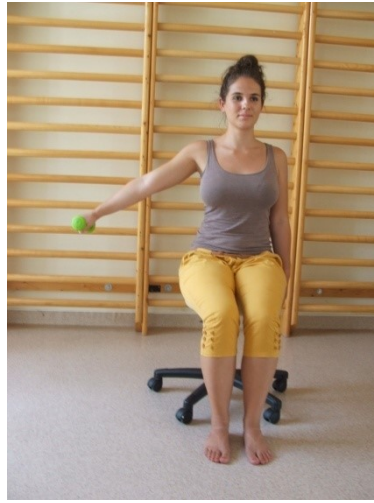
End position: Arm is extended near the ear.

Communication, exercise instructions: Lift your arm away from your body up to your ear.

Shoulder joint abduction – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

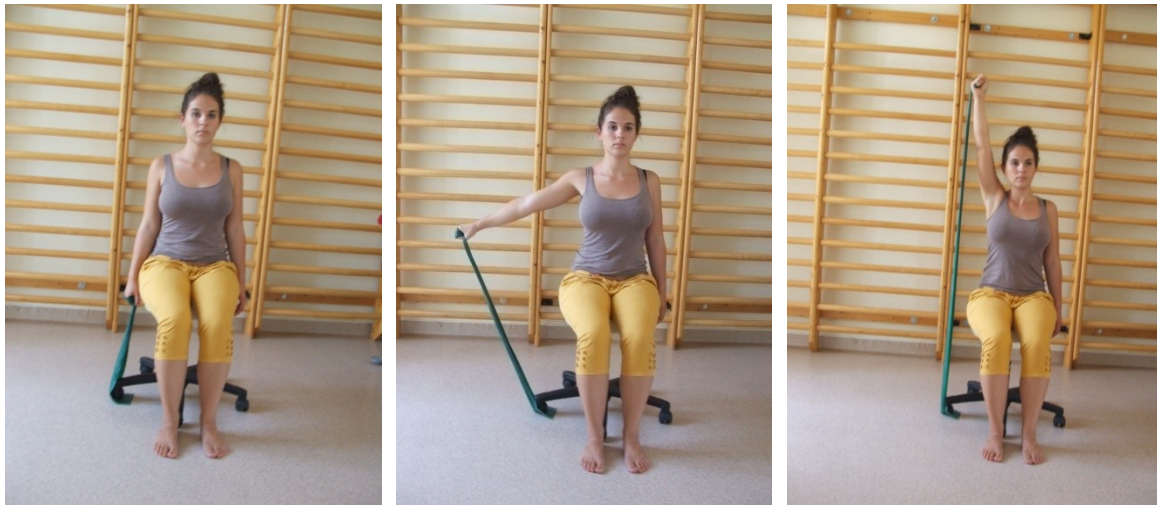
Starting position: Patient sitting or standing, arm extended near body, weight in hand.

Movement description: The extended arm moves away from the body to the side against the resistance of the weight.

End position: The arm is extended near the ear, weight is in hand.

Communication, exercise instructions: Lift your extended arm away from your body to the side up to your ear.

Shoulder joint abduction – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)

(EP)

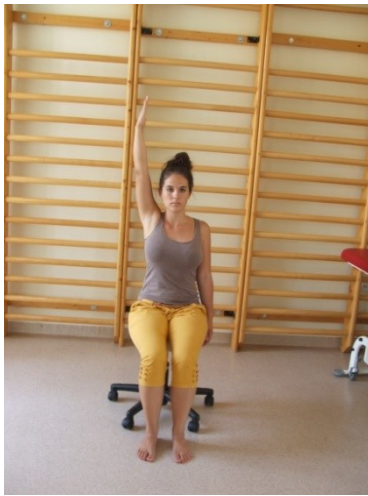
Starting position: Patient sitting or standing, arm extended near body, one end of resistance band secured under foot, other end in hand.

Movement description: The extended arm is raised away from the body to the side against the resistance of the band.

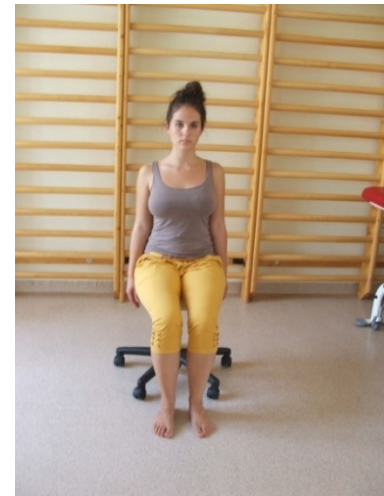
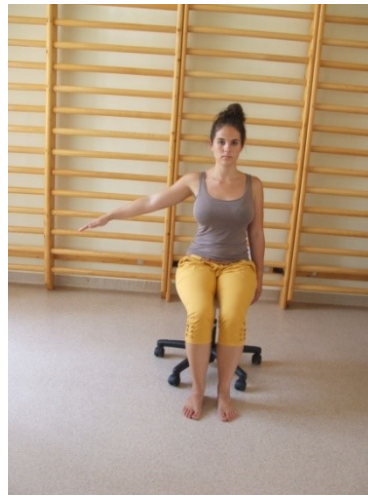
End position: The arm is extended near the ear, band is taut.

Communication, exercise instructions: Lift your arm away from your body to the side up to your ear, stretch the band keeping your wrist extended all the time.

Shoulder joint abduction – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting or standing, arm extended near ear.

Movement description: The extended arm slowly sinks from the ear to the side against gravity.

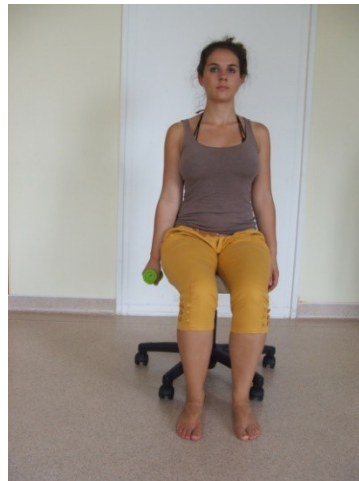
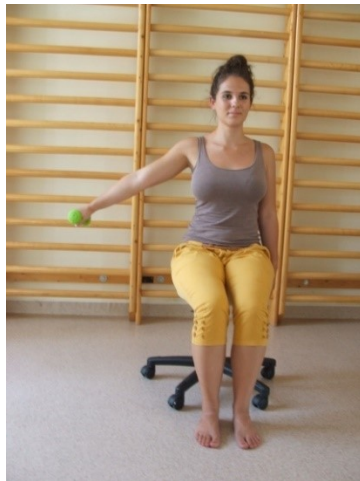
End position: Arm extended near the body.

Communication, exercise instructions: Slowly lower your arm to your side, control the speed.

Shoulder joint abduction – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

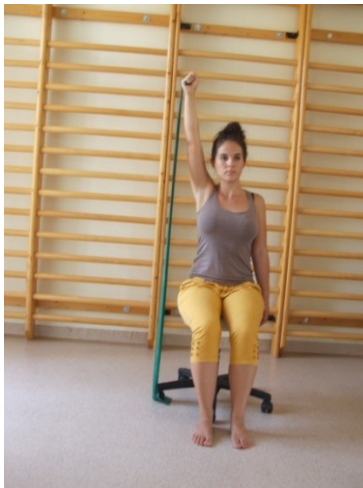
Starting position: Patient sitting or standing, arm extended near ear, weight in hand.

Movement description: The extended arm slowly sinks from the ear to the side against the resistance of the weight.

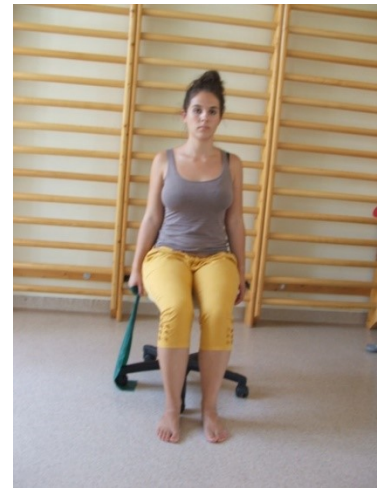
End position: Arm extended near the body.

Communication, exercise instructions: Slowly lower your arm to your side, control the speed against the resistance of the weight.

Shoulder joint abduction – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting or standing, arm extended near ear, one end of resistance band secured under patient's foot, other end in hand, fully taut

Movement description: The extended arm slowly sinks from the ear to the side against the resistance of the band.

End position: Arm extended near the body.

Communication, exercise instructions: Slowly lower your arm to your side, control the speed against the resistance of the band keeping your wrist extended all the time.

Shoulder joint flexion – isometric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

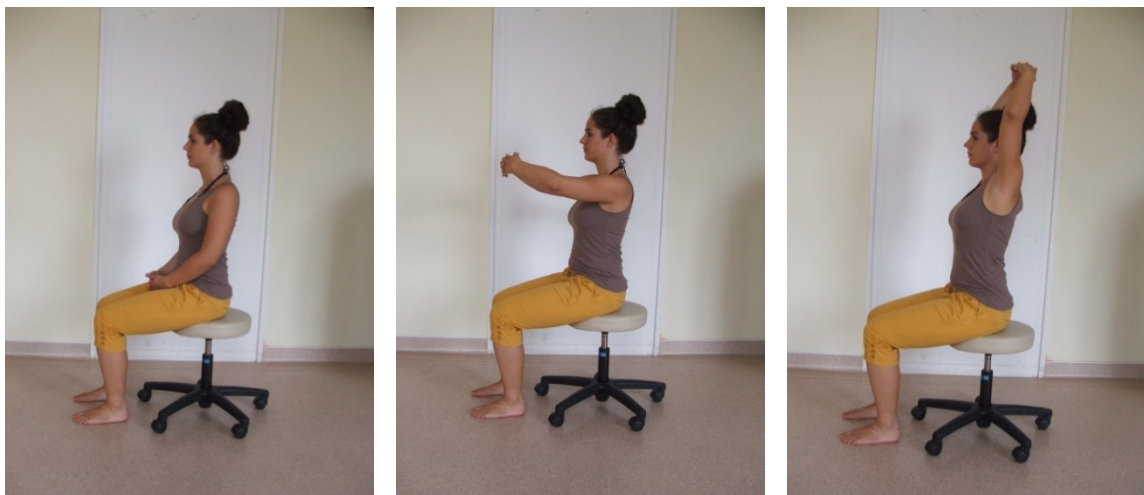
Starting position: Patient walk standing facing wall, arm near body, elbow bent at right angle, ball on wall at elbow level.

Movement description: The ball is pressed with hand clenched, perpendicular force without movement effect, position is held for 8-10 seconds.

End position: The ball is pressed with hand clenched, perpendicular force without movement effect, position is held for 8-10 seconds.

Communication, exercise instructions: Press the ball at elbow level with your hand clenched keeping your upper arm near your body, hold for 8-10 seconds.

Shoulder joint flexion – mobilization exercise



(SP)

(EP)

Starting position: Patient sitting on chair, arms with fingers laced together, loosely resting in patient's lap, shoulder joint in neutral position.

Movement description: Arms are raised with fingers laced together and elbow slightly bent up to ear level.

End position: Arms lifted near the ears, fingers laced together, elbow extended.

Communication, exercise instructions: Lift your arms up to your ears with your fingers laced together and elbow slightly bent and extend both arms when you reach your ears.

Note: The stronger arm can support the weaker one.

Shoulder joint flexion/extension – closed kinematic chain exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: Patient walk standing facing wall, one arm extended at shoulder level leaning against wall.

Movement description: Weight is shifted forward on arm leaning against the wall while elbow is bent and extended again.

End position: Weight is on the arm leaning against the wall while the elbow is bent.

Communication, exercise instructions: Shift your weight on your arm leaning against the wall at shoulder level, bend and extend your arm in this position.

Shoulder joint combined exercise



(SP)



(EP)

Starting position: Patient walk standing facing wall bars, one arm extended high holding one end of resistance band, other end secured high on wall bars in opposite direction. Other arm near body.

Movement description: The arm is pulled down with elbow bent and band firmly stretched behind the body.

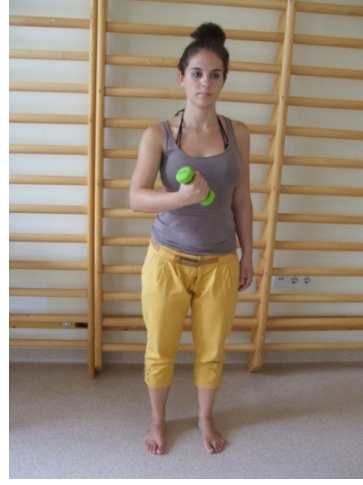
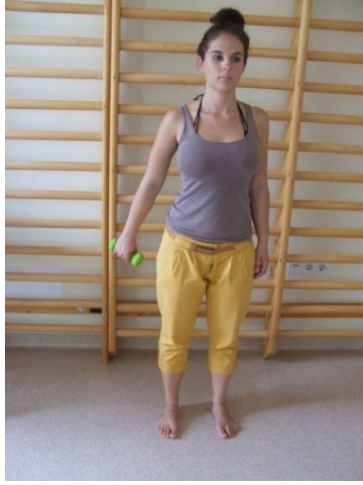
End position: Arm bent is behind the body, the band is taut.

Communication, exercise instructions: Pull your arm down behind your body bending your elbow and firmly stretching the band.

Shoulder joint complex exercise



(SP)



(EP)

Starting position: Patient walk standing, both arms near body, weight in one hand, palm facing backwards.

Movement description: Weight is moved to touch opposite shoulder with elbow bent, arm pulled across body at shoulder level, palm facing downwards.

End position: Weight is moved to touch opposite shoulder with elbow bent, arm pulled across body at shoulder level, palm facing downwards.

Communication, exercise instructions: Touch your opposite shoulder with the weight while bending your elbow, keep your arm at shoulder level with your palm facing downwards.

2.3. Elbow joint exercises

Elbow joint flexion – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient lying on back, arms extended near body resting on table.

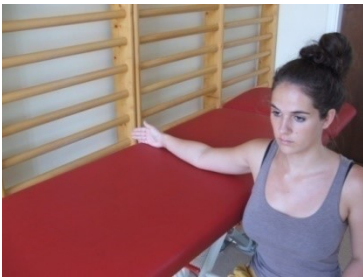
Movement description: Patient trying to bend elbow (direction of movement should be demonstrated manually).

End position: No actual movement.

Communication, exercise instructions: Imagine and try as if you were to bend your elbow.

Note: The therapist demonstrates the direction of movement on the front part of the forearm with hand.

Elbow joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient sitting, arm extended on table, forearm resting with thumb upward.

Movement description: The elbow is bent parallel to the table, the forearm slides on the table (manual support is possible).

End position: The elbow is bent; the arm is close to the shoulder.

Communication, exercise instructions: Bend your elbow by sliding your forearm on the table.

Elbow joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting or standing, arm near body with elbow extended.

Movement description: The hand moves close to the shoulder by bending the elbow against gravity, the upper arm is kept against the body.

End position: The hand is at the shoulder, the elbow is bent.

Communication, exercise instructions: Touch your shoulder with your hand facing forward by bending your elbow.

Elbow joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

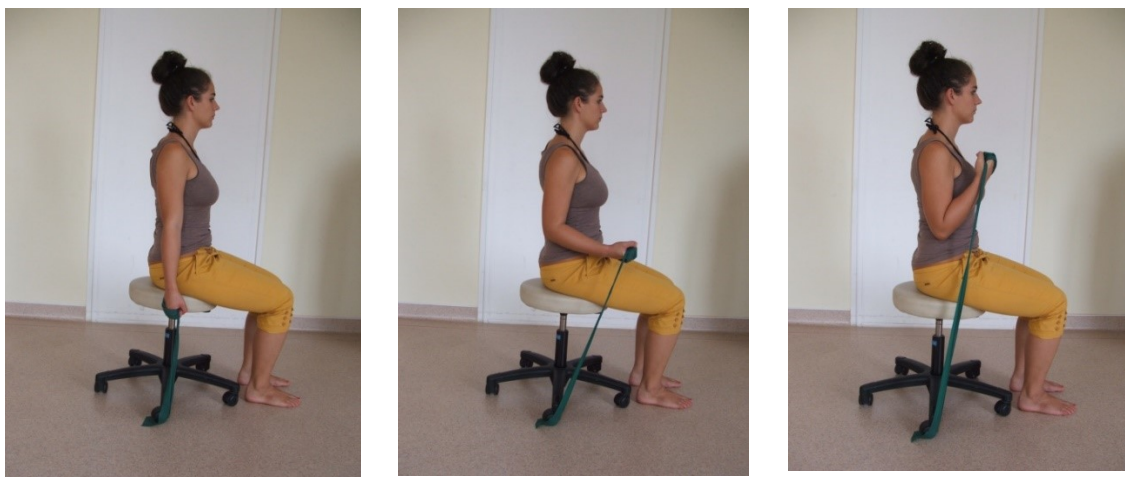
Starting position: Patient sitting or standing, arm near body with elbow extended, weight in hand.

Movement description: The hand moves close to the shoulder by bending the elbow against the resistance of the weight, the upper arm is kept against the body.

End position: The weight is at the shoulder, the elbow is bent.

Communication, exercise instructions: Lift the weight to your shoulder with your hand facing forward by bending your elbow.

Elbow joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)

(EP)

Starting position: Patient sitting or standing, arm near body with elbow extended, one end of resistance band secured under patient's foot, other end in patient's hand.

Movement description: The hand moves close to the shoulder by bending the elbow against the resistance of the band, the upper arm is kept against the body.

End position: The hand touches the shoulder, band is taut, the elbow is bent.

Communication, exercise instructions: Touch your shoulder with your hand facing forward by bending your elbow and firmly stretching the band.

Elbow joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting or standing, hand touching shoulder with elbow bent.

Movement description: The arm is lowered to the side by slowly bending the elbow against gravity, the upper arm is kept against the body.

End position: Arm extended near the body.

Communication, exercise instructions: Slowly extend your elbow and lower your arm to your side.

Elbow joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

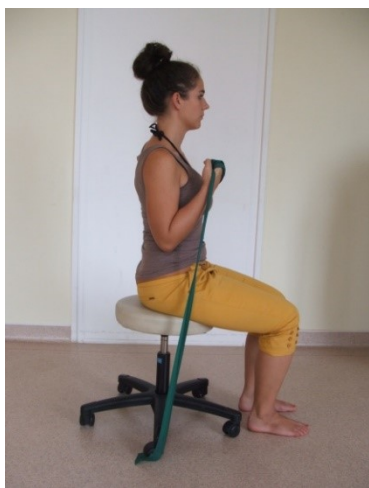
Starting position: Patient sitting or standing, hand touching shoulder with elbow bent, weight in hand.

Movement description: The arm is lowered to the side by slowly bending the elbow against the resistance of the weight and controlling the speed. The hand faces upward all the time.

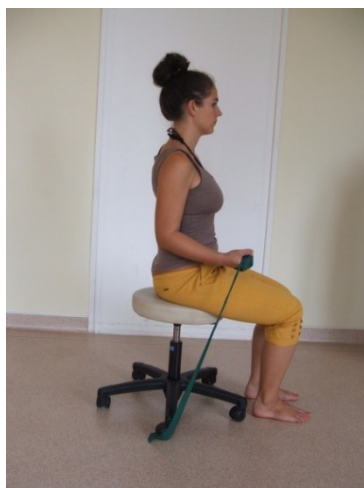
End position: Arm extended near the body.

Communication, exercise instructions: Slowly extend your elbow holding the weight with your hand facing upward all the time, lower your arm to your side. Control the speed.

Elbow joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting or standing, hand touching shoulder with elbow bent, resistance band secured under foot, fully taut.

Movement description: The arm is lowered to the side by slowly bending the elbow, controlling the speed against the resistance of the band, the upper arm is kept against the body. The hand faces upward all the time.

End position: Arm extended near the body, the band is loose.

Communication, exercise instructions: Slowly extend your elbow, control the speed, hold the band with your hand facing upward all the time, lower your arm to your side.

Note: The wrist remains extended all the time.

Elbow joint pronation – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient sitting at table, forearm on table with elbow bent and thumb upward.

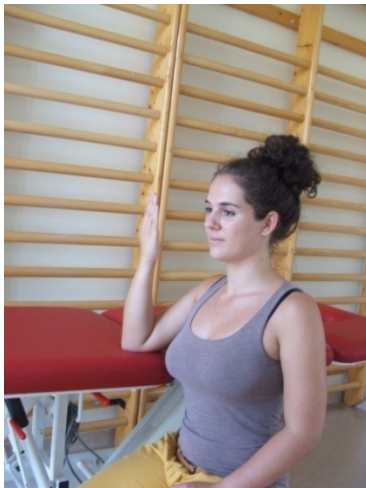
Movement description: Patient trying to rotate hand, forearm in the direction of tabletop (direction of movement should be demonstrated manually).

End position: No actual movement.

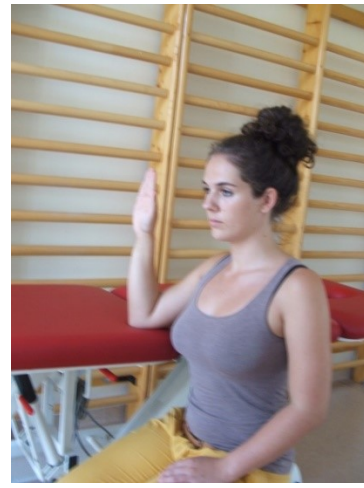
Communication, exercise instructions: Imagine and try as if you were to lay your hand on the table with your palm facing downward.

Note: The therapist demonstrates the direction of movement on the forehead with hand.

Elbow joint pronation – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient sitting at table, elbow resting on table, forearm vertical, palm facing backward.

Movement description: The forearm rotates around its centre, the palm turns to face forward.

End position: The forearm rests on the table in vertical position with the palm facing forward.

Communication, exercise instructions: Rotate your hand and forearm so that your palm faces forward.

Elbow joint pronation – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, forearm and palm facing upward.

Movement description: The hand and the forearm turn in the direction of the tabletop.

End position: Forearm rests on the table with thumb upward.

Communication, exercise instructions: Rotate your hand and forearm towards the tabletop until your thumb is upward.

Elbow joint pronation – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, forearm and palm facing upward, weight in hand.

Movement description: The hand turns in the direction of the tabletop while holding the weight.

End position: Forearm rests on the table with thumb upward.

Communication, exercise instructions: Rotate your hand and forearm towards the tabletop until your thumb is upward while holding the weight.

Elbow joint pronation – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, forearm and palm facing downward, one end of resistance band secured from direction of thumb, other end in hand.

Movement description: The hand rotates in the direction of the tabletop while band is firmly stretched.

End position: Hand rests on the table with thumb upward, the band is fully taut.

Communication, exercise instructions: Rotate your hand towards the tabletop resisting the band.

Elbow joint pronation – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, forearm resting with thumb upward.

Movement description: The hand and forearm slowly rotate toward the tabletop so that the palm faces upward.

End position: The forearm is on the table with palm facing upward.

Communication, exercise instructions: Slowly rotate your hand and forearm toward the tabletop so that your palm faces upward.

Elbow joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, forearm resting with thumb upward. Wrist and hand not supported, weight in hand.

Movement description: The hand and forearm slowly rotate toward the tabletop so that the palm faces upward. Control the speed against the resistance of the weight.

End position: The forearm is on the table with palm facing upward, weight is in the hand.

Communication, exercise instructions: Slowly rotate your hand and forearm toward the tabletop so that your palm faces upward. Control the speed.

Elbow joint pronation – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, hand and forearm resting with thumb upward. Wrist and hand not supported, resistance band fully taut, one end secured at table from direction of thumb.

Movement description: The hand and forearm slowly rotate toward the tabletop so that the palm faces upward. Control the speed against the resistance of the band.

End position: The forearm is on the table with palm facing upward, the band is loose.

Communication, exercise instructions: Slowly rotate your hand and forearm toward the tabletop so that your palm faces upward. Control the speed.

Elbow joint extension – isometric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)

Starting position: Patient walk standing facing wall bars with elbow bent at right angle, forearm and hand facing downward. Resistance band tied to wall bars hanging in a loop, wrist in loop, band taut.

Movement description: Elbow is extended against the resistance of taut band without actual movement. Position held for 10 seconds

End position: Elbow remains bent, the band is fully taut.

Communication, exercise instructions: Firmly stretch the band without movement as if you extended your elbow, hold this position for 10 seconds.

Note: Shoulder girdles should not rise or sink during the exercise.

Elbow joint flexion/extension – closed kinematic chain exercise



(SP)



(EP)

Starting position: Patient sitting facing wall bars, hands leaning against wall wider than shoulder width with elbow extended.

Movement description: Slowly both elbows bend then extend again holding the weight of the upper part of the body.

End position: Patient leaning against the wall bars with elbow extended, trunk tilted with straight back.

Communication, exercise instructions: Slowly bend your elbows and extend them again keeping your weight on your arms all the time, tilting your trunk with straight back.

Elbow joint flexion/extension – mobilization exercises



(SP)



(EP)

Starting position: Patient sitting, hands folded, arms extended at shoulder level.

Movement description: Folded hands touch one shoulder by bending both elbows then extend again, one hand may control the other one's movement.

End position: Folded hands touch one shoulder, both elbows are extended.

Communication, exercise instructions: Bend both elbows with your hands folded, extend elbows again, one arm may control the other one's movement.

Note: Compensation movement by shoulder girdles and trunk must be prevented.

Elbow joint – combined exercises



(SP)



(EP)

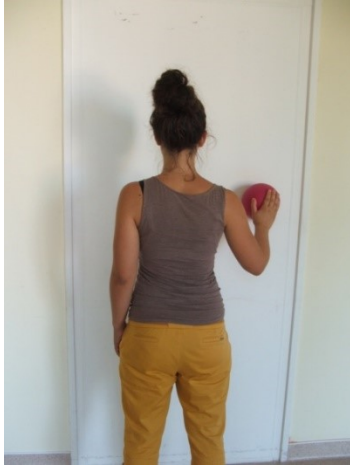
Starting position: Patient standing, arm extended near body.

Movement description: Patient touches top of the head by lifting the arm and bending the elbow.

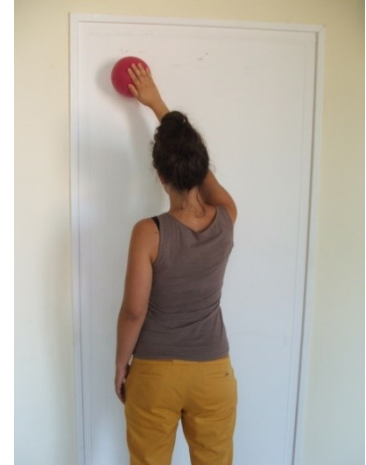
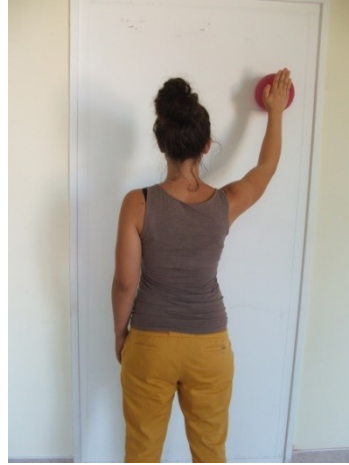
End position: The hand is on top of the head, elbow and shoulder are bent.

Communication, exercise instructions: Lift your arm and touch your head by bending your elbow.

Elbow joint – complex exercises



(SP)



(EP)

Starting position: Patient walk standing facing wall, holding ball at shoulder level on wall, other hand near body.

Movement description: Patient drawing large circles with the ball in one hand on the wall with the elbow and the shoulder moving simultaneously.

End position: Patient drawing large circles with the ball in one hand on the wall with the elbow and the shoulder moving simultaneously.

Communication, exercise instructions: Hold the ball in your hand and draw large circles one the wall with one hand.

2.4. Wrist joint exercises

Wrist joint flexion – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient sitting at table, forearm on table with elbow bent, forearm resting with thumb upward, fingers relaxed.

Movement description: Patient trying to tilt wrist in the direction of the body (direction of movement should be demonstrated manually).

End position: No actual movement.

Communication, exercise instructions: Imagine and try as if your were to tilt your wrist in the direction of your body.

Note: The therapist demonstrates the direction of the movement with hand from the direction of the palm.

Wrist joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, wrist in neutral position (or slightly extended), hand resting with thumb upward, fingers relaxed.

Movement description: The wrist tilts in the direction of the palm by sliding hand on the table with fingers relaxed (manual support is possible).

End position: The wrist is on the table tilted in the direction of the palm.

Communication, exercise instructions: Tilt your wrist in the direction of your body holding your hand on the table.

Note: The therapist may support the movement with hand from the side of the little finger.

Wrist joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)

(EP)

Starting position: Patient sitting at table, forearm resting on table, hand from wrist hanging from edge of table. Palm and forearm facing upward, wrist in neutral position (or slightly extended), fingers relaxed.

Movement description: The wrist tilts in the direction of the palm against gravity, fingers are relaxed, forearm remains on table.

End position: The wrist is tilted in the direction of the palm against gravity.

Communication, exercise instructions: Tilt your wrist in the direction of your body.

Wrist joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting at table, forearm resting on table (pad), hand from wrist hanging from edge of table. Palm and forearm facing upward, wrist in neutral position (or slightly extended), fingers relaxed, weighted ball in hand.

Movement description: The wrist tilts in the direction of the palm against the resistance of the weighted ball, forearm remains on the table.

End position: The wrist is tilted in the direction of the palm against the resistance of the weighted ball.

Communication, exercise instructions: Lift the weight while tilting your wrist in the direction of your body keeping your forearm on the table.

Wrist joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)



Starting position: Patient sitting at table, forearm resting on table, hand from wrist hanging from edge of table. Palm and forearm facing upward, wrist in neutral position (or slightly extended), one end of resistance band in hand, other end secured under table.

Movement description: The wrist tilts in the direction of the palm against the resistance of the band, forearm remains on the table.

End position: The wrist is tilted in the direction of the palm against the resistance of the band, band is fully taut.

Communication, exercise instructions: Tilt your wrist in the direction of your body while firmly stretching the band and keeping your forearm on the table.

Wrist joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting at table, forearm resting on table (pad), hand from wrist hanging from edge of table. Palm facing upward, wrist tilted in the direction of palm, fingers relaxed.

Movement description: The wrist slowly bends backwards against gravity, fingers are relaxed, forearm remains on table.

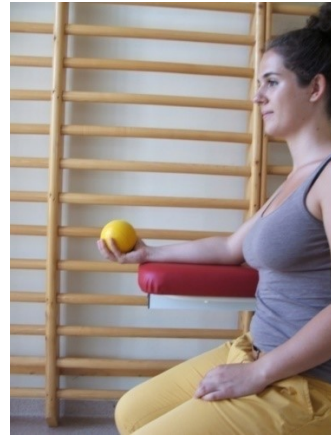
End position: The wrist is extended against gravity.

Communication, exercise instructions: Slowly extend your wrist, allow it to sink from the edge of the table.

Wrist joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

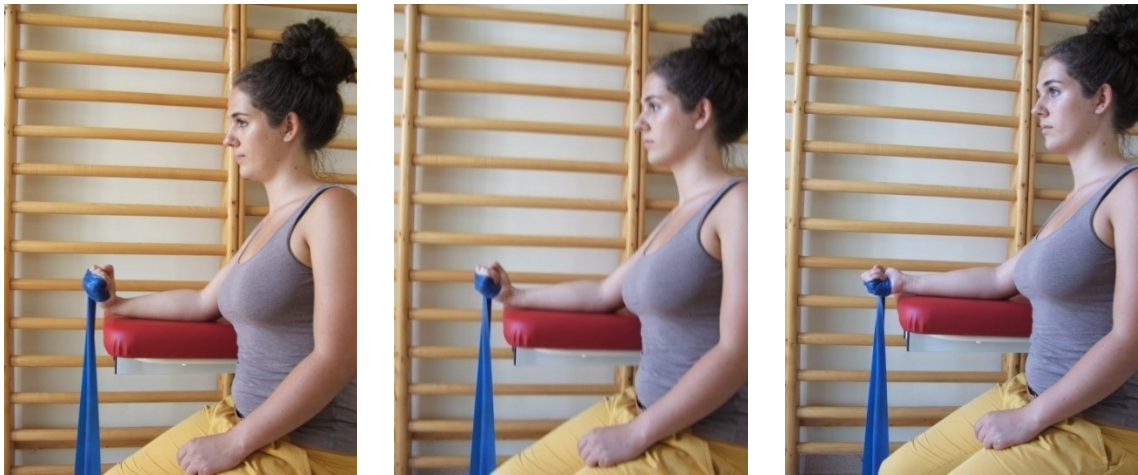
Starting position: Patient sitting at table, forearm resting on table (pad), hand from wrist hanging from edge of table. Palm facing upward, wrist tilted in the direction of palm, weighted ball in hand.

Movement description: Wrist slowly bends backwards against the resistance of the weighted ball, speed is controlled, forearm remains on the table.

End position: The wrist is extended against the resistance of the weighted ball.

Communication, exercise instructions: Slowly extend your wrist in the direction of the floor, control the speed.

Wrist joint flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)

(EP)

Starting position: Patient sitting at table, forearm resting on table (pad), hand from wrist hanging from edge of table. Palm facing upward, wrist tilted in direction of palm, resistance band fully taut in hand, other end of band secured under table.

Movement description: Wrist slowly bends backwards against the resistance of the band, speed is controlled, forearm remains on the table.

End position: The wrist is slowly extended against the resistance of the band. The band is loose.

Communication, exercise instructions: Slowly extend your wrist in the direction of the floor, control the speed.

Wrist joint radial deviation – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Patient sitting at table, forearm on table, palm facing table, wrist in neutral position or slightly tilted in the direction of little finger, fingers relaxed.

Movement description: Patient trying to slide hand in the direction of the thumb (direction of movement should be demonstrated manually).

End position: No actual movement.

Communication, exercise instructions: Imagine and try as if you were to tilt your wrist in the direction of your thumb.

Note: The therapist demonstrates the direction of the movement with hand from the direction of the thumb.

Wrist joint radial deviation – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table, palm facing table, wrist in neutral position or slightly tilted in the direction of little finger, fingers relaxed.

Movement description: Hand slides on the table in the direction of the thumb (manual support is possible).

End position: The wrist is tilted in the direction of the thumb.

Communication, exercise instructions: Slide your hand and tilt your wrist in the direction of your thumb.

Note: The therapist may support the movement by stabilizing the patient's hand.

Wrist joint radial deviation – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

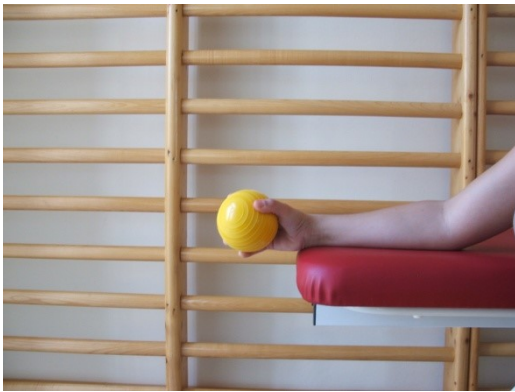
Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Hand resting with thumb upward, wrist tilted in direction of little finger, fingers relaxed.

Movement description: The hand rises and the wrist tilts against gravity, in the direction of the thumb.

End position: The wrist is tilted in the direction of the thumb against gravity.

Communication, exercise instructions: Lift your arm and tilt your wrist in the direction of your thumb.

Wrist joint radial deviation – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Hand resting with thumb upward, wrist tilted in direction of little finger, weighted ball in hand.

Movement description: The hand rises and the wrist tilts against the resistance of the weighted ball, in the direction of the thumb.

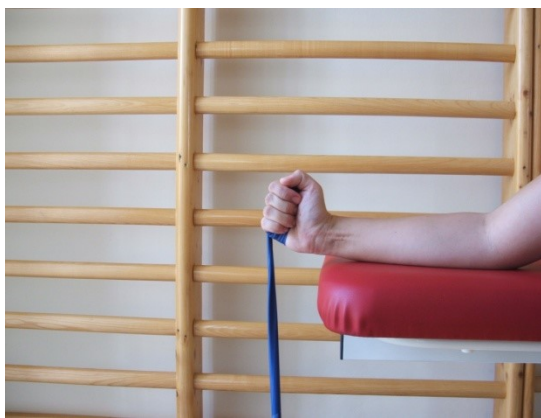
End position: The wrist is tilted in the direction of the thumb against the resistance of the weight.

Communication, exercise instructions: Lift the weight and tilt your wrist in the direction of your thumb.

Wrist joint radial deviation – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Hand resting with thumb upward, wrist tilted in direction of little finger, resistance band in hand, taut.

Movement description: The hand rises and the wrist tilts against the resistance of the band, in the direction of the thumb.

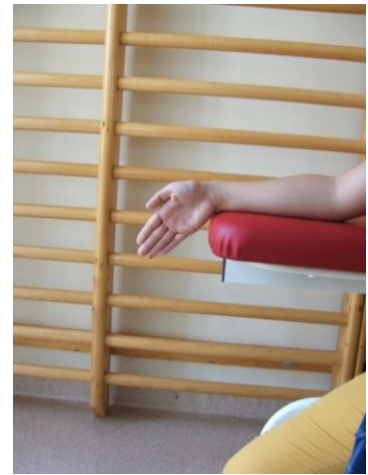
End position: The wrist is tilted in the direction of the thumb against the resistance of the band.

Communication, exercise instructions: Lift your hand and tilt your wrist in the direction of your thumb firmly stretching the band.

Wrist joint radial deviation – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table with elbow bent, hand hanging from wrist, hand resting with thumb upward, wrist tilted in direction of thumb, fingers relaxed.

Movement description: The hand slowly sinks and the wrist tilts in the direction of the little finger against gravity.

End position: The wrist is tilted in the direction of the little finger against gravity.

Communication, exercise instructions: Allow your hand to slowly sink and tilt your wrist in the direction of your little finger, control the speed.

Wrist joint radial deviation – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with weight)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Wrist tilted in direction of thumb, weighted ball in hand.

Movement description: The hand slowly sinks with controlled speed and the wrist tilts in the direction of the little finger against the resistance of the weight.

End position: The wrist is tilted in the direction of the little finger against the resistance of the weighted ball.

Communication, exercise instructions: Allow your hand to slowly sink and tilt your wrist in the direction of your little finger, control the speed.

Wrist joint radial deviation – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



(SP)



(EP)

Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Wrist tilted in direction of thumb, resistance band in hand, taut.

Movement description: Patient sitting at table, forearm on table, hand hanging from wrist. Wrist tilted in direction of thumb, resistance band in hand, fully taut.

End position: The hand slowly sinks with controlled speed and the wrist tilts in the direction of the little finger against the resistance of the band.

Communication, exercise instructions: The wrist is tilted in the direction of the little finger against the resistance of the band.

Wrist joint extension – isometric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with flexible resistance)



Starting position: Patient sitting at table, forearm on table, hand hanging from wrist. Forearm and hand clenched facing downward, resistance band wrapped around backhand, taut.

Movement description: Patient holding hand and wrist extended for 10 seconds by stretching the resistance band (shortening its length from below) without movement.

End position: The forearm and hand clenched facing downward, resistance band is wrapped around the backhand, position held for 10 seconds against the resistance of the band.

Communication, exercise instructions: Hold your wrist extended for 10 seconds with your hand clenched against the resistance of the band.

Wrist joint – closed kinematic chain exercise



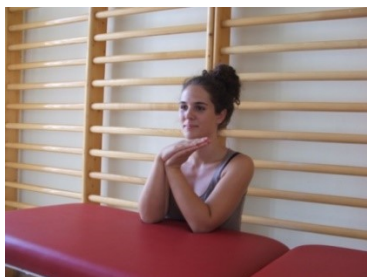
Starting position: Patient walk standing facing wall bars, dynair on wall at shoulder level, hand clenched leaning on dynair, wrist joint in neutral position.

Movement description: Patient shifting weight on the arm leaning on dynair while wrist and elbow are further bent. Dynair is pressed against the wall.

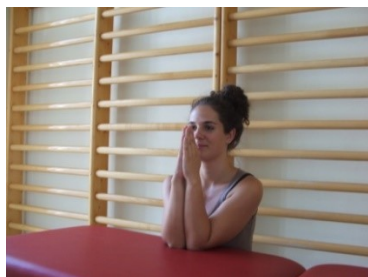
End position: Patient's weight is on foot in the front and arm leaning on wall, the wrist is further tilted and dynair is pressed against the wall.

Communication, exercise instructions: Bend your elbow and your wrist by shifting your weight on your foot in the front and leaning on dynair.

Wrist joint flexion/extension – mobilization exercises



(SP)



(EP)

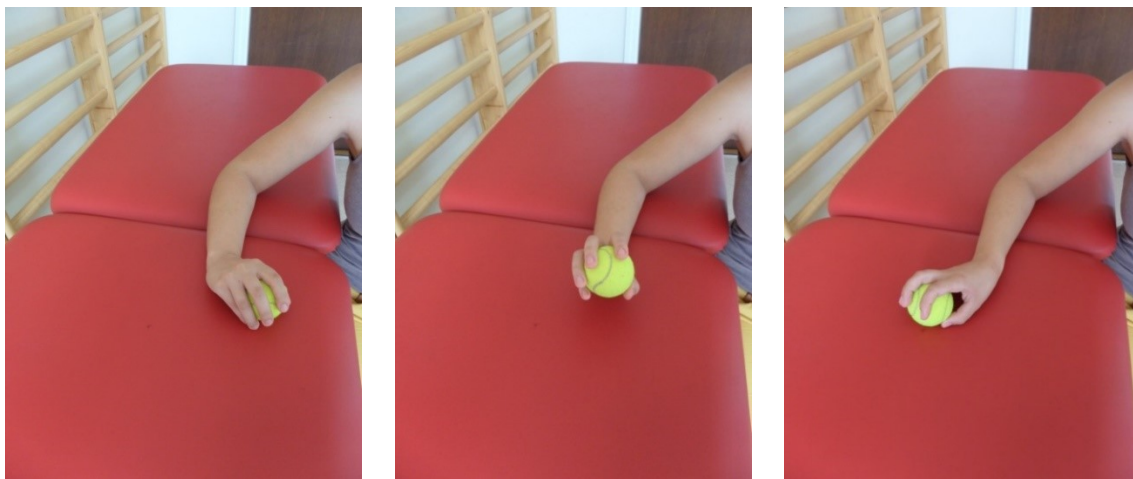
Starting position: Patient sitting at table, elbow bent, two palms joined, wrists close in straight line with forearm.

Movement description: One hand bends the other hand backwards and back with arms resting on elbows.

End position: One hand bends the other hand backwards with palms joined and arms resting on elbows.

Communication, exercise instructions: Bend your wrist backwards with one hand and back with your other hand with your palms joined and your arms resting on your elbows.

Wrist joint – combined exercise



(SP)

(EP)

Starting position: Patient sitting at table, forearm and hand facing table, tennis ball in hand.

Movement description: The tennis ball is passed from the side of the thumb to the side of the little finger by moving the wrist, the forearm remains on the table all the time.

End position: Tennis ball and hand are on the side of the little finger, the wrist is tilted in the direction of the little finger.

Communication, exercise instructions: Pass the tennis ball from the side of your thumb to the side of your little finger by moving your wrist, keep your forearm on the table all the time and lift the ball high.

Wrist joint – complex exercises



(SP)



(EP)

Starting position: Patient sitting at table; forearm and hand facing table, spoon in hand.

Movement description: Patient lifts the spoon to the mouth by bending the elbow.

End position: The spoon touches the mouth by bending the elbow.

Communication, exercise instructions: Hold the spoon and lift it to your mouth.

2.5. (II-V.) Exercises for metacarpophalangeal joints

Metacarpophalangeal joint flexion - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Sitting at the table, the forearm is on the table, the palm is supported on the edge of the little finger, the wrist is in base position, the fingers are extended.

Movement description: With extended fingers try to bend the basal joints of the fingers (manually have the patient feel the movement direction).

End position: No displacement

Communication, exercise instructions: Imagine and try to bend your basal joints with extended fingers.

Comment: Attendant's hand makes the patient feel the direction of movement on the palm side of the fingers.

**Metacarpophalangeal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the palm is supported on the edge of the little finger, the wrist is in base position, the fingers are extended.

Movement description: Bending the basal joints with extended fingers, fingers sliding on the table (manual support to the movement can be offered)

End position: With extended fingers, basal joints are in bent position, fingers on the table.

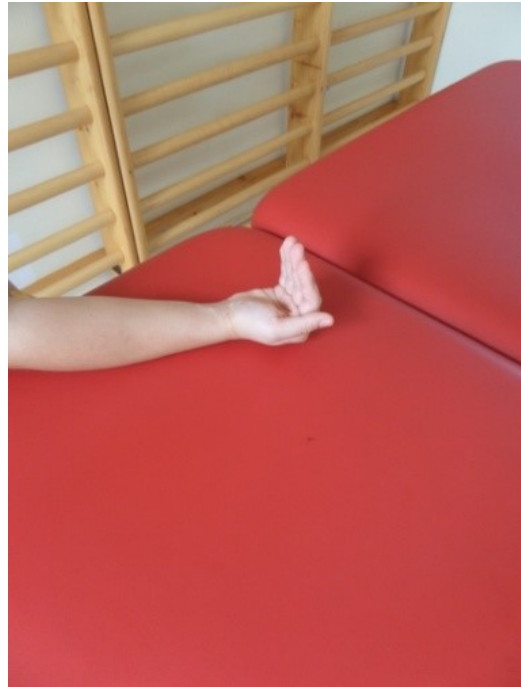
Communication, exercise instructions: Bend your basal joints with extended fingers, while sliding the fingers on the table.

Attendant's hand can offer support to the movement by propping up the edge of the little finger.

**Metacarpophalangeal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is on the table with palm facing upward, the fingers are extended.

Movement description: Bending the basal joints with extended fingers against gravity.

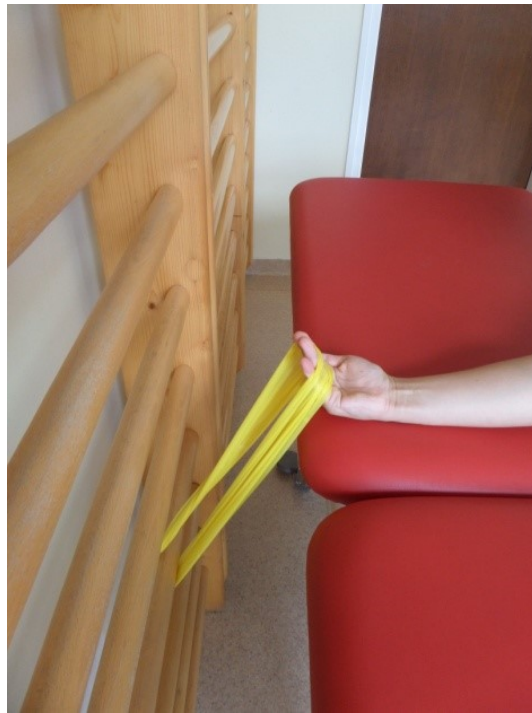
End position: Basal joints bent against gravity with extended fingers.

Communication, exercise instructions: Bend your basal joints against gravity with extended fingers.

**Metacarpophalangeal joint flexion- concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with elastic resistance)**



(SP)



(EP)

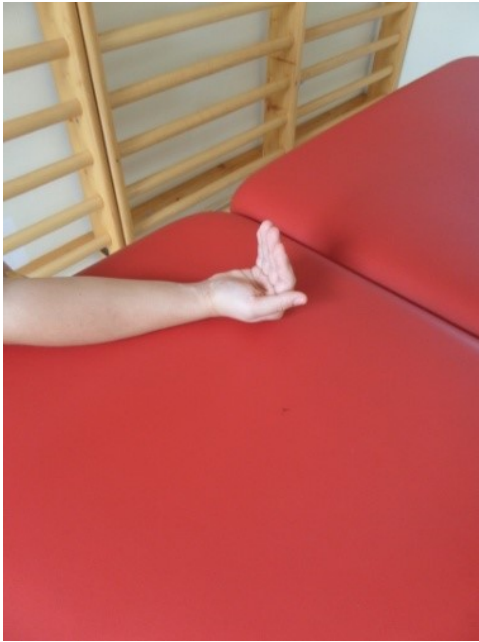
Starting position: Sitting at the table, the forearm is on the table, the hand is on the table with palm facing upward, the fingers are extended, the band is wrapped around the fingers (II-V).

Movement description: Bending the basal joints with extended fingers against the resistance of the band.

End position: Basal joints bent with extended fingers against the resistance of the band.

Communication, exercise instructions: With extended fingers lift the band and bend your basal joints of the fingers against gravity.

**Metacarpophalangeal joint flexion - eccentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is on the table with palm facing upward, with extended fingers, the basal joints of the fingers are in bent position.

Movement description: Slow extension of the basal joints with extended fingers against gravity.

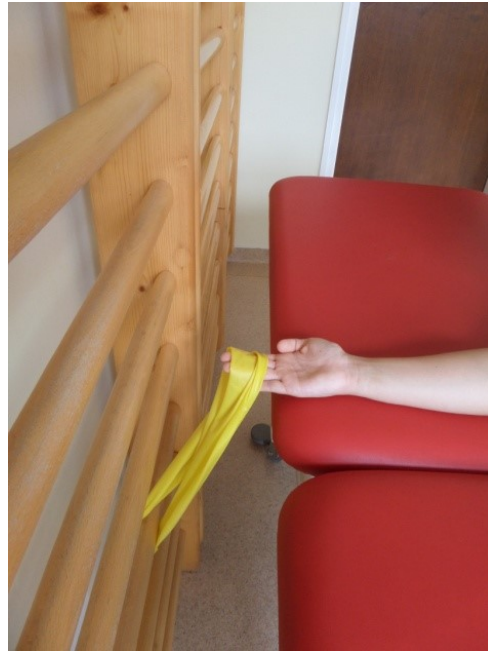
End position: The basal joints are extended with extended fingers.

Communication, exercise instructions: Slowly extend the basal joints of the fingers against gravity, with extended fingers, slow down the movement.

**Metacarpophalangeal joint flexion- eccentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with elastic resistance)**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is on the table with palm facing upward, with extended fingers, the basal joints of fingers are in bent position, the band is wrapped around the fingers (II-V), fully taut.

Movement description: Slow extension of basal joints with extended fingers against the resistance of the band.

End position: Extended fingers against the resistance of the band.

Communication, exercise instructions: With extended fingers slowly extend the basal joints of the fingers against the resistance of the band, slow down the movement.

Metacarpophalangeal joint abduction - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Sitting at the table, the forearm is on the table, the palm is facing downward, the wrist is in neutral position, the fingers are extended and closed.

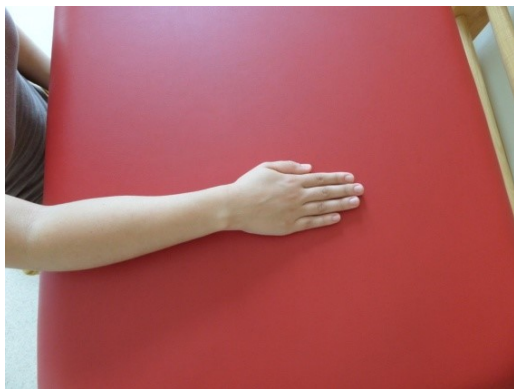
Movement description: Try to spread the fingers on the table (manually have the patient feel the direction of movement).

End position: No displacement

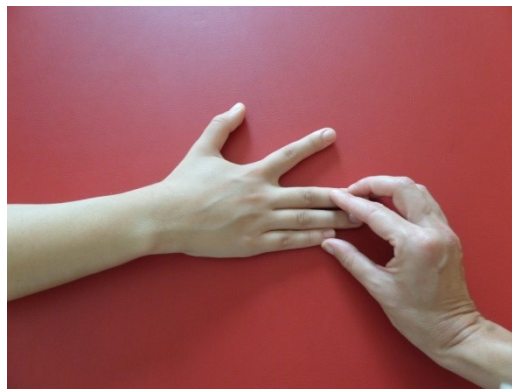
Communication, exercise instructions: Imagine and try to spread your fingers on the table.

Comment: Attendant's hand makes the patient feel the direction of movement on the fingers' side.

**Metacarpophalangeal joint abduction - concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the palm is facing downward, the wrist is in neutral position, the fingers are extended and closed.

Movement description: Spreading the extended fingers on the table.

End position: Spread position of extended fingers on the table.

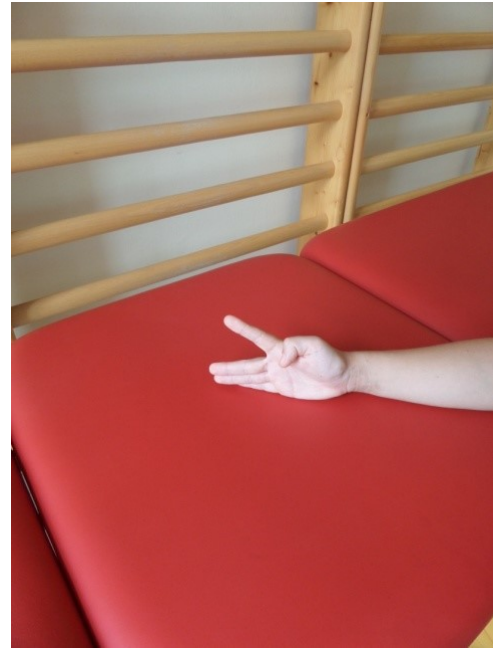
Communication, exercise instructions: Spread open your fingers on the table.

Comment: Attendant's hand can support the movement by propping up the fingers on the palm side of the fingers.

**Metacarpophalangeal joint abduction - concentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is resting on the edge of the little finger, the fingers are extended and closed.

Movement description: Spreading the extended fingers against gravity.

End position: Fingers extended, spread, against gravity.

Communication, exercise instructions: Spread open your fingers.

**Metacarpophalangeal joint abduction - concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with elastic resistance)**



(SP)



(EP)

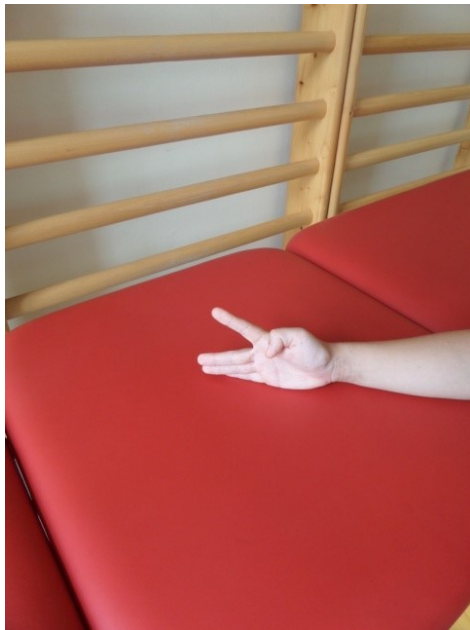
Starting position: Sitting at the table, the forearm is on the table, the hand is no longer propped up from the wrist onward, the hand is resting on the edge of the little finger, the fingers are extended and closed with the resistance band between them.

Movement description: Spreading the extended fingers against the resistance of the band.

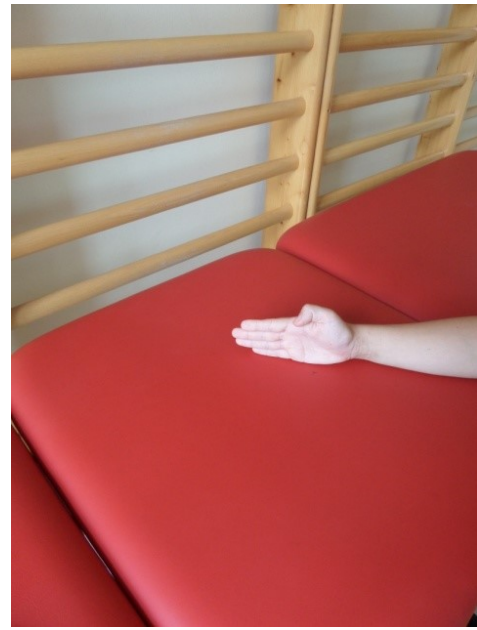
End position: Spread position of the extended fingers against the resistance of the band, band fully taut.

Communication, exercise instructions: Spread open your fingers and pull the band taut.

**Metacarpophalangeal joint abduction - eccentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is no longer propped up from the wrist onward, the hand is resting on the edge of the little finger; the fingers are extended and spread.

Movement description: Slow closing of the spread fingers against gravity.

End position: Closed position of extended fingers, against gravity.

Communication, exercise instructions: Slowly close your fingers together.

Metacarpophalangeal joint abduction - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with elastic resistance)



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is no longer propped up from the wrist onwards, the hand is resting on the edge of the little finger, the fingers are extended and spread, with the taut resistance band between them.

Movement description: Closing slowly the fingers against the resistance of the band.

End position: Closed position of extended fingers.

Communication, exercise instructions: Slowly close your fingers together and release the tension of the band.

2.6. (II-V.) Exercises for the proximal interphalangeal joint

Proximal interphalangeal joint extension - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Sitting at the table, the forearm is on the table, the hand is resting on the table on the edge of the little finger; the wrist is in neutral position, the middle joints of the fingers are in bent position.

Movement description: Try to extend the fingers (manually have the patient feel the direction of movement).

End position: No displacement

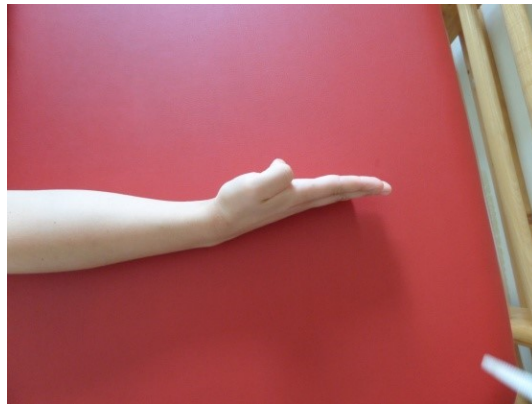
Communication, exercise instructions: Imagine and try to extend your fingers on the table.

Comment: Attendant's hand makes the patient feel the direction of movement on the fingers' back side.

Proximal interphalangeal joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is resting on the table on the edge of the little finger, the wrist is in neutral position, the middle joints of the fingers are in bent position, the basal joints are extended.

Movement description: Extending the fingers in parallel with the table (manual support to the movement can be offered).

End position: The fingers are extended.

Communication, exercise instructions: Extend your fingers sliding them on the table.

Comment: Attendant's hand can offer support to the movement by propping up the edge of the little finger.

Proximal interphalangeal joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is propped up by a pillow except for the fingers. Wrist in neutral position, palm facing the table, the middle joints of the fingers are bent, the basal joints are extended.

Movement description: Extending the fingers against gravity.

End position: The fingers are extended.

Communication, exercise instructions: Extend your fingers.

Comment: The therapist can also prop up the hand under the basal joints.

Proximal interphalangeal joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with elastic resistance)



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is propped up by a pillow except for the fingers. Wrist in neutral position, palm facing the table, the middle joints of the fingers are bent, the basal joints are extended, the band is attached to the end of the fingers.

Movement description: Extending the fingers against the resistance of the band.

End position: The fingers are extended, band fully taut.

Communication, exercise instructions: Extend your fingers against the resistance.

Comment: Manual prop up under the basal joints can be well used.

**Proximal interphalangeal joint extension - eccentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is propped up by a pillow except for the fingers. Wrist in neutral position, palm facing the table, the fingers extended.

Movement description: Slow bending of the fingers against gravity, the basal joint remains extended.

End position: Fingers in bent position, basal joint remains extended.

Communication, exercise instructions: Slowly bend your fingers, keep the basal joints extended.

Comment: Manual prop up under the basal joints can be well used.

Proximal interphalangeal joint extension - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with elastic resistance)



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is propped up by a pillow except for the fingers. Wrist in neutral position, palm facing the table, the fingers are extended, the band attached to the end of the fingers is fully taut.

Movement description: Slow bending of the fingers against the resistance of the band, basal joint remains extended.

End position: Fingers in bent position, basal joint remains extended.

Communication, exercise instructions: Slowly, restraining the resistance of the band, bend your fingers, keep the basal joints extended.

2.7. (II-V.) Exercises for the distal interphalangeal joint

Distal interphalangeal joint flexion - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Sitting at the table, the forearm is on the table, the hand rests on the edge of the little finger, the wrist is in base position, the fingers are extended.

Movement description: Trying to bend the last joint of the middle finger (manual support to have the patient feel the direction of movement).

End position: No displacement

Communication, exercise instructions: Imagine and try to bend the last joint of your finger.

Comment: Attendant's finger makes the patient feel the movement direction on the palm side of the patient's finger. The therapist manually immobilizes the other joints.

**Distal interphalangeal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the elbow is bent, the hand rests on the edge of the little finger, the wrist is in base position, the fingers are extended.

Movement description: Bending the last joint on the middle finger, the other joints are immobilized in extended position.

End position: Last joint in bent position on the middle finger.

Communication, exercise instructions: Bend your last joint, keep the other joints extended.

Comment: The therapist manually immobilizes the other joints.

**Distal interphalangeal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table with bent elbow, the hand is on the table with palm facing upward, the fingers are extended.

Movement description: Bending the last joint on one finger against gravity, the other joints are immobilized in extended position.

End position: Last joint in bent position on one finger.

Communication, exercise instructions: Bend your last joint, keep the other joints extended.

Comment: The therapist manually immobilizes the other joints.

Distal interphalangeal joint flexion - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5 (with elastic resistance)



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table with bent elbow, the hand is on the table with palm facing upward, the fingers are extended, the band is attached at the end of the fingers.

Movement description: Bending the last joint on the middle finger against the resistance of the band, the other joints are immobilized in extended position.

End position: Last joint in bent position on the middle finger, fully taut band.

Communication, exercise instructions: Bend your last joint, pull the band taut, keep the other joints extended.

Comment: The therapist manually immobilizes the other joints.

Fingers flexion - isometric exercise, muscle strengthening equivalent to muscle strength 4, 5



Starting position: Sitting at the table, the forearm is on the table, fingers I and II form a “ring” by touching together.

Movement description: The other thumb interlocks with the “ring” to break it apart. The finger I and II strongly keeps the “ring”

End position: The thumb interlocks with the “ring” formed by fingers I and II.

Communication, exercise instructions: Try to break apart the ring formed with fingers I and II on your other hand, but do not allow it to succeed, keep the “ring” strongly.

Fingers, mobilization exercise



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table with bent elbow, the palm is facing the table. First finger is extended, a cylinder is placed under the last joint.

Movement description: The middle finger rolls the cylinder toward the palm by bending the fingers' joints, then rolls it away by extending the joints.

End position: The joints of the middle finger are bent, the cylinder is rolled toward the palm.

Communication, exercise instructions: Roll the cylinder toward your palm, bend the joints of your middle finger, then roll it back to its starting position.

2.8. (Finger I) Exercises for the carpometacarpal joint

Carpometacarpal joint flexion - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: Sitting at the table, the forearm is on the table, the hand rests on the edge of the little finger on the table, the wrist is in base position, the fingers are extended.

Movement description: Try to bend the basal joint of the thumb, bring your thumb to your palm (manually have the patient feel the movement direction)

End position: No displacement

Communication, exercise instructions: Imagine and try to approach your thumb to your palm.

Comment: Attendant's finger makes the patient feel the movement direction on the palm side of the patient's finger.

**Carpometacarpal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 2**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is resting on the table with palm facing upward, the basal joint of the thumb is loose or extended.

Movement description: Bending the basal joint of the thumb, the finger approaches the palm.

End position: The thumb is in a position close to the palm.

Communication, exercise instructions: Bring close your thumb to your palm, the basal joint should move.

**Carpometacarpal joint flexion - concentric exercise, muscle strengthening
equivalent to muscle strength 3**



(SP)



(EP)

Starting position: Lying on side on the table, the forearm is resting on the table on its thumb side, the basal joint of the thumb is loose or extended.

Movement description: Bending the basal joint of the thumb, the finger approaches the palm.

End position: The thumb is in a position close to the palm.

Communication, exercise instructions: Bring close your thumb to your palm, the basal joint should move.

**Carpometacarpal joint flexion- concentric exercise, muscle strengthening
equivalent to muscle strength 4, 5 (with elastic resistance)**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the hand is resting on the table with palm facing upward, the basal joint of the thumb is loose or extended, the band is attached to the end of the finger.

Movement description: Bending the basal joint of the thumb, the finger approaches the palm against the resistance of the band.

End position: The thumb is in a position close to the palm, the band is pulled taut.

Communication, exercise instructions: Bring close your thumb to your palm, the basal joint should move, pull the band taut.

**Carpometacarpal joint flexion- eccentric exercise, muscle strengthening equivalent
to muscle strength 4, 5**



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table with palm facing upward, the hand is on the table, the thumb's basal joint is in a position bent close to the palm, the band is attached to the end of the finger (the resistance comes from the back of the hand).

Movement description: Slow extension of the basal joint of the thumb, the finger moves away from the palm against the resistance of the band.

End position: The thumb is drawn back from the palm, the band is loose.

Communication, exercise instructions: Slowly pull back your thumb against the resistance of the band, the basal joint should move, slow down the movement.

Finger I. - isometric exercise



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table with bent elbow, a foam cube in one hand, the other hand grips the cube with two fingers.

Movement description: The hand holding the cube does not allow the other hand's two fingers (I and II) to take the cube away.

End position: The other hand's fingers I and II grips the foam cube and tries to take it away.

Communication, exercise instructions: Try to take away the cube with fingers I and II from your other hand - don't let it go.

Finger I. flexion/extension - mobilization exercise



(SP)



(EP)

Starting position: Sitting at the table, the forearm is on the table, the thumb touches the little finger's last phalanx.

Movement description: The thumb strokes the little finger from the last phalanx down to the basal phalanx then back while the thumb bends and then extends.

End position: The thumb touches the basal phalanx of the little finger; the thumb is in bent position.

Communication, exercise instructions: With your thumb stroke along your little finger from the tip to the base.

2.9. Exercises to improve manipulation

Exercise to improve manipulation - without tools, exercising opposition



(SP)



(EP)

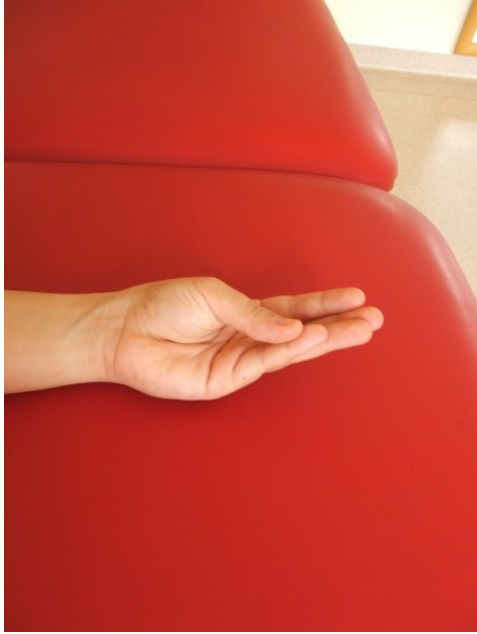
Starting position: Sitting at the table, the elbow rests on the table, the fingers are in extended, loose position.

Movement description: The finger pad touches the other fingers' pads one by one.

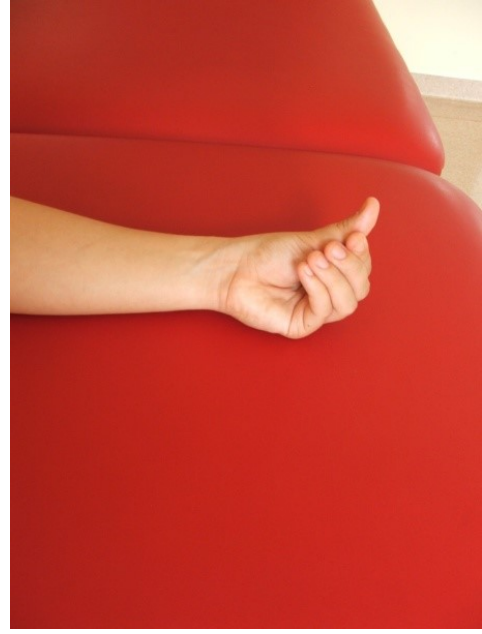
End position: Thumb's pad touches the little finger's pad.

Communication, exercise instructions: With your thumb's pad touch your other finger-pads one by one.

Exercise to improve manipulation - without tools, exercising opposition



(SP)



(EP)

Starting position: Sitting at the table, the elbow rests on the table, the fingers are in extended, loose position.

Movement description: The fingers perform a “salt sprinkling” movement, the thumb’s pad strokes the other fingers’ pads, the movement starts from the little finger.

End position: The thumb’s pad touches the other fingers’ pads, it strokes them.

Communication, exercise instructions: Imitate the movement of “salt sprinkling”, Stroke the pads of your fingers with your thumb pad, start the movement from your little finger.

Exercise to improve manipulation - without tools, tip grip



(SP)



(EP)

Starting position: Sitting at the table, the elbow rests on the table, the fingers are in extended, loose position.

Movement description: The end of the fingers touch in a tip.

End position: The end of the fingers touch in a tip.

Communication, exercise instructions: The end of the fingers should touch.

Exercise to improve manipulation - with tool, ball grip



(SP)



(EP)

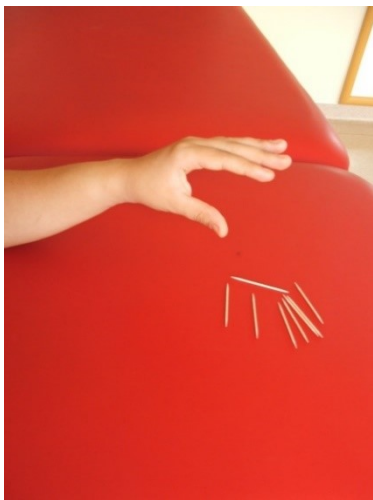
Starting position: Sitting at the table, a tennis ball is held in the hand, the forearm rests on the table, the palm is facing the table, fingers are in loose position.

Movement description: Gripping the ball, the fingers are bent correspondingly to the size of the ball, then squeezing the ball.

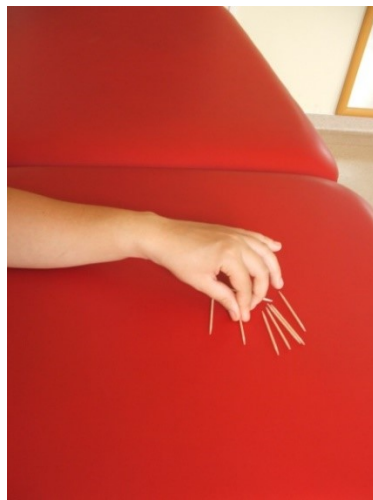
End position: The ball is in the palm, the fingers are holding it, then the ball is squeezed.

Communication, exercise instructions: Pick up the ball, grab it with your fingers, then squeeze it.

Exercise to improve manipulation - with tool, precision grip (finger pad with finger pad)



(SP)



(EP)

Starting position: Sitting at the table, the finger I is in open opposition, Finger II is extended with bent basal joint, match sticks on the table.

Movement description: Finger I pad faces finger II pad and picks up the match sticks from the table.

End position: Finger I pad faces finger II pad and picks up the match sticks from the table.

Communication, exercise instructions: Pick up the match sticks from the table with your first two fingers by pressing together your finger pads.

Comment: It can be further developed by picking up the match sticks with finger I in pair with the other fingers one by one.

Exercise to improve manipulation - with tool, lateral finger grip



(SP)



(EP)

Starting position: Sitting at the table, the hand rests on the edge of the little finger, the wrist is slightly extended, the fingers are loose, a booklet is placed on the treatment bed.

Movement description: The basal joint of finger I is in flexion and adduction, holding the booklet pressed to the side of the bent finger II. The other fingers provide support from below.

End position: The thumb presses the booklet to the side of the four fingers.

Communication, exercise instructions: Pick up the booklet and hold it firm with four bent fingers from below and your thumb from above.

Exercise to improve manipulation - with tool, complex movements



(SP)



(EP)

Starting position: Sitting at the table, the patient holds a therapy putty ball in one of his/her hand, the other elbow rests on the table, wrist loosely extended, fingers loosely extended.

Movement description: Gripping the ball with 5 fingers, then twisting it.

End position: Ball in hand twisted with 5 fingers.

Communication, exercise instructions: Hold the ball with one hand and twist it, the other hand holds the ball.

2.10. Playful exercises in pairs for the upper limb

Playful exercise in pairs - circling with a ball



(SP)

(EP)

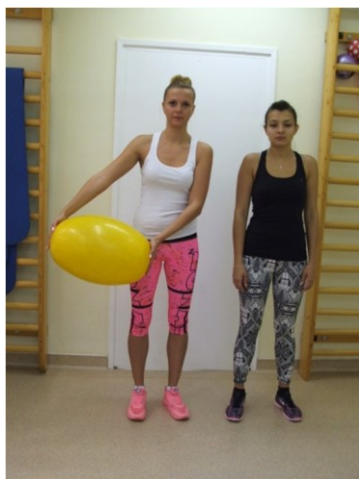
Starting position: The two persons are facing each other with feet slightly apart, keeping a distance that allows that both of them hold a middle-sized ball at chest height with slightly bent elbows.

Movement description: Making large circles with the ball, together, in the same direction by extending the elbows and raising the arms.

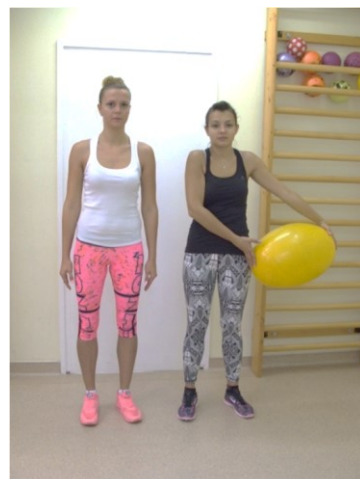
End position: Continuous circular movement with the ball.

Communication, exercise instructions: Hold the ball at chest height and move it in circular motion by extending the elbow and raising the arms, then back again.

Playful exercise in pairs - passing the ball



(SP)



(EP)

Starting position: The two persons are standing side by side with feet slightly apart, at arm's length from each other, one of them has the ball at his/her side beside the trunk, with extended arms. The other person's arms are also extended on the sides of the trunk.

Movement description: Passing the ball to each other with extended arms.

End position: The ball is passed from the first person's hand to the other person, who in turn lowers it next to his/her trunk.

Communication, exercise instructions: Pass the ball over your heads to each other, using your both hands, while keeping your arms extended all the time.

Playful exercise in pairs - Paddling with a stick



(SP)



(EP)

Starting position: The two persons are facing each other with legs slightly apart, keeping a distance that allows that both of them hold a stick that has balls on its ends, holding it at chest height and grabbing it in a shoulder-width stance, with slightly bent elbows.

Movement description: They both imitate paddling movement with their both arms (kayaking) by moving forward their elbows, then bending them.

End position: Continuous paddling movement, one elbow bent, the other extended forward.

Communication, exercise instructions: Make paddling motions forward, at the chest height, one elbow bent, the other extended.

Playful exercise in pairs - stick swinging



(SP)



(EP)

Starting position: The two persons are facing each other with feet slightly apart, at a distance that allows for them to hold the ends of two sticks with balls at their end, with arms extended along the trunk.

Movement description: The arms of the persons perform opposite movement, as a mirror image, one thrusting the stick forward, the other pulling it backward.

End position: Continuous swinging of the arms forward and back, the two sticks move in opposite direction next to the trunk forward and back.

Communication, exercise instructions: Swing vigorously your extended arms and the sticks next to your trunk forward and back. Perform the movement as the mirror images of each other.

Playful exercise in pairs - intersecting resistance band



(SP)



(EP)

Starting position: The two persons are facing each other with legs slightly apart, at a distance that allows both of them to hold two intersecting resistance bands at chest height, with extended arms.

Movement description: Both arms of both persons are moving in opposite direction, one arm pulling the band diagonally upward, the other pulling it diagonally downward. They perform the movement as the mirror images of each other.

End position: One arm diagonally upward, the other diagonally downward, the band is fully taut.

Communication, exercise instructions: Pull the band taut, one arm upward and the other arm downward, diagonally pull it back. Both of you should use the same limb at the same time.

Questions:

1. How would you strengthen the m. deltoideus anterior in a patient with muscle strength 2 with a concentric exercise? Give instructions for the exercise.
2. How would you strengthen the m. triceps brachii in a patient with muscle strength 3 with a concentric exercise? Give instructions for the exercise.
3. How would you strengthen the m. trapezius posterior in a patient with muscle strength 4 with an eccentric exercise? Give instructions for the exercise.
4. How would you use isometric strengthening of the m. flexor carpi ulnaris/radialis in a patient with muscle strength 4? Give instructions for the exercise.
5. How would you strengthen the m. subscapularis in a patient with muscle strength 4 with an eccentric exercise? Give instructions for the exercise.

References:

1. Balogh I. (1999) Kineziológiai alapismeretek, Mozgás ABC [The Basics of Kinesiology, The ABC of Movement], Tillinger, Szentendre, 90-107.
2. Hilde S. R., Regina G.-N. (2001) Fizioterápia. [Physiotherapy]. Medicina, Budapest

3. TRUNK EXERCISES (MELINDA JÁROMI)

3.1. Muscle strengthening exercises

Trunk extension-isometric exercise, muscle strengthening equivalent to muscle strength 1



(SP), (EP)



(1), (2)

Starting position: Lying in supine position with feet drawn on the sole (triflexion position) Arms extended by the head.

Movement description: The back of the hand and upper limb pressed to floor (1), thorax raised (2).

End position: Lying in supine position with feet drawn on the sole (triflexion position). Arms extended by the head.

Timing: It is necessary to keep the limbs pressed to the floor for three seconds.

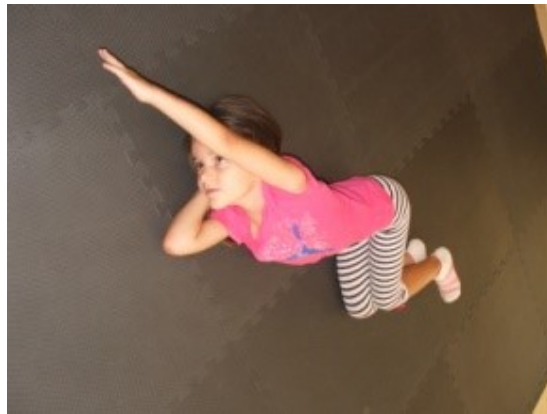
Communication, exercise instructions: Lie on your back! Draw your feet on the soles! Stretch your arms by your head on the floor! Press the back of your hand and upper limbs into the surface! Try to raise your chest! Keep this position for three seconds, then relax your muscles!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 1.

Trunk extension-isotonic concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP), (EP)



(1), (2), (3)

Starting position: Lying sideways with 90 degrees hip-, knee-, and ankle joint flexion. The hand underneath touches the nape, the hand above is extended by the ear.

Movement description: Head raised backwards (1), creating trunk extension sliding on the floor (2). Reaching backwards with the extended hand above. (3).

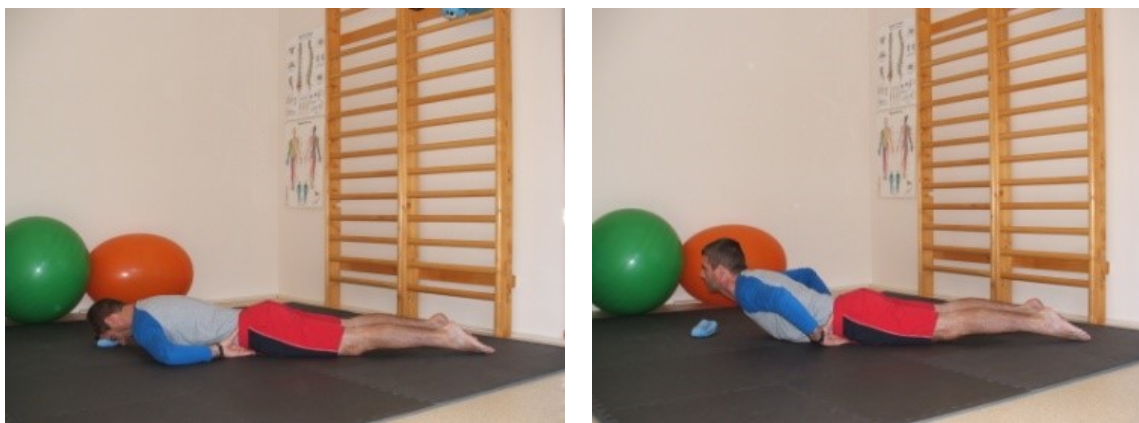
End position: Side position with 90 degrees hip-, and knee-joint flexion. The hand underneath touches the nape, the hand above is extended by the ear. The trunk is in a neutral position.

Timing: The exercise has to be performed continually and slowly, trunk extension lasts for 2 seconds (in 2 counts), then returns into neutral position in 2 seconds.

Communication, exercise instructions: Take your position lying sideways! Bend your hips and knees in 90 degrees! Place your hand underneath on your nape, extend your hand above beside your ears! Pay attention that your hip does not move and your spine curves back in an arch!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 2. „Switching off” gravity, it is an active instructed movement performed in perpendicular plane to the direction of gravity.

Trunk extension-isotonic concentric exercise, muscle strengthening in case of muscle strength 3



(SP), (EP)

(1), (2), (3)

Starting position: Lying in prone position, lower limbs extended, arms placed on the hips, elbows on the floor.

Movement description: Raising of head and trunk above the floor (1) with raising the elbows (2) and folded shoulder blades (3).

End position: Lying in prone position, lower limbs extended, arms placed on the hips.

Timing: In 3 seconds/counts: head and trunk raising, in 1 second/count: trunk lowered back to the surface.

Communication, exercise instructions: Lie in prone position! Lean on your forehead, on the floor! Place your hands on your hips! Slowly, in three seconds raise your head, lift your trunk! Stretch your elbows backwards and fold your shoulder blades! Then in one second lower your trunk and head back to the surface!

Note: In the 0-5 metric system it is a muscle-strengthening exercise in case of muscle strength 3. It is an active movement performed against gravity, in the same plane as the axis of the force of gravity, but in opposing direction.

Trunk extension-isotonic concentric exercise, muscle strengthening equivalent to muscle strength 4



(SP), (EP)



(1)

Starting position: Lying in prone position, with extended lower limbs, arms extended by the head on the floor.

Movement description: Raising of head, trunk and arms (1) from the floor.

End position: Lying in prone position, with extended lower limbs, arms extended by the head on the floor.

Timing: In 3 seconds/counts: head, trunk and arms raising, in 1 second/count: trunk lowered back to the floor.

Communication, exercise instructions: Lie in prone position! Lean on your forehead, on the floor! Place your arms by your head! Slowly, in three seconds raise your head, lift your trunk and arms! Keep your arms extended all through the exercise! Then in one second lower your trunk, head and arms back to the floor!

Note: In the 0-5 metric system it is a muscle-strengthening exercise in case of muscle strength 4. It is an active movement performed with long weight-lever against gravity, in the same plane as the axis of the force of gravity, but in opposing direction.

Trunk extension-isotonic eccentric exercise, muscle strengthening equivalent to muscle strength 5



(SP), (EP)



(1)

Starting position: Lying in prone position, with extended lower limbs, hand on the nape.

Movement description: Raising of head and trunk from the floor (1), then slowly lowering the trunk back to the floor.

End position: Lying in prone position, with extended lower limbs, hands on the nape.

Timing: In 1 second/count: raising of head, trunk, and arms, in 5 seconds/counts: trunk lowered back to surface.

Communication, exercise instructions: Lie in prone position! Lean on your forehead, on the surface! Place your hands on the nape, keep your elbows on the surface! In one second/one count raise your head, trunk and elbows! Keep your hands on the nape all through the exercise! Then slowly, in five seconds/counts lower your trunk, head and elbows back to the surface!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 4 and 5.

Trunk flexion-isometric exercise, muscle strengthening equivalent to muscle strength 1



(SP), (EP)



(1)

Starting position: Lying in supine position with legs raised, foot soles on the floor (triflexion position). The patient keeps a physioball on his stomach, the palms of the patient on the physioball with extended elbow joints.

Movement description: During exhalation pushing the ball to the thighs with extended arms (1).

End position: Lying in supine position with legs raised, foot soles on the floor (triflexion position). The patient keeps a physioball on his stomach, the palms of the patient on the physioball with extended elbow joints.

Timing: It is necessary to stretch the muscles for 3 seconds.

Communication, exercise instructions: Lie in supine position! Raise your legs with your foot soles on the floor! Place the ball on your stomach! Exhale the air and at the same time push the ball with your hands and lower arms towards your thighs! Keep your elbows extended all through the exercise!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 1.

Trunk flexion-isotonic concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP), (EP)



(1)

Starting position:Lying in side position with 90 degrees hip-, and knee joint flexion. Hands on the nape.

Movement description:In a curved trunk bending head and elbows aim towards the knees. (1).

End position:Lying in side position with 90 degrees hip-, and knee joint flexion. Hands on the nape. Trunk in neutral position.

Timing: The exercise has to be performed slowly and continually, the trunk flexion lasts 2 seconds (in two counts), then it returns to the neutral position in two seconds.

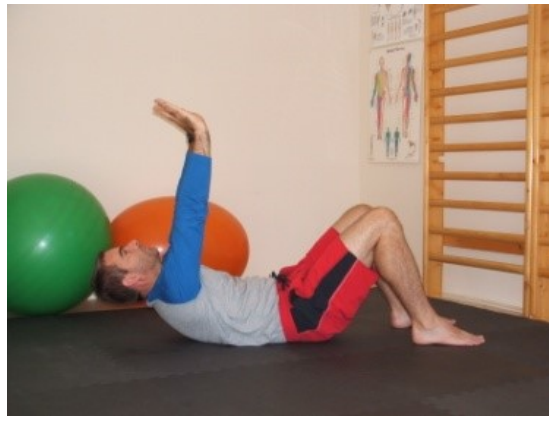
Communication, exercise instructions:Lie in side position! Bend you hip and knees in 90 degrees! Place both hands on your nape! Aim with your head and elbows towards your knees! Pay attention to keeping your pelvis fixed and bending your spine in a curve!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 2. „Switching off” gravity, it is an active instructed movement performed in perpendicular plane to the direction of gravity.

Trunk flexion-isotonic concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP), (EP)



(1)

Starting position: Lying in supine position, triflextion position, arms raised from the shoulder towards the ceiling, with extended elbows.

Movement description: Raising of head and trunk upwards from floor (1), then lowering back.

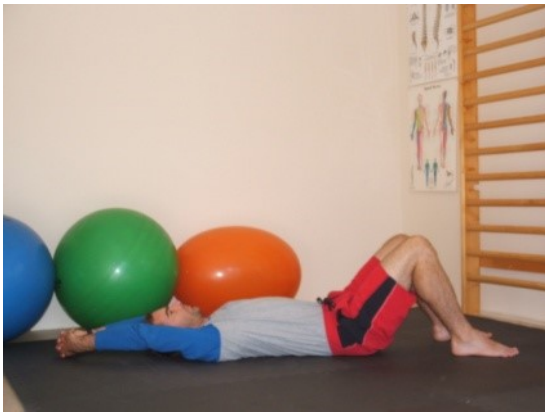
End position: Lying in supine position, triflextion position, arms raised from the shoulder towards the ceiling, with extended elbows.

Timing: In 3 seconds/counts: raising the head and trunk, in 1 second/count: trunk lowered back to the floor.

Communication, exercise instructions: Lie in supine position! Raise your legs with your foot soles on the floor! Raise your arms towards the ceiling with extended elbows! Slowly, in three seconds raise your head and trunk, while exhaling the air! Take special care that your chin does not narrow your chest! Then in one second lower your trunk and head back to the floor!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 3. It is an active movement performed against gravity, in the same plane as the axis of the force of gravity, but in opposing direction.

Trunk flexion-isotonicconcentricexercise, muscle strengthening equivalent to muscle strength 4, 5



(SP), (EP)



(1)

Starting position: Lying in supine position, trifixion position, arms extended by the head on the floor with hands clasped.

Movement description: Raising of head-, trunk- and extended arms upwards from the floor (1), then lowering it back.

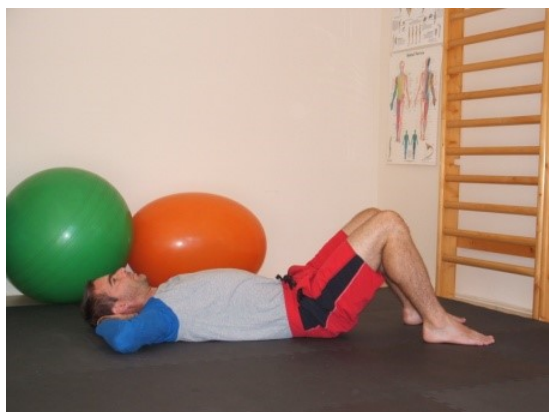
End position: Lying in supine position, trifixion position, arms extended by the head on the floor with hands clasped.

Timing: In 3 seconds/counts:raising the head, trunk and arms, in 1 second/count: trunk lowered back to the floor.

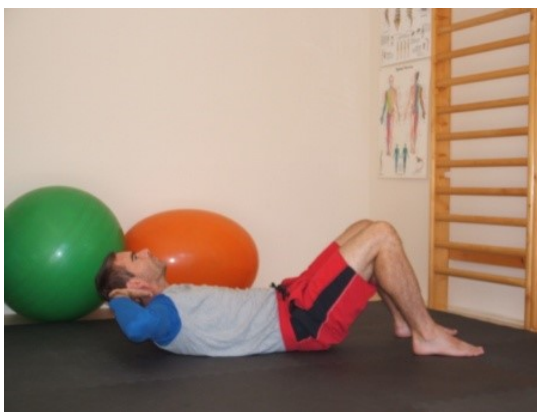
Communication, exercise instructions: Lie in supine position! Raise your legs with your foot soles on the floor! Place your arms by your head on the floor! Clasp your hands! Slowly, in three seconds raise your head, trunk and arms! Keep your arms extended all through the exercise beside or behind your ears! Then in one second lower your trunk, head and arms back to the floor!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 4. It is an active movement performed with long weight-lever against gravity, in the same plane as the axis of the force of gravity, but in opposing direction.

Trunk flexion-isotonic eccentric exercise, muscle strengthening equivalent to muscle strength 5



(SP), (EP)



(1)

Starting position: Lying in supine position, triflextion position, hands on the nape.

Movement description: Raising head and trunk from the floor (1), then slowly lowering trunk and head to the floor.

End position: Lying in supine position, triflextion position, hands on the nape.

Timing: In 1 second/count: raising the head, trunk and arms, in 5 seconds/counts: trunk lowered back to the floor.

Communication, exercise instructions: Lie in supine position! Raise your legs with your foot soles on the floor! Place your hands on the nape, keep your elbows on the floor! Quickly raise your head and trunk! Keep your hands on the nape all through the exercise! Do not narrow your chin to your chest! Then slowly, in five seconds lower your trunk, head and elbows back to the floor!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 4 and 5.

Trunk lateral flexion-isometric exercise, muscle strengthening equivalent to muscle strength 1



(SP), (EP)



(1)

Starting position: Lying in side position (on right side), 90 degree flexion in knee- and hip joint, hands on the nape.

Movement description: The (right) hip in underneath position and the shoulder is pressed into the floor (1). Keep this position for 4 seconds, then release the pressure on the muscles.

End position: Lying in side position (on right side), 90 degree flexion in knee- and hip joint, hands on the nape.

Timing: 1. count: pressing shoulder and hip into the floor, 2-5. counts: keeping up isometric stretching, 6. returning to starting position.

Communication, exercise instructions: Lie on your right side! Bend your legs to create a 90 degrees angle with your knee and hip! Press your shoulder and hip in underneath position into the floor! Keep up this position for 4 seconds! Then relax your muscles, breathe in your own rhythm!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 1.

Trunk lateral flexion-isotonic concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP), (EP)



(1)

Starting position: Lying in (right) side position with 90 degrees hip- and knee joint flexion. The (right) hand underneath is placed in front of the stomach on the left hip with slight elbow flexion, left hand on the nape.

Movement description: Raising of the trunk upwards from floor, left elbow nearing the left hip (1). Back to starting position.

End position: Lying in side position with 90 degrees hip- and knee joint flexion. The hand underneath is placed on the hip above, left hand on the nape. Trunk in neutral position.

Timing: The exercise has to be performed continually and slowly, the trunk lateral flexion lasting for 2 seconds (2 counts), then the body returns to neutral position.

Communication, exercise instructions: Lie in side position! Bend your hip and knees in an angle of 90 degrees! Put your (right) hand underneath on your hip above! Put your (left) hand above on the nape! Raise your head and trunk nearing your elbow to the hip! Pay attention to keeping your pelvis fixed and bending your spine in a curve!

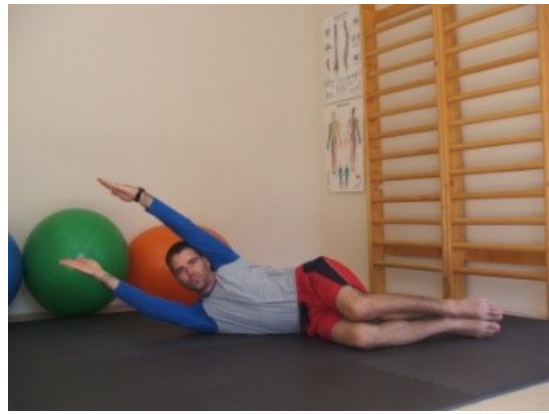
Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 3.

It is a muscle-strengthening exercise with short lever.

Trunk lateral flexion-isotonic eccentric exercise muscle strengthening equivalent to muscle strength 5



(SP), (EP)



(1)

Starting position: Lying in side position, arms extended beside the ears.

Movement description: Raising the head, arms and trunk up from the floor (1), then slowly lowering the trunk, head and arms back to the floor.

End position: Lying in side position, arms extended beside the ears.

Timing: 1 second/count raising the head, trunk and arms, 5 seconds/counts lowering trunk, head and arms back to the floor.

Communication, exercise instructions: Lie in side position! Bend your legs in 90 degrees at the knee and hip! Extend your arms beside your head! Raise your head, trunk and arms quickly! Keep your arms beside the ears all through the exercise! Do not narrow your chin to your chest! Do not bend your trunk in front! Then slowly in five seconds lower your trunk, head and elbow back to the floor!

Note: In the 0-5 metric system it can be used as muscle-strengthening exercise in case of muscle strength 4 and 5. It is a muscle-strengthening exercise with long lever.

3.2. Mobilizing exercises

Mobilizing exercise directed at trunk flexion-extension



(SP), (2), (EP)



(1)



(3)

Starting position: Position on all fours/kneeling.

Movement description: With palms kept on the floor sitting on heels, then on all fours swinging the extended arm and leg upwards in opposite direction.

End position: Position on all fours.

Timing: (1) sitting on heels, (2) back to the position on all fours, (3) in position on all fours swinging the extended arm and leg upwards, then back to the position on all fours.

Communication, exercise instructions: Take a position on all fours! Palms underneath the shoulders. Knees underneath the hip. Stretch your stomach. Head is positioned in line with the spine. Face the floor. Move your pelvis backwards and sit on your heels! Try to narrow your forehead to your knees or the floor! Return to the position on all fours! Swing your opposing arm and leg extended upwards! Look at your raised hand! Put your palm and knees on the floor, take up the position on all fours again!

Note: During the exercise the mobilizing of the cervical-, thoracic- and lumbar spine section in flexion and extension direction is achieved.

Mobilizing exercise directed at trunk lateral-flexion



(SP), (EP)



(1)

Starting position: Lying in supine position, triflextion position. Arms extended by the body.

Movement description: Right arm stretching towards right heel, the arm sliding on the floor. (1).

End position: Lying in supine position, triflextion position, arms placed symmetrically by the body.

Timing: We perform the lateral flexion movement in two counts, then in two counts we return to the starting position.

Communication, exercise instructions: Lie on your back! Draw your feet on the sole! Keep your arms extended by your body on the floor. Sliding your right arm on the floor stretch your body towards your right heel! Pay attention that your pelvis does not move! Follow the movement of your body with your head, keep your head on the floor, and face the ceiling all through the exercise! Pay attention that your trunk should curve in an arch! Then return to your starting position!

Note: Lateral flexion mobilizing exercise of the cervical-, thoracic- and lumbar spine section in case of muscle strength 3. In case of muscle strength 2, trunk lateral flexion muscle group muscle strengthening exercise.

Trunk mobilizing exercise in rotational direction



(SP), (EP)



(1)

Starting position: Cross-legged (tailor) sitting. Touching the shoulders, shoulder joint in 90 degrees abduction, elbow joint in flexion.

Movement description: Torso rotation, touching the opposite hip (1).

End position: Cross-legged (tailor) sitting. Touching the shoulders, shoulder joint in 90 degrees abduction, elbow joint in flexion.

Timing: In counts 1-3: torso rotation, then in counts 4-6: back to the starting position.

Communication, exercise instructions: Position yourself in cross-legged sitting. Stretch your stomach muscles, folding your shoulder blades and stretch your body towards the ceiling! Touch your shoulders with your fingers with your upper arm in horizontal- and your elbow bent position! Try to touch the outer side of your left hip with your right arm! Pull back your left elbow and turn your head after it! Follow the movement of your left elbow with your head! Then return to the original position!

Note: A mobilizing exercise of the cervical-, thoracic- and lumbar spine section in rotational direction.

3.3. Closed kinematic chain exercises

Trunk extension closed kinematic chain exercise



(SP), (EP)



(1)

Starting position: Lying in supine position, triflexion position. Arms extended by the body.

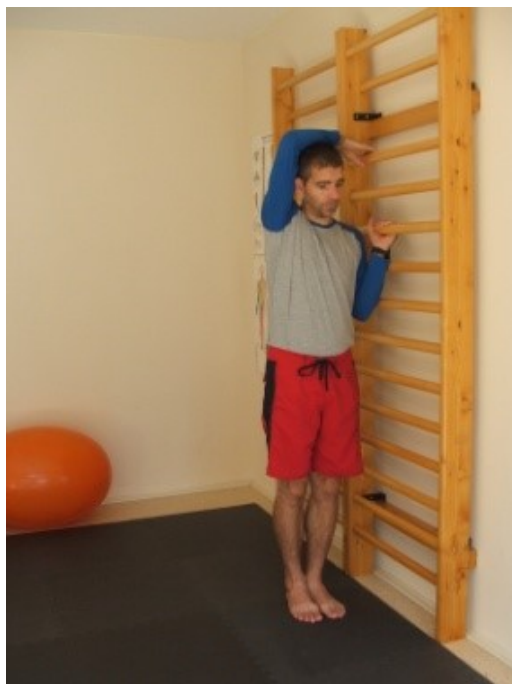
Movement description: Keeping the head, shoulders and pelvis on the floor, raising the thoracic section up from the floor with the help of the extended upper limb. (1).

End position: Lying in supine position, triflexion position.

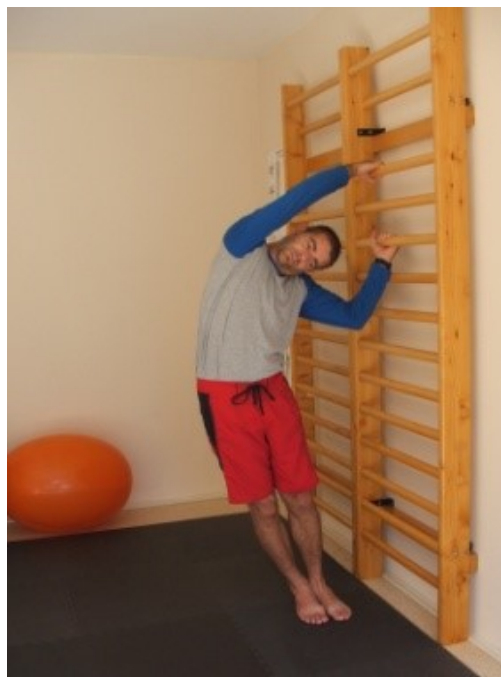
Timing: In counts 1-3:raising the thoracic section up from the floor, in count 4:back to the starting position.

Communication, exercise instructions: Lie on your back! Draw your feet on the soles! With the help of your arms raise your spine section around the shoulder blades up from the floor! Push up your chest! Then return to the starting position!

Trunk lateral flexion closed kinematic chain exercise



(SP), (EP)



(1)

Starting position: Standing by the wall-bars. Arms at ear- and shoulder height on the wall-bars.

Movement description: Without moving from the foot sole support and holding on to the wall-bars, we create a trunk lateral flexion with the frontal moving of the pelvis (1).

End position: Standing by the wall-bars. Arms at ear- and shoulder height on the wall-bars.

Timing: In counts 1-3: lateral flexion, in count 4: back to starting position.

Communication, exercise instructions: Stand by the wall-bars with your right side! You should stand near the wall-bars! With your right arm hang on to the wall-bars at shoulder height, with your left arm hang on to the wall-bars at ear height. Loosen your pelvis to the left side, with your head between your upper arms. Your spine has to curve! Pay attention so that your trunk should not rotate and do not bend forward! Pay attention that your foot soles do not move from the floor/on the floor during exercise!

Trunk rotation closed kinematic chain exercise



(SP), (EP)



(1)

Starting position: Position on all fours.

Movement description: Right elbow flexion (1) and extension. Then repeating on the other side as well.

End position: Position on all fours.

Timing: In two counts elbow flexion, in two counts elbow extension.

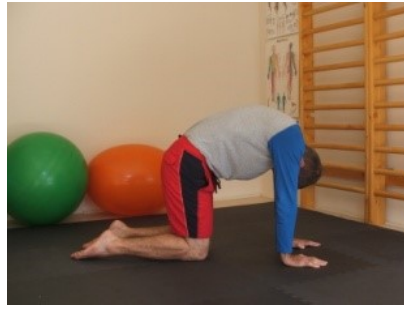
Communication, exercise instructions: Position yourself on all fours! (Adjustment of correct position) Bend your right elbow and reach for the floor! Keep your left elbow extended! This way your right shoulder moves downwards with your spine rotating. Pay attention that your trunk does not bend and your head does not near to the floor!

3.4. Combined exercises

Trunk flexion-lateral flexion combined exercise



(SP), (2), (EP)



(1)



(3)

Starting position: Position on all fours.

Movement description: Performing a trunk flexion (1), then back to the position on all fours (2) and then to perform a lateral flexion (3).

End position: Position on all fours.

Timing: In two counts trunk flexion, in two counts back to neutral position, in two counts lateral flexion and in two counts back to the position on all fours.

Communication, exercise instructions: Position yourself on all fours! (setting the position) Curve your back, lower your head slowly! Return to starting position on all fours! Try to near your shoulder and pelvis/hip on the same side! Pay attention so that your trunk should not rotate!

Note: Primarily a mobilizing exercise directed at trunk flexion and lateral flexion.

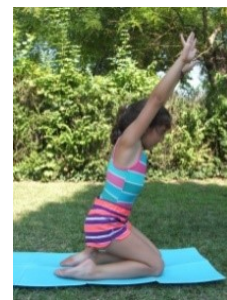
Trunk muscle strengthening combined exercise



(SP)



(1)



(3), (EP)

Starting position: Position on all fours.

Movement description: In position on all fours hands turned inside, fingers facing, elbow flexion (dachshundposition) (1). Exhaling, by stretched stomach body weight shifted to upper limbs (2). This position is to be kept without breathing or by normal breathing. Then by shifting body weight backward through sitting on the heels arrive at kneeling position, with increased knee- and hip flexion, arms raised with extended elbows (3).

End position: Kneeling position with increased hip- and knee flexion, back bended straight, arms by the head in extended position.

Timing: In two counts we shift our body weight from the position on all fours to the front, then in four seconds/counts we keep this position, in three counts we shift our body weight backwards and position ourselves on our heels, sitting on them, in two counts kneeling position with slight bending of the knee and extended arms, in four seconds/counts we keep this position.

Communication, exercise instructions: Position yourself on all fours! (setting of position) Turn your hands inside with fingers facing! Bend your elbow! Exhale the air and stretch your stomach muscles! Keep your stomach muscles stretched all through the exercise! Shift your body weight forwards so that your shoulders are placed in front of your hands! Keep this position for 4 seconds! Shift your body weight backwards, sit on your heels! Lift up your pelvis from your heel by 15 cm! Raise both your arms by your ears with extended elbows! Keep up this position for 4 seconds! Return to the position on all fours!

Note: Isometric/static trunk muscle strengthening combined exercise.

In the kneeling position any of the arm positions used in back muscle training may be applied.

Trunk combined exercise with physioball



(SP), (2)



(1)



(3)

Starting position: Cross-legged (tailor) sitting, ball on the surface, hands on top of the physioball.

Description of movement: Roll the ball forward with erect trunk bending (1). Then back to the starting position (2). Hands slid downwards and roll to the side (3).

End position: Cross-legged (tailor) sitting, the ball stands upright on the surface, hands on top of the physioball.

Timing: Counts 1-2.: bending the trunk, counts 3-4.: back to initial position, counts 5-6. Lateral flexion, counts 7-8.: back to starting position.

Communication, exercise instructions: Take your position in cross-legged sitting! Place the ball in front of you! Put your hands on top of the ball! Stretch your gluteal and abdominal muscles! Close your shoulder-blades! Stretch upwards with the top of your head! With an erect trunk bend forward starting from the hip, roll the ball forward! Keep your abdominal muscles stretched all through the exercise, with your back and waist erect! Return to your starting position, your trunk is now upright! Slide your hand on the side of the ball! Roll the ball to the side and follow its movement with your trunk! Return to the starting position!

Trunk flexion-rotation combined exercise with physioball



(SP), (2), (EP)



(1), (3)



(4)

Starting position: Lying in supine position on the physioball, with the lumbar section leaning on the ball. Foot soles leaning on the floor, 90 degrees flexion in knee-joint, arms raised towards the ceiling perpendicularly to the body.

Movement description: By the flexion of the thoracic section arms stretching upwards to the ceiling (1), then back to the starting position (2). Making two steps forward with the thoracic section leaning on the ball, the extended arms raised to the ceiling (3). Right arm still stretching towards the ceiling, while the torso is rotated and the left shoulder is leaning on the ball (4). Back to the starting position.

End position: Lying in supine position on the physioball, with the lumbar section leaning on the ball. Foot soles leaning on the floor, 90 degrees flexion in knee-joint, arms raised to the ceiling.

Timing: Every movement element is performed in two counts.

Communication, exercise instructions: Lie on the ball! Your waist should lean on the ball. Your foot soles lean on the floor! Raise both your arms towards the ceiling to be positioned perpendicular to your body! Raise your trunk/chest upwards, with your arms stretching towards the ceiling! Exhale the air! Do not near your head/chin to your chest! Lower your body back to the ball! Breathe at your normal breathing/in your natural breathing rhythm! Move two small steps forward with your feet, so that your upper back leans on the ball! Stretch your body towards the ceiling with your right arm, while rotating your body, your right shoulder is raised from the ball and your left shoulder leans on the

ball! Lower back your arm! Take a position on the ball with your waist leaning on the ball and your knees in 90 degrees position, with your foot soles still leaning on the floor!

Note: Trunk muscle strengthening exercise, core exercise, lumbar motorcontrol abilities developing exercise.

3.5. Complex exercises

Complex trunk exercise without apparatus



(SP), (EP)



(1)



(2)

Starting position: Straddled position on the floor. The trunk is erect, arms on the hip.

Movement description: The right arm stretches towards left shin/ankle, the left arm stretches towards the ceiling (1), then slowly support the body with the right arm behind the right hip, left hand raised to the ceiling (2).

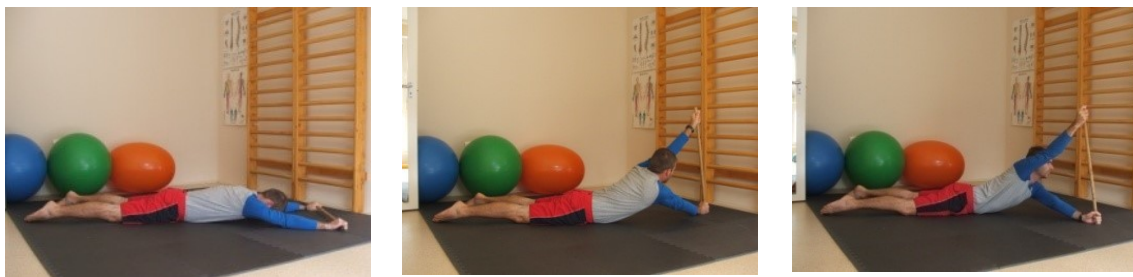
End position: Straddled position on the floor. The trunk is erect, arms on the hip.

Timing: Counts 1-2.: the right arm stretches towards left ankle, counts 3-6.: the right arm supports the right hip and the left arm stretches towards the ceiling.

Communication, exercise instructions: Sit on the floor with your legs extended! Open your legs into a straddled position! Place your arms on your hip! Try to touch your left ankle with your right hand! Stretch your left arm towards the ceiling and look into your hand/palm! Slowly raise your right arm backwards, drawing an arc with your arm and support yourself behind your right hip! Raise your left arm towards the ceiling and look at your hand/palm! Move your trunk into an erect position, put your hands on the hip!

Note: It is an exercise for the mobilization of the hip.

Complex trunk exercise with gymnastic rod



(SP), (2), (EP)

(2)

(3)

Starting position: Lying in prone position, the forehead leans on the floor, lower limbs in slightly apart. The rounded/gymnastic rod is kept in the hand with wider grip than the shoulders. The rod is on the floor in horizontal position.

Movement description: The rod is lifted to vertical position with the left hand, while the rod is slid with the right hand in front of the left shoulder, then it is supported there. (1). Then back to the starting position (2). Sliding the rod in front of the right shoulder, this time the left hand is supporting it, the right hand is placed up on the rod. The rod is in vertical position. (3).

End position: Lying in prone position, the rod is kept in the hand with wider grip than the shoulders. The rod is on the floor in horizontal position.

Timing: Counts 1-2: placing the rod in front of the left shoulder and lifting it to vertical position, counts 3-4: the rod is in horizontal position, counts 5-6: the rod is in front of the right shoulder, in vertical position, counts 7-8: the rod is in horizontal position.

Communication, exercise instructions: Lie on your stomach! Keep your legs extended, slightly apart! Extend your arms by your ears, keep the rod with a wider grip than your shoulders and keep it in a horizontal position on the floor! With your left arm raise the rod into vertical position and push the rod in front of your left shoulder! Bring the rod back to horizontal position! With your right arm lift the rod into vertical position and push the rod with your left hand in front of your right shoulder! Bring the rod back to horizontal position on the floor!

Complex trunk exercise with physioball



(SP), (2), (EP)



(1)



(3)

Starting position: In cross-legged sitting position the right hand on the hip, the left lower arm on the physioball.

Movement description: Rolling the ball in front with the lower arm, then with the back of the hand in front of the knee over the midline of the body with straight bending of the body and torso rotation (1). Then rolling it backwards by the body (2) and further rolling it backwards behind the body with trunk extension and rotation (3).

End position: In cross-legged sitting position the right hand on the hip, the left lower arm on the physioball.

Timing: Counts 1-3: rolling the ball forward, counts 4-6:rolling the ball back to the side of the body,counts 7-9: rolling the ball backwards, counts10-12:rolling the ball back to the side of the body.

Communication, exercise instructions: Take a position sitting on your heels! Place your lower arm on the ball! Stretch your gluteus- and stomach muscles! Fold your shoulder blades! Stretch your body upwards with the top of your head! Roll the ball in front of your right knee! Put your arm forth, stretch your body forward, and turn your body in the direction of the ball! Then pull the ball back to the side of your body! Roll the ball behind your body! Look in the direction of the ball! Roll the ball back to the side of your body! Keep your trunk again in vertical position!

Complex trunk exercise with resistance band



(SP), (EP)



(2)



(4)

Starting position: Position on all fours/kneeling support. Resistance band under left palm and in right hand.

Movement description: Stretching with right arm in front of left hand (1), then with shoulder joint extension by the extended elbow raising the arm with trunk rotation beside/above the trunk (2). Right arm circling above touching the left hand (3), then while sitting on the heels the right arm is raised beside the ear with extended elbow and trunk rotation (4).

End position: Position on all fours/kneeling support. Resistance band under left palm and in right hand.

Timing: Count 1:right arm crossed in front of the left, counts 2-4:torso rotation, shoulder-blade joint extension, counts 5-6: keep the position, count 7: right hand touches the left hand, counts 8-9: extended arm raised by the ear with torso rotation in heel sitting position, count 10: back to the starting position.

Communication, exercise instructions: Take your position on all fours! Put the resistance band under your left palm, support yourself on the floor in this position! Keep the resistance band in your right hand! Place your right hand in front of your left hand on the floor! Raise your arm with extended elbow backwards, with the right hand in the line of the right hip! Stretch the resistance band and raise your arm further upwards, above your body, fold your shoulder blades, raise your shoulder up and turn out to the side! Look at the back of your hand! Do not you're your pelvis to the side! Keep this position for two seconds! Touch the back of your left hand with your right hand! Look at the back of your hand! Raise your extended arm by your ear!At the same time sit on your heels and turn your trunk outside! Look at the back of your hand! Lower your arm and return to the position on all fours!

3.6. Pair-, playful exercises

Trunk muscle strengthening playful exercise



Description and rules of the game:

Starting position: Children/participants take up positions freely in the play area, lying on the surface in prone or supine position.

Movement description, rules of the game: The aim of the game is to prevent the balloon thrown in the play area from falling to the floor. During the game participants are only allowed to be in lying position (prone, supine, side), movement can only be performed rolling or curling on the floor. The balloon may be thrown, pushed, kicked or headed. The player nearest to whom the balloon falls to the floor is the loser in the game.

Communication, exercise instructions: The aim of the game is to prevent the balloon from falling to the floor! The balloon may be thrown, pushed, kicked or headed. The player nearest to whom the ball falls to the floor is the loser in the game. During the game only the lying position is allowed, movement is performed by rolling or curling on the floor. The duration of the game is two minutes. The game begins and ends by clapping.

Note:

The duration of the game can be modified depending on the physical condition of the participants and the training/therapeutic aims.

The exercise can be used with two or more participants as pair-, or group exercise (the balloon should not fall to the floor in the field of the group).

The exercise can be performed in different body positions: in lying position the exercise strengthens the trunk muscles, in sitting- or standing positions it has mobilising functions, developing coordination and balance.

Playful bridges-trunk muscle strengthening and mobilizing exercise



Rules and description of the game:

Starting position: Positions on all fours, chest- and back push-ups.

Description of movement, rules of the game: Half the players are „bridges” (positions on all fours, chest- and back push-ups), the other half are „pedestrians”, walking over or under the bridge. They take turns to signal.

Communication, exercise instructions: Half of the players will be „bridges” in position of chest push-up, maintaining their position. The other half of the players will be “pedestrians” on all fours, continually moving under, above and around the “bridge”. The game starts at clapping and stops at clapping, at this point the players change roles. We take turns every 12 seconds, ten times.

Note:

The game can be played by two players as well.

The “bridge” may be of different positions: on all fours with raising the knee by 1 cm, lizard position, dachshund position, on all fours with supporting lower arms, chest push-up with lower arm support.

The “pedestrians” can use different types of movement: crawling and climbing on all fours, lying in prone position with lower arms support, lizard position, dachshund position. The duration of the exercise can vary between 3-10-60-120 seconds depending on the training/therapeutic aims.

Effects of the exercise: static/isometric muscle development (“bridge”), trunk mobilization (“pedestrian”).

„Obey, disobey” playful exercise



Starting position: The children take up position freely in the playground area, opposite a child/adult. The child/adult instructing the game holds two figures in their hands, for example a duck and a clown.

Movement description, rules of the game: The person instructing the game tells the children the exercises in word and raising the hand with the figure giving the instruction. We obey one figure, for example the duck, and perform the task. We do not obey the other figure, for example the clown, and do not perform the task. The child making a mistake and obeying the „we do not obey figure” as well is out of the game.

Communication, exercise instructions: Take your positions so that you can see or hear me! I have got a duck and a clown in my hands. We obey the duck/bear and do what it tells us. We do not obey the clown; do not do what he tells us. Be careful; do not mix them up, because if you make a mistake and obey the clown, you are out of the game. Pay attention, now we begin. Duck says: Raise your arms! Clown says: Lie on your belly! Bear says: Put your hands on the nape of your neck and stretch your elbow backwards!

Note:

During the game any type of movement sequence can be dictated depending on the therapeutic/preventive/training aims, for example improving posture, muscle-strengthening, developing endurance and mobilizing.

It is also possible to apply isotonic and isometric exercises as well during the game.

The duration of the game can vary between 5-20 minutes depending on the actual capacities (concentration, physical abilities) of the children.

Animal, plant imitation game



(1)



(2)



(3)



(4)

Starting position: Children take up position freely in the playground area.

Movement description, rules of the game: The person instructing the game names an animal or a plant after clapping the hands. The children imitate the movement of the animal or take up a position characteristic of the plant. For example: penguin with feet turned outwards, arms along the body, scapula in abduction, shoulder joint in slight extension, wrist joint in dorsal flexion, elbow joint in extension, walking in small steps (1), peacock- arms along the body, scapula in abduction , shoulder. and elbow joint in extension, palms in a facing position, walking in average size steps to average pace, with the arms moving in symmetric extended movement (2), tree-standing on right leg, left foot sole on right shin, arms raised diagonally, fingers in abduction, palms facing forward (3), giraffe-standing on tiptoes, arms beside the ears, hands on top of each other, wrist joint in

90 degrees flexion, arms and top of the head in continuous upward stretching, walking in small steps on tiptoes, slowly (4).

Communication, exercise instructions: We are going to imitate a penguin, a peacock, a tree, and a giraffe. When I clap my hands and say the name of an animal or plant, please try and imitate it until the next clapping. (Clap) Penguin. (Clap) Giraffe. (Clap) Tree. (Clap) Peacock.(Clap) Tree. (Clap) Giraffe. (Clap) Peacock.

Note:

The examples listed feature exercises focusing on improving posture.

During the game any type of movement sequence can be dictated depending on the therapeutic/preventive/training aims.

It is also possible to apply isotonic and isometric exercises as well during the game.

The duration of the game can vary between 5-20 minutes depending on the actual capacities (concentration, physical abilities) of the children.

Test questions, practice exercises:

1. Give instructions for five trunk extensor muscle group isometric exercises! Pay attention to the gradedness of the exercises and to setting the correct position!
2. Give instructions for ten trunk flexor muscle group isotonic concentric exercises! Pay attention to the gradedness of the exercises and to setting the correct position!
3. List five items of trunk mobilising play exercises!
4. Give instructions for five trunk muscle-strengthening pair work exercises with ball!
5. Give instructions for ten trunk mobilizing exercises in standing position! Pay attention to the gradedness of the exercises and to setting the right position. While performing the exercise correct the faults manually!
6. Give instructions for ten trunk muscle-strengthening exercises in position on all fours! Pay attention to the gradedness of the exercises and to setting the correct position! While performing the exercise correct the faults orally!
7. Give instructions for ten trunk muscle-strengthening exercises from lying position to standing position, according to the development of movement! Pay attention to setting the correct position and to linking the positions!
8. Give instructions for trunk flexion mobilizing exercises in close chain!
9. Perform ten trunk isotonic concentric muscle-strengthening exercises with a repetition number of ten times! Pay attention to the correct movement performance!
10. Perform ten close chain trunk mobilizing exercises with a repetition number of ten times! Pay attention to correct posture and movement performance!

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4. LOWER LIMB EXERCISES (BÁLINT MOLICS)

4.1. Exercises for the hip joint

Hip anteflexion – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, pulled to the edge of the treatment bed.

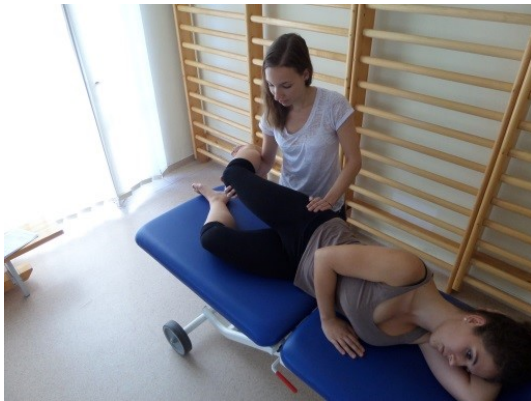
Movement description: attempt to lift the limb to be treated from the hip.

End position: no displacement occurs.

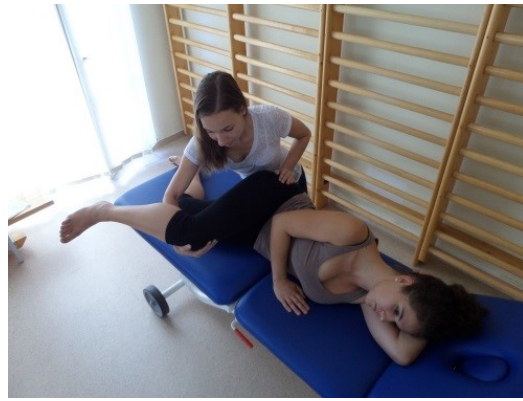
Communication, exercise instructions: imagine and try to lift your hanging limb, moving it from your hip.

Comment: the contraction of the m. iliopsoas' contraction can be felt medially from the spina iliaca anterior superior below the lig. inguinale.

Hip anteflexion - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, propped up by the therapist. The axis of the thigh to be treated is the continuation of the trunk's, the knee joint is slightly bent. The lower limb is in slightly flexion at the hip and knee.

Movement description: moving the full limb to be treated forward, in parallel with the bed (manual support to the movement can be offered).

End position: full bending of the hip joint

Tempo: reaching the end position in one count.

Communication, exercise instructions: bend your upper limb fully, forward.

Comment: the therapist holds the limb's weight only, he/she does not help the forward movement.

Hip anteflexion - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed.

Movement description: lifting the limb to be treated with the full bending of the hip joint.

End position: full bending of the hip joint

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift the hanging limb off the bed and bend your hip completely.

Hip anteflexion - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: lifting the limb to be treated with the full bending of the hip joint against resistance.

End position: full bending of the hip joint

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift the hanging limb off the bed and bend your hip completely against the resistance of the weight.

Comment: the resistance can be a manual resistance as well, that is exerted on the anterior, distal part of the thigh against the movement direction on the whole curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip anteflexion - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the knee joint of the limb to be treated is bent, the hip joint is fully bent, while the other limb is pulled to the edge of the treatment bed, resting on its sole.

Movement description: lowering the limb to be treated to the treatment bed.

End position: lowering the limb to be treated to the treatment bed in such a way that the leg of the limb hangs from the table from the knee down.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your limb to the treatment bed while keeping your hip joint completely bent.

Hip anteflexion - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the knee joint of the limb to be treated is bent, the hip joint is fully bent, while the other limb is pulled to the edge of the treatment bed, resting on its sole. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: lowering the limb to be treated to the treatment bed.

End position: lowering the limb to be treated to the treatment bed in such a way that the leg of the limb hangs from the table from the knee down.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your limb to the treatment bed while keeping your hip joint completely bent.

Comment: the resistance can be a manual resistance as well, that is exerted on the anterior, distal part of the thigh on the whole curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip retroflexion – isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed.

Movement description: attempt to lift the extended limb from the hip.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to lift your limb to be treated from the treatment bed moving it from the hip while keeping it extended.

Comment: feeling the contraction of the m. gluteus maximus can be done with full palm.

Hip retroflexion - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, propped up by the therapist. The axis of the limb to be treated is the continuation of the trunk's or it is slightly bent, the knee joint is extended. The lower limb is in slightly flexion at the hip and knee.

Movement description: moving the full limb to be treated backward, in parallel with the bed (manual support to the movement can be offered).

End position: the limb to be treated is pulled backwards (about 10-15°).

Tempo: reaching the end position in one count.

Communication, exercise instructions: move the upper limb backward and do not tilt your pelvis.

Comment: the therapist holds the limb's weight only, he/she does not help the movement. During the exercise it should be avoided to increase the lordosis of the lumbar spinal column, the forward tilt of the pelvis due to excessively pulling back the limb.

Hip retroflexion - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed.

Movement description: lifting the extended limb to be treated from the treatment bed.

End position: lifting the extended limb from the treatment bed (about 10-15°).

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift the limb to be treated up from the bed, moving it from your hip, while preventing your pelvis from tilting.

Comment: during the exercise it should be avoided to increase the lordosis of the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb.

Hip retroflexion - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: lifting the extended limb to be treated against resistance from the treatment bed.

End position: lifting the extended limb from the treatment bed (about 10-15°).

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift up from the bed the limb to be treated against the resistance of the weight, moving it from your hip, while preventing your pelvis from tilting.

Comment: during the exercise it should be avoided to increase the lordosis of the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb. The resistance can also be applied manually, exerted on the posterior, distal end of the thigh against the movement direction. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip retroflexion - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: prone position the limb to be treated is extended and lifted from treatment bed (about 10-15 °). The other limb is extended and resting on the table, the foot is overhanging the edge of the treatment bed.

Movement description: lowering the extended limb from the treatment bed, movement starting from the hip.

End position: both extended limbs are resting on the treatment bed, the feet overhanging the edge of the treatment bed.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower the raised, extended limb back to the bed.

Comment: in the starting position it should be avoided to increase the tilt of the pelvis through excessive raise of the limb and the increase of the lordosis of the lumbar spinal column.

Hip retroflexion - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: prone position the limb to be treated is extended and lifted from treatment bed (about 10-15 °). An ankle weight is placed on the limb to be treated on the distal part of the leg. The other limb is extended and resting on the table, the foot is overhanging the edge of the treatment bed.

Movement description: lowering the extended limb from the treatment bed, movement starting from the hip.

End position: both extended limbs are resting on the treatment bed, the feet overhanging the edge of the treatment bed.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower the raised, extended limb back to the bed.

Comment: in the starting position it should be avoided to increase the tilt of the pelvis through excessive raise of the limb and the increase of the lordosis of the lumbar spinal column. The resistance can also be applied manually, exerted on the posterior, distal end of the thigh. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip abduction - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, both lower limbs extended.

Movement description: attempt to move the limb to be treated laterally, from the hip joint

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to move your extended limb sideways from your hip joint.

Comment: the muscle contraction can be felt on the trochanter major femoris.

Hip abduction - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: in supine position, both lower limbs extended.

Movement description: full lateral movement of the limb to be treated in parallel with the bed (manual support to the movement can be offered).

End position: full lateral abduction of the limb from the hip joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: move your extended limb fully sideways while preventing your pelvis from tilting.

Comment: the therapist holds the limb's weight only, he/she does not help the lateral movement. On smooth, friction-free floor there is no need to offer support to the limb. During the performance of the exercise it should be avoided the pelvis' tilt and the lumbar spinal column's lateral displacement that takes place due to the excessive movement of the limb.

Hip abduction - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, propped up. The axis of the limb to be treated is the continuation of the trunk's. The lower limb is in slightly flexion at the hip and knee.

Movement description: full lifting of the affected limb.

End position: the limb to be treated is in upper position, lifted and extended.

Tempo: reaching the end position in one count.

Communication, exercise instructions: raise the upper limb fully, but do not tilt your pelvis.

Comment: during the exercise it should be avoided to move laterally the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb.

Hip abduction - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, propped up. The axis of the limb to be treated is the continuation of the trunk's. The lower limb is in slight flexion at the hip and knee. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: full lifting of the affected limb against resistance.

End position: the limb to be treated is in upper position, lifted and extended.

Tempo: reaching the end position in one count.

Communication, exercise instructions: raise the upper limb fully, against resistance, but do not tilt your pelvis.

Comment: during the exercise it should be avoided to move laterally the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb. The resistance can also be applied manually, exerted on the posterior, distal end of the thigh, on the lateral side against the movement direction. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip abduction - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, extended and raised. The lower limb is in slightly flexion at the hip and knee.

Movement description: lowering the affected limb.

End position: the limb to be treated in upper position is lowered while extended, its axis is the continuation of the trunk's. A pillow can be used for propping it up.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your raised, upper limb.

Comment: during the exercise, at the starting position it should be avoided to move laterally the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb.

Hip abduction - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, extended and raised. The lower limb is in slightly flexion at the hip and knee. An ankle weight is placed on the limb to be treated, on the distal part of the leg.

Movement description: lowering the affected limb.

End position: the limb to be treated in upper position is lowered while extended, its axis is the continuation of the trunk's. A pillow can be used for propping it up.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your raised, upper limb.

Comment: during the exercise, at the starting position it should be avoided to move laterally the lumbar spinal column, the tilt of the pelvis due to the excessive lifting of the limb. The resistance can also be applied manually, exerted on the posterior, distal end of the thigh, on the lateral side along the whole curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip adduction - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, both lower limbs extended. The limb to be treated is in slight abduction.

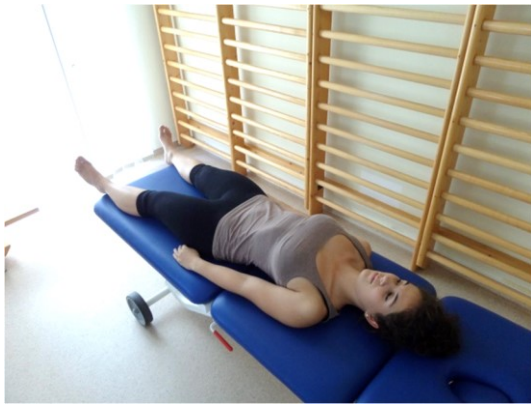
Movement description: attempting to pull the affected limb to central position from the hip.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to pull your extended limb to the centre from your hip joint.

Comment: the contraction of the muscle can be felt near the origin of the adductors, in the medial side of the thigh, proximally.

Hip adduction - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: in supine position, both lower limbs extended. Both limbs are in slight abduction.

Movement description: pulling the limb to be treated inward, beyond the center-line in parallel with the bed (manual support to the movement can be offered).

End position: the limb to be treated is pulled beyond the center-line and next to the other limb.

Tempo: reaching the end position in one count.

Communication, exercise instructions: pull inward the limb to be treated and next to the other limb, while keeping it extended.

Comment: the therapist holds the limb's weight only, he/she does not help the inward movement. On smooth, friction-free floor there is no need to offer support to the limb.

Hip adduction - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: lying on one side, both lower limbs extended. The limb to be treated is in lower position, the other limb is above, immobilized in abduction. Immobilization can be done by the physiotherapist, by holding the limb.

Movement description: lifting the limb to be treated, being in lower position, while keeping it extended, beyond the center-line.

End position: lifted position of the limb to be treated, while keeping it extended.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift the limb to be treated from the bed while keeping it extended.

Hip adduction - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: lying on one side, both lower limbs extended. The limb to be treated is in lower position, the other limb is above, immobilized in abduction. Immobilization can be done by the physiotherapist, by holding the limb. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: lifting against resistance the limb to be treated, being in lower position, while keeping it extended, beyond the center-line.

End position: lifted position of the limb to be treated, while keeping it extended.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lift the limb to be treated from the bed against the resistance of the weight while keeping it extended.

Comment: the resistance can also be applied manually, exerted on the posterior, distal end of the thigh, on the medial side against the movement direction. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Hip adduction - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: lying on one side, both lower limbs extended. The limb to be treated is in lower position, the other limb is above, immobilized in abduction. Immobilization can be done by the physiotherapist, by holding the limb. The limb to be treated is lifted from the treatment bed beyond the center-line.

Movement description: lowering the bottom limb to the bed.

End position: the bottom limb is extended on the treatment bed.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your limb to the bed while keeping it extended.

Hip adduction - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: lying on one side, both lower limbs extended. The limb to be treated is in lower position, the other limb is above, immobilized in abduction. Immobilization can be done by the physiotherapist, by holding the limb. The limb to be treated is lifted from the treatment bed beyond the center-line, this limb has an ankle weight on the distal part of the leg.

Movement description: lowering the bottom limb to the bed.

End position: the bottom limb is extended on the treatment bed.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your limb to the bed while keeping it extended.

Comment: the resistance can also be applied manually, exerted on the posterior, distal end of the thigh, on the medial side. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

External rotation of the hip - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, both lower limbs are extended, the limb to be treated is in slight abduction and the hip joint is rotated inward.

Movement description: attempt to rotate the limb to be treated outward from the hip.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to rotate outward your extended limb.

Comment: the muscle contraction can be felt on the tip of the trochanter major femoris, at the fossa trochanterica.

External rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: in supine position, the limb to be treated is bent in 90° angle, the thigh axis is vertical, the leg can be propped up by the physiotherapist. The other limb is pulled up until it slightly rests on its sole.

Movement description: full external rotation along the vertical axis of the thigh through the inward movement of the leg, while keeping the leg in the horizontal plane.

End position: full external rotation, the leg of the limb to be treated is moved inward, the axis of the thigh is vertical.

Tempo: reaching the end position in one count.

Communication, exercise instructions: while holding your thigh vertically, rotate your leg inward, and keep your leg in the horizontal plane.

Comment: the therapist holds the leg's weight only, he/she does not help the movement. Regardless of the hip joint's flexed or extended state, in the case of muscle strength 2 any body posture can be assumed in which the movement, that is the thigh's axis, is vertical, thus the perpendicular movement plane is horizontal.

External rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed.

Movement description: full external rotation (about 45 °) by moving the leg of the limb to be treated inward, along the thigh's axis.

End position: full external rotation (about 45 °), the leg on the limb to be treated is moved inward.

Tempo: reaching the end position in one count.

Communication, exercise instructions: keep your thigh down on the bed and rotate your leg fully inward.

Comment: during the execution of this exercise it should be avoided to transfer the movement of the limb to the pelvis as well as lifting the body from the bed.

External rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: full external rotation (about 45 °) by moving the leg of the limb to be treated inward, along the thigh's axis, against resistance.

End position: full external rotation (about 45 °), the leg on the limb to be treated is moved inward.

Tempo: reaching the end position in one count.

Communication, exercise instructions: keep your thigh down on the bed and rotate your leg fully inward against the resistance of the weight.

Comment: during the execution of this exercise it should be avoided to transfer the movement of the limb to the pelvis. The resistance can be manual resistance as well, which can be applied on the distal end of the leg, over the malleolus medialis, against the movement direction, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

External rotation of the hip - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed.

End position: the leg on the limb to be treated is moved inward in full external rotation (about 45 °)

Movement description: from full external rotation (about 45 °) the leg of the limb to be treated is lowered until reaches vertical position, along the thigh's axis.

End position: the leg of the limb to be treated is in vertical position, lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: hold your thigh down on the bed and lower your leg until it reaches a vertical position.

Comment: in the starting position it should be avoided to transfer the movement of the limb to the pelvis due to excessive limb movement.

External rotation of the hip - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. **End position:** the leg on the limb to be treated is moved inward in full external rotation (about 45 °) and there is an ankle weight on the distal part of the leg.

Movement description: from full external rotation (about 45 °) the leg of the limb to be treated is lowered until reaches vertical position, along the thigh's axis.

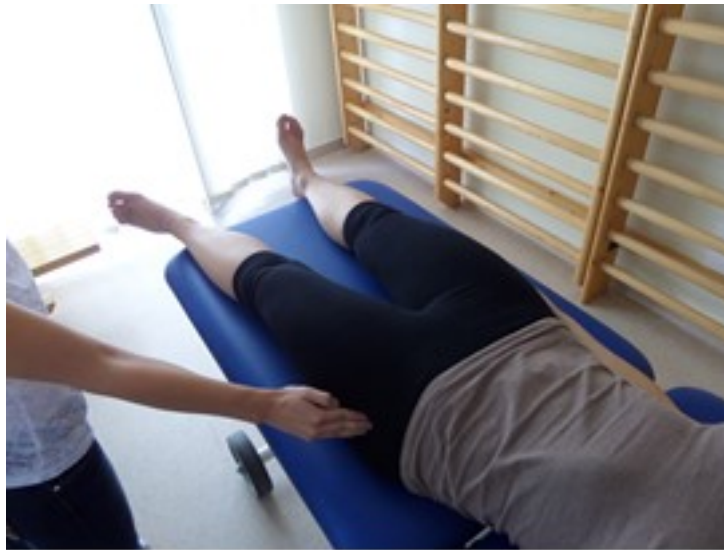
End position: the leg of the limb to be treated is in vertical position, lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: hold your thigh down on the bed and lower your leg until it reaches a vertical position.

Comment: in the starting position it should be avoided to transfer the movement of the limb to the pelvis due to excessive limb movement. The resistance can be manual resistance as well, which can be applied on the distal end of the leg, over the malleolus medialis, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Internal rotation of the hip - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, both lower limbs are extended, the limb to be treated is in slight abduction and the hip joint is rotated outward.

Movement description: attempt to rotate the limb to be treated inward from the hip.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to rotate inward your extended limb.

Comment: the muscle contraction can be felt over the trochanter major femoris.

Internal rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: in supine position, the limb to be treated is bent in 90° angle, the thigh axis is vertical, the leg can be propped up by the physiotherapist. The other limb is pulled up until it slightly rests on its sole.

Movement description: full internal rotation along the vertical axis of the thigh through the outward movement of the leg, while keeping the leg in the horizontal plane.

End position: full internal rotation, the leg of the limb to be treated is moved outward, the axis of the thigh is vertical.

Tempo: reaching the end position in one count.

Communication, exercise instructions: while holding your thigh vertically, rotate your leg outward, and keep your leg in the horizontal plane.

Comment: the therapist holds the leg's weight only, he/she does not help the movement. Regardless of the hip joint's flexed or extended state, in the case of muscle strength 2 any body posture can be assumed in which the movement, that is the thigh's axis, is vertical, thus the perpendicular movement plane is horizontal.

Internal rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed.

Movement description: full internal rotation (about 30 °) by moving the leg of the limb to be treated outward, along the thigh's axis.

End position: full internal rotation (about 30 °), the leg on the limb to be treated is moved outward.

Tempo: reaching the end position in one count.

Communication, exercise instructions: keep your thigh down on the bed and rotate your leg fully outward.

Comment: during the execution of this exercise it should be avoided to transfer the movement of the limb to the pelvis as well as lifting the body from the bed.

Internal rotation of the hip - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: full internal rotation (about 30 °) by moving the leg of the limb to be treated outward, against resistance, along the thigh's axis.

End position: full internal rotation (about 30 °), the leg on the limb to be treated is moved outward.

Tempo: reaching the end position in one count.

Communication, exercise instructions: keep your thigh down on the bed and rotate your leg fully outward against the resistance of the weight.

Comment: during the execution of this exercise it should be avoided to transfer the movement of the limb to the pelvis. The resistance can be manual resistance as well, which can be applied on the distal end of the leg, over the malleolus lateralis, against the movement direction, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Internal rotation of the hip - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. **End position:** full internal rotation (about 30 °), the leg on the limb to be treated is moved outward.

Movement description: from full internal rotation (about 30 °) the leg of the limb to be treated is lowered until reaches vertical position, along the thigh's axis.

End position: the leg of the limb to be treated is in vertical position, lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: hold your thigh down on the bed and lower your leg until it reaches a vertical position.

Comment: in the starting position it should be avoided to transfer the movement of the limb to the pelvis due to excessive limb movement.

Internal rotation of the hip - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated hangs from the bed from the knee down while the other limb is resting on its sole, moved to the edge of the treatment bed. **End position:** the leg on the limb to be treated is moved outward in full internal rotation (about 30 °) and there is an ankle weight on the distal part of the leg.

Movement description: from full internal rotation (about 30 °) the leg of the limb to be treated is lowered until reaches vertical position, along the thigh's axis.

End position: the leg of the limb to be treated is in vertical position, lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: hold your thigh down on the bed and lower your leg until it reaches a vertical position.

Comment: in the starting position it should be avoided to transfer the movement of the limb to the pelvis due to excessive limb movement. The resistance can be manual resistance as well, which can be applied on the distal end of the leg, over the malleolus lateralis, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

4.2. Exercises for the knee joint

Knee joint extension - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, the knee joint of the limb to be treated is slightly bent, propped up.

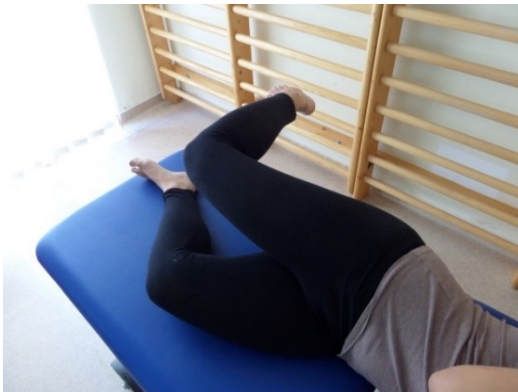
Movement description: attempting to extend the knee joint on the limb to be treated.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to extend your knee, lifting your heel from the bed.

Comment: feeling the contraction of the m. quadriceps femoris can be done on the patella or over the patella, on the muscle.

Knee joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, it also can be propped up by the physiotherapist or by a tool. The axis of the thigh on the limb to be treated is the continuation of the trunk's, the knee joint is bent in a 90 ° angle. The bottom limb's hip and knee joint is slightly bent.

Movement description: full extension of the knee joint on the limb to be treated, moving the leg forward, in parallel with the bed (manual support to the movement can be offered).

End position: full extension of the knee joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: extend fully your knee joint of your upper limb.

Comment: the physiotherapist may only hold the weight of the limb, he/she may not assist the leg's forward movement.

Knee joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated is hanging from the bed from the knee down, the knee joint is bent in a 90 ° angle, while the other limb is resting on its sole, moved to the edge of the treatment bed.

Movement description: moving forward the leg of the limb to be treated, full extension of the knee joint.

End position: full extension of the knee joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully extend the knee joint of the limb to be treated.

Knee joint extension - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: in supine position on the edge of the treatment bed in a way that the leg of the limb to be treated is hanging from the bed from the knee down, the knee joint is bent in a 90 ° angle, while the other limb is resting on its sole, moved to the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: moving forward the leg of the limb to be treated, full extension of the knee joint against resistance.

End position: full extension of the knee joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: extend the knee joint of your limb to be treated against the resistance of the weight.

Comment: the resistance can be manual resistance as well, which can be applied on the distal end of the leg from the front, against the movement direction, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Knee joint extension - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: supine position on the edge of the treatment bed in a way that the leg of the limb to be treated overhangs the edge of the bed from the knee down, knee joint extended, while the other limb is resting on its sole, moved to the edge of the treatment bed.

Movement description: bending the knee joint on the limb to be treated, lowering the leg to vertical position.

End position: the knee joint on the limb to be treated is bent in a 90° angle.

Tempo: reaching the end position in one count.

Communication, exercise instructions: bend your knee joint on the limb to be treated and lower your leg into vertical position.

Knee joint extension - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: supine position on the edge of the treatment bed in a way that the leg of the limb to be treated overhangs the edge of the bed from the knee down, knee joint extended, while the other limb is resting on its sole, moved to the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: bending the knee joint on the limb to be treated, lowering the leg to vertical position.

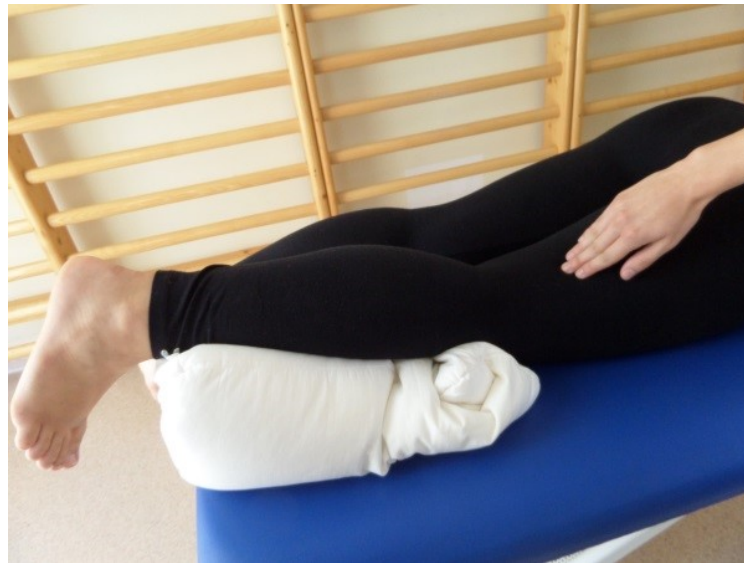
End position: the knee joint on the limb to be treated is bent in a 90° angle.

Tempo: reaching the end position in one count.

Communication, exercise instructions: bend your knee joint on the limb to be treated and lower your leg into vertical position.

Comment: the resistance can be manual resistance as well, which can be applied on the distal end of the leg from the front, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Knee joint flexion - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed. The knee joint of the limb to be treated is slightly bent and propped up.

Movement description: attempting to bend the knee joint on the limb to be treated and to lift the leg.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to bend your knee, lifting your leg from the bed.

Comment: muscle contraction can be felt on the posterior surface of the thigh.

Knee joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is in upper position, it also can be propped up by the physiotherapist or by a tool. The axis of the thigh on the limb to be treated is the continuation of the trunk's, the knee joint is bent. The bottom limb's hip and knee joint is slightly bent.

Movement description: full bending of the knee joint on the limb to be treated, moving the leg backward, in parallel with the bed (manual support to the movement can be offered).

End position: the knee joint is fully bent.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully bend your knee joint on your upper limb.

Comment: the physiotherapist may only hold the weight of the limb, he/she may not assist the leg's forward movement.

Knee joint flexion - concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed.

Movement description: lifting up the leg on the limb to be treated from the bed, full bending of the knee joint.

End position: full flexion of the knee joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully bend your knee joint on your limb to be treated.

Knee joint flexion - concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed. An ankle weight is placed on the limb to be treated on the distal part of the leg.

Movement description: lifting up the leg on the limb to be treated from the bed, full bending of the knee joint against resistance.

End position: full flexion of the knee joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully bend your knee joint on your limb to be treated.

Comment: the resistance can be manual resistance as well, which can be applied on the distal end of the leg from the back, against the movement direction, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Knee joint flexion - eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed. The knee joint on the limb to be treated is bent in a 90° angle.

Movement description: lowering the leg of the limb to be treated to the bed, full extension of the knee joint.

End position: the knee joint of the limb to be treated is extended.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your leg of the limb to be treated to the bed, extend your knee joint.

Knee joint flexion - eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: prone position, both lower limbs are extended and the feet overhang the edge of the treatment bed. The knee joint of the limb to be treated is bent in a 90 ° angle, an ankle weight is attached to the distal part of the leg.

Movement description: lowering the leg of the limb to be treated to the bed, full extension of the knee joint.

End position: the knee joint of the limb to be treated is extended

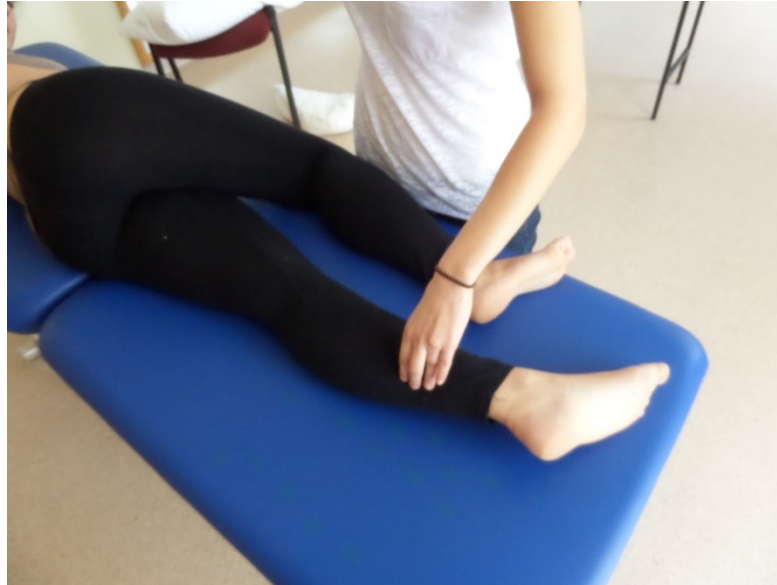
Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your leg of the limb to be treated to the bed, extend your knee joint.

Comment: the resistance can be manual resistance as well, which can be applied on the distal end of the leg from the back along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

4.3. Exercises for the ankle joint

Ankle joint extension - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: lying on one side, the limb to be treated is positioned below with knee and hip joint extended. The other limb's knee and hip joint is bent, resting in front of the limb to be treated on the treatment bed.

Movement description: attempt to flex the foot of the limb to be treated downward, plantar flexion.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to flex your foot of your limb to be treated downward, toward your sole.

Comment: the contraction of the m. gastrocnemius can be felt over the Achilles tendon. Strengthening of the m. soleus with muscle strength 1 can be carried out in similar manner but in this case the knee joint is slightly bent in the starting position.

Ankle joint plantar flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is positioned below with knee and hip joint extended. The other limb's knee and hip joint is bent, resting in front of the limb to be treated on the treatment bed.

Movement description: flexing the foot of the limb to be treated downward, plantar flexion, in parallel with the bed.

End position: full plantar flexion of the ankle joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully flex downward your limb to be treated in the direction of your sole.

Comment: strengthening the m. soleus with muscle strength 2 is done similar to the m. gastrocnemius with muscle strength 2, but the knee joint is slightly bent in the starting position.

Ankle joint plantar flexion – concentric exercise, muscle strengthening equivalent to muscle strength 3, 4, 5



(SP)



(EP)

Starting position: prone position, both limbs are extended and they overhang the edge of the treatment bed.

Movement description: full plantar flexion of the leg against resistance.

End position: full plantar flexion of the ankle joint.

Tempo: reaching the end position in one count.

Communication, exercise instructions: push your limb to be treated against resistance from your ankle.

Comment:

- similarly, at 3, 4, or 5 muscle strength a resistance is applied. When applied manually, this can be done on the calcaneum or on the sole.
- strengthening the m. soleus with muscle strength 3, 4 or 5 is done similar to the m. gastrocnemius with muscle strength 3, 4 or 5, but in the starting position the knee joint is bent in a 30 ° angle.
- strengthening the m. gastrocnemius and the m. soleus with 3, 4 or 5 muscle strength can also be done in a closed kinetic chain as follows:

Strengthening the m. gastrocnemius with a muscle strength 3, 4 or 5 in closed kinematic chain:



(SP)



(EP)

Starting position: standing on one foot with extended knee joint on the limb to be treated.

Movement description: rising on tiptoe, raising the heel off the floor.

End position: the heel is raised from the floor.

Tempo: reaching the end position in one count.

Communication, exercise instructions: raise your heel, raise on tiptoe while keeping your knee joint extended.

Comment: strengthening with muscle strength 3, 4 or 5 differs in the number of repetitions.

Strengthening the m. soleus with a muscle strength 3, 4 or 5 in closed kinematic chain:



(SP)



(EP)

Starting position: sitting position, the hip joint and the knee joints are bent, both limbs' soles are resting on the floor.

Movement description: raising on tiptoe with the limb to be treated, raising the heel off the floor. Resistance is applied to the knee from above, against the movement.

End position: heel raised off the floor against resistance.

Tempo: reaching the end position in one count.

Communication, exercise instructions: raise your heel off the floor against resistance.

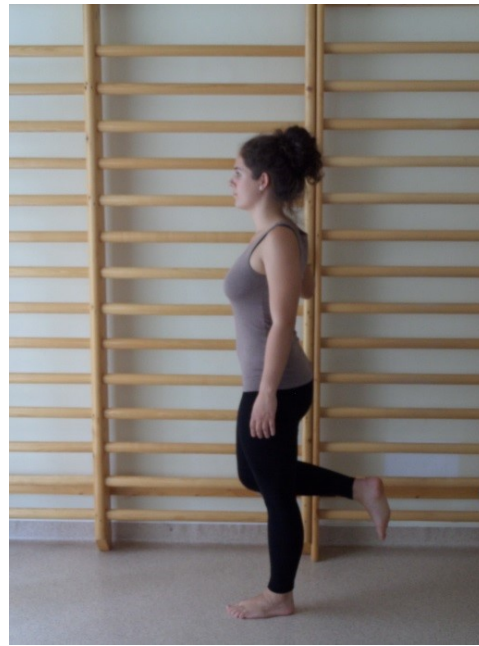
Comment: strengthening with muscle strength 3, 4 or 5 differs in the amount of resistance applied.

Ankle joint plantar flexion – eccentric exercise, muscle strengthening equivalent to muscle strength 3, 4, 5

Strengthening the m. gastrocnemius with a muscle strength 3, 4 or 5 in closed kinematic chain:



(SP)



(EP)

Starting position: standing on one foot on tiptoe, with extended knee joint on the limb to be treated.

Movement description: lowering the heel to the floor from tiptoe.

End position: the heel and the whole sole is on the floor.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your heel to the floor while keeping your knee joint extended.

Comment: strengthening with muscle strength 3, 4 or 5 differs in the number of repetitions.

Strengthening the m. soleus with a muscle strength 3, 4 or 5 in closed kinematic chain:



(SP)



(EP)

Starting position: sitting position, the hip and knee joints are bent, the limb to be treated is raised on tiptoe.

Movement description: lower your heel of your limb to be treated to the floor against resistance. Resistance is applied to the knee from above.

End position: the heel and the whole sole is on the floor against resistance.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower your heel to the floor against resistance.

Comment: strengthening with muscle strength 3, 4 or 5 differs in the amount of resistance applied.

Ankle joint extension - isometric exercise, muscle strengthening equivalent to muscle strength 1



Starting position: in supine position, knee and hip joints are extended on both limbs, the limbs overhanging the edge of the treatment bed.

Movement description: attempting the dorsiflexion of the leg to be treated.

End position: no displacement occurs.

Communication, exercise instructions: imagine and try to dorsiflex your foot to be treated.

Comment: the muscle contraction can be felt at the height of the ankle joint, frontally.

Ankle joint flexion – concentric exercise, muscle strengthening equivalent to muscle strength 2



(SP)



(EP)

Starting position: lying on one side, the limb to be treated is positioned below with knee and hip joint extended. The other limb's knee and hip joint is bent, resting in front of the limb to be treated on the treatment bed.

Movement description: full dorsiflexion of the foot to be treated in parallel with the bed.

End position: full dorsiflexion of the ankle joint on the leg to be treated.

Tempo: reaching the end position in one count.

Communication, exercise instructions: flex your foot fully toward your sole.

Ankle joint dorsiflexion – concentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: sitting position on the edge of the treatment bed so that the legs of both limbs hangs from the bed, the ankle joints are loose.

Movement description: lifting the leg of the limb to be treated, dorsiflexion.

End position: the foot of the limb to be treated is fully dorsiflexed.

Tempo: reaching the end position in one count.

Communication, exercise instructions: fully flex back the foot of the limb to be treated.

Ankle joint dorsiflexion – concentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: sitting position on the edge of the treatment bed so that the legs of both limbs hangs from the bed, the ankle joint is loose. A weight is attached to the foot of the limb to be treated.

Movement description: full lifting of the foot on the limb to be treated against resistance.

End position: the foot on the limb to be treated is fully lifted against resistance.

Tempo: reaching the end position in one count.

Communication, exercise instructions: flex fully back the foot to be treated against resistance.

Comment: the resistance can be manual resistance as well, which can be applied on the foot, against the movement direction, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

Ankle joint dorsiflexion – eccentric exercise, muscle strengthening equivalent to muscle strength 3



(SP)



(EP)

Starting position: sitting position on the edge of the treatment bed so that the legs of both limbs hangs from the bed, the foot of the limb to be treated is lifted in the ankle joint, dorsiflexed.

Movement description: lowering the leg of the limb to be treated.

End position: the foot of the limb to be treated is fully lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower fully your dorsiflexed foot.

Ankle joint dorsiflexion – eccentric exercise, muscle strengthening equivalent to muscle strength 4, 5



(SP)



(EP)

Starting position: sitting position on the edge of the treatment bed so that the legs of both limbs hangs from the bed. A weight is attached to the foot of the limb to be treated, the foot is in dorsiflexion.

Movement description: full lowering the foot of the limb to be treated against resistance.

End position: the foot of the limb to be treated is fully lowered.

Tempo: reaching the end position in one count.

Communication, exercise instructions: lower fully your dorsiflexed foot.

Comment: the resistance can be manual resistance as well, which can be applied on the foot, along the full curve of the movement. The muscle strengths 4 and 5 can be differentiated subjectively by the size of the weight and the amount of manual resistance exerted.

4.4. Combined exercises of the lower limb

Lower limb combined exercise 1.



(SP), (4)



(1)



(2)



(3)

Starting position: lying on one side, the limb to be treated is in upper position. The axis of the thigh on the limb to be treated is the continuation of the trunk's, the knee joint is bent, ankle joint in neutral position. The bottom limb's hip and knee joint is slightly bent.

Movement description:

1. full flexion of the hip and knee joint of the limb to be treated with the ankle joint's plantar flexion.
2. full forward extension of the knee joint with the dorsiflexion of the ankle joint, while keeping the flexion of the hip joint.
3. full extension of the hip joint of the limb to be treated with the ankle joint's plantar flexion.
4. bringing the extended limb back to the starting position through a slight flexion of the hip joint of the limb to be treated.

End position: same as the starting position.

Tempo: 1 sec/count

Communication, exercise instructions:

1. pull your upper limb close to your stomach, while bending your knee and flexing your ankle downward.
2. extend your knee fully forward while flexing your ankle upward.
3. move your extended limb back, while flexing your ankle downward.
4. bring back your extended limb to the line of your body, loosen your ankle.

Comment: the movement of the limb is parallel with the plane of the treatment bed during the whole time of the exercise. Muscle strength 4 is needed for the hip abductors (m. gluteus minimus and medius) in order to keep the limb in the plane for a prolonged period. Lacking the muscle strength, the limb can be propped up by the means of a universal exercise unit or by the therapist. The therapist may not assist the movement, he/she only may prop up the limb.

In the second stroke, at the extension of the knee joint, the extent of the flexion decreases. In the third stroke it should be avoided to increase the lordosis of the lumbar spinal column, the forward tilt of the pelvis, due to excessively pulling back the limb.

Lower limb combined exercise 2.



(SP), (3)



(1)



(2)

Starting position: in supine position, on the limb to be treated the hip joint and the knee joint are extended, the ankle joint is in plantar flexion. The other limb is pulled to rest on its sole.

Movement description:

1. full flexion of the hip and knee joint of the limb to be treated with the ankle joint's plantar flexion.
2. full forward extension of the knee joint with the dorsiflexion of the ankle joint, while keeping the flexion of the hip joint.
3. lowering the limb to be treated to the floor with the plantar flexion of the ankle joint.

End position: same as the starting position.

Tempo: 1 sec/count

Communication, exercise instructions:

1. pull your limb to be treated to your stomach, while bending your knee. Flex your ankle downward.
2. fully extend your knee joint toward the ceiling, while flexing upward your ankle.
3. lower your extended limb to the floor, moving it from your hip, while flexing downward your ankle.

Comment: the movement of the limb is kept in the sagittal plane during the whole time of the exercise. The muscles performing the movement are working against gravity, carrying out a concentric muscle movement during the lifting and an eccentric muscle movement during the backward movement.

In the second stroke, at the extension of the knee joint, the extent of the flexion decreases.

Lower limb combined exercise 3.



(SP), (4)



(1)



(2)



(3)

Starting position: sitting position, the knee and hip joints of both limbs are bent from the hip joints, the sole rests on the floor.

Movement description:

1. full flexion of the hip joint on the limb to be treated, plantar flexion of the ankle joint.
2. full forward extension of the knee joint with the dorsiflexion of the ankle joint, while keeping the flexion of the hip joint.
3. lowering the limb to be treated to the floor with the plantar flexion of the ankle joint.
4. pulling the limb to its sole by flexing the hip joint and the knee joint on the limb to be treated, assuming the starting position.

End position: same as the starting position.

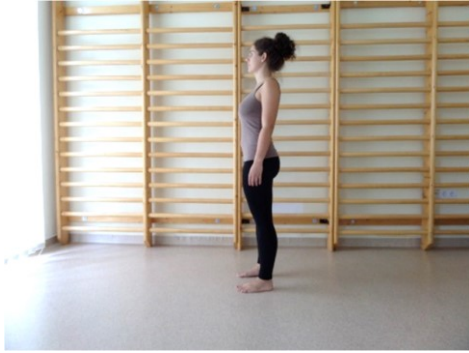
Tempo: 1 sec/count

Communication, exercise instructions:

1. pull your limb to be treated to your stomach, while flexing your ankle downward.
2. fully extend your knee joint forward while flexing upward your ankle.
3. lower your extended limb to the floor, moving it from your hip, while flexing downward your ankle.
4. pull your extended limb to its sole.

Comment: the movement of the limb is kept in the sagittal plane during the whole time of the exercise. The muscles performing the movement are working against gravity, carrying out a concentric muscle movement during the lifting and an eccentric muscle movement during the backward movement. In the second stroke, at the extension of the knee joint, the extent of the flexion decreases.

Lower limb combined exercise 4.



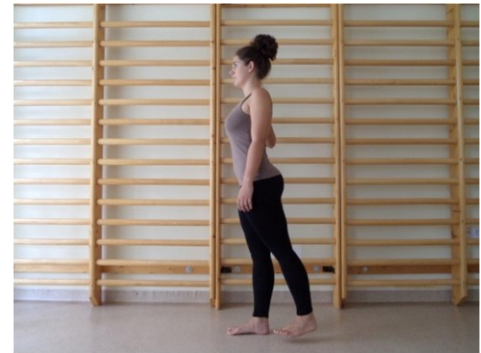
(SP)



(1)



(2)



(EP)

Starting position: basic standing position

Movement description:

1. full flexion of the hip and knee joint of the limb to be treated with the ankle joint's plantar flexion.
2. full forward extension of the knee joint with the dorsiflexion of the ankle joint, while keeping the flexion of the hip joint.

End position: full extension of the hip joint of the limb to be treated with the ankle joint's dorsiflexion.

Tempo: 1 sec/count

Communication, exercise instructions:

1. pull your limb to be treated close to your stomach, while bending your knee and flexing your ankle downward.
2. extend your knee fully forward while flexing your ankle upward. Hold your limb as high as possible.

EP. pull back your extended limb while keeping your knee extended and your ankle flexed upward.

Comment: the movement of the limb is kept in the sagittal plane during the whole time of the exercise. In the second stroke, at the extension of the knee joint, the extent of the flexion decreases. In the last stroke it should be avoided to increase the lordosis of the lumbar spinal column, the forward tilt of the pelvis, due to excessively pulling back the limb.

4.5. Lower limb complex exercises

Lower limb complex exercise 1.



(SP), (2)



(1)

Starting position: in supine position, on the limb to be treated the hip joint and the knee joint are extended, the ankle joint is loose. The other limb is pulled to rest on its sole.

Movement description:

1. knee joint flexing together with the hip joint's flexing, abducting and external rotation.
2. assuming the starting position.

End position: same as the starting position.

Tempo: 1 sec/count

Communication, exercise instructions:

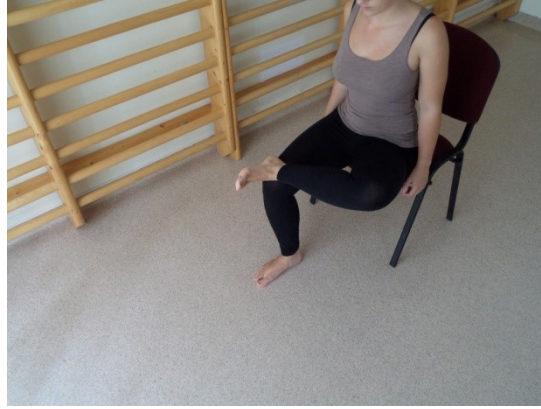
1. place the heel of your limb to be treated to your other knee.
2. place your leg back down by extending your knee.

Comment: during the exercise the external rotation a flexion, abduction and external rotation of the hip joint will occur together with the knee joint's flexion (and external rotation). The joint movements of the everyday activities are similar to all the components of the m. sartorius that affect these two joints.

Lower limb complex exercise 2.



(SP), (2)



(1)

Starting position: sitting position, the knee joint of the limb to be treated is extended on the floor, the other limb is pulled up to rest on its sole. Hands on hips.

Movement description:

1. knee joint flexing together with the hip joint's flexing, abducting and external rotation.
2. assuming the starting position.

End position: same as the starting position.

Tempo: 1 sec/count

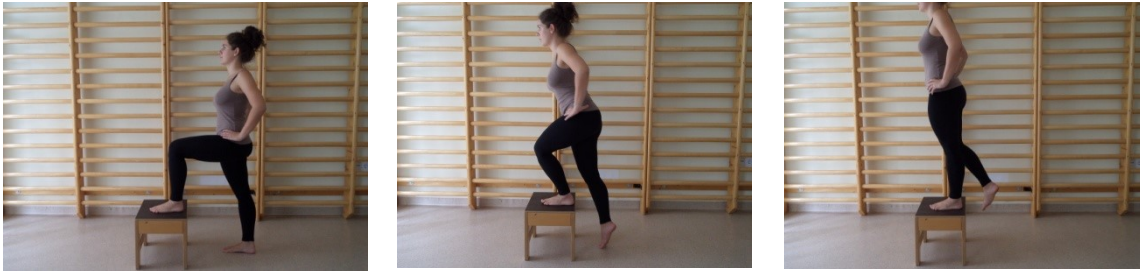
Communication, exercise instructions:

1. place the heel of your limb to be treated to your other knee.
2. place your leg back down by extending your knee.

Comment: during the exercise the external rotation a flexion, abduction and external rotation of the hip joint will occur together with the knee joint's flexion (and external rotation). The joint movements of the everyday activities are similar to all the components of the m. sartorius that affect these two joints.

4.6. Lower limb closed kinematic chain exercises

Lower limb closed kinematic chain exercise 1.



(SP), (2)

(1)

Starting position: standing, facing a footstool so that the limb to be treated is on the footstool, hip and knee joint bent in a 90 ° angle. Hands on hips.

Movement description:

1. moving the body's center of gravity to the footstool, stepping up on it, by extending the hip and knee joints. The other limb is in the air, slightly flexed.
2. assuming the starting position.

End position: same as the starting position.

Tempo: 1 sec/count

Communication, exercise instructions:

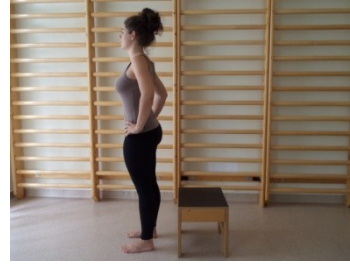
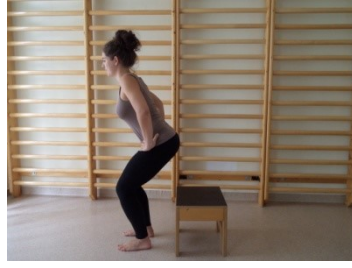
1. push yourself up with your foot on the footstool and keep the other limb in the air.
2. step back down

Comment: during the performance of the exercise the climbing up can be helped by the limb standing on the floor by a push. During the exercise the hip and knee joints' extensors are working against the weight of the body, concentrically during climbing and eccentrically during stepping back. The exercise is a closed kinematic chain exercise regarding the limb to be treated.

Lower limb closed kinematic chain exercise 2.



(SP), (2)



(1)

Starting position: sitting position. The hip and knee joints of both limbs are bent in a 90° angle, soles are fully resting on the floor, hands on hips.

Movement description:

1. moving the body's center of gravity to the limbs by standing up, extending the hip and knee joints.
2. flexing the hip and knee joints, sitting back.

End position: same as the starting position.

Tempo: 1 sec/count

Communication, exercise instructions:

1. stand up.
2. sit down.

Comment: during the exercise, getting impetus by leaning back or by raising the limbs before standing up should be avoided. During the exercise the hip and knee joints' extensors are working against the weight of the body, concentrically during standing up and eccentrically during sitting down. The exercise is a closed kinematic chain exercise regarding both limbs.

4.7. Lower limb exercises in pairs

Lower limb exercise in pairs 1.



(SP), (2)



(1)

Starting position: standing back to back, a large ball between the backs. Hands on hips.

Movement description:

1. both persons bend their hip and knee joints to a 90 ° angle simultaneously.
2. simultaneous extension of hip and knee joints, assuming the starting position.

End position: same as the starting position.

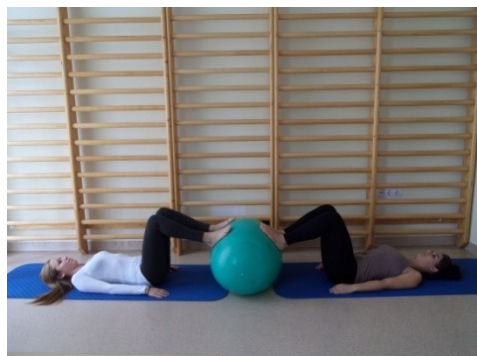
Tempo: 2 sec/count

Communication, exercise instructions:

1. bend your knees simultaneously, as if you were trying to sit down.
2. stand up.

Comment: during the exercise, primarily the extensors of the hip and knee joints are working against the weight of the body and the forces exerted by the partner. In a smooth, coordinated exercise the muscle activity is eccentric in the first count and concentric in the second count. The exercise is a closed-chain exercise.

Lower limb exercise in pairs 2.



(SP), (2)



(1)

Starting position: supine position, with soles facing each other, so that the hip and knee joints are bent and the soles rest fully on the large ball. The arms are extended along the body.

Movement description:

1. for both persons, the extension of hip joints, raising the pelvis.
2. lowering the pelvis, assuming the starting position.

End position: same as the starting position.

Tempo: 2 sec/count

Communication, exercise instructions:

1. push your legs into the ball and raise your pelvis off the floor.
2. lower your pelvis back to the floor.

Comment: during the exercise, primarily the extensors of the hip and knee joints are working against the weight of the body and the forces exerted by the partner. In a smooth, coordinated exercise the muscle activity is concentric in the first count and eccentric in the second count. The exercise is a closed-chain exercise.

Questions:

1. How would you strengthen the external rotators of the hip joint in case of muscle strength 2? Give instructions for the exercise.
2. How would you strengthen the extensors of the knee joint in case of muscle strength 3? Give instructions for the exercise.
3. How would you strengthen the plantar flexors of the ankle joint in case of muscle strength 3? Give instructions for the exercise.
4. What does it mean the extended and slightly bent position of the knee joint from the aspect of strengthening the plantar flexors?

References:

1. Balogh I. (1999) Kineziológiai alapismeretek, Mozgás ABC [Basic Kynesiology, Motion Rudimentals], Tillinger, Szentendre, 90-107.
2. Gardi Zs. (2000) Gyógytorna gyakorlatok gyűjteménye [A Collection of Physiotherapy Exercises], SE, Budapest
3. Reichel HS, Groza-Nolte R (2001) Fizioerápia [Physiotherapy], Medicina, Budapest

5. BREATHING EXERCISES (MÁRTA HOCK)

5.1. Feeling one's breath

Arms on the chest



(SP), (EP)



(1)



(2)



(3)

Starting position: body in supine position, arms on either side of the chest and on the ribs, lower limbs bent at the knee.

Movement description: take a deep breath through the nose while chest rises.

End position: body in supine position, arms on either side of the chest and on the ribs, lower limbs bent at the knee, inhaling end position.

Tempo: 1 -2-3 sec inhaling, 1-2-3-4 sec exhaling.

Communication, exercise instructions: chest rises as we inhale, blow air out through mouth while exhaling.

Note: process of breathing should be natural, in line with your own rhythm or tempo.

Feeling your breath with hands on the stomach



(SP), (EP)



(1)

Starting position: body in supine position, both hands on stomach, lower limbs bent at the knee.

Movement description: inhale deeply through your nose, while the abdominal wall rises.

End position: body in supine position, both hands on the stomach, stomach raised, inhaling end position, lower limbs bent at the knee.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: abdominal wall rises while inhaling.

Note: process of breathing should be natural, in line with your own rhythm and your vital capacity.

Feeling your breath with one hand on the stomach and one hand on the chest



(SP), (EP)



(1)

Starting position: body in supine position, one hand on stomach, other hand on chest, lower limbs bent at the knee.

Movement description: inhale deeply through the nose, the chest expands and the stomach rises.

End position: one hand on stomach, other hand on chest, inhaling end position.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: during inhalation chest should expand and stomach should rise.

Note: process of breathing should be natural, in line with your own rhythm and your vital capacity, both chest and stomach expand.

Feeling the diaphragm



(SP), (EP)



(1), (3)



(2)

Starting position: body in supine position, one hand on the stomach, other hand on the chest, lower limbs bent at the knee.

Movement description: inhale deeply through the nose, keep air in the chest, hold the diaphragm down, lift stomach and push back toward the chest.

End position: one hand on stomach, other hand on chest, inhaling end position, chest expanded.

Tempo: inhale in 1-2-3 sec, keep air in chest for 1-2 sec, push down to stomach for 1-2 sec, push back to chest in 1-2 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: expand your chest when inhaling, raise your stomach, then release, raise your chest then slowly exhale.

Note: during the exercise no air should escape through the nose or through the mouth.

5.2. Breathing exercises – exercises to support inhalation

With short lever arm



(SP), (EP)



(1)

Starting position: body in supine position, both hands on shoulder of the same side, upper arms by the body, lower limbs bent at the knee.

Movement description: while moving upper arms to the side we deeply inhale.

End position: both hands on shoulder of the same side, at should-height on the side, inhaling via chest in end position.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: chest should rise and expand during inhalation, air should be blown out gently through the mouth.

Note: the process of breathing should not be forced; the strength of breathing should be in line with vital capacity.

With short lever arm against gravity



(SP), (EP)



(1)

Starting position: body in supine position, both hands on shoulder of the same side, lower limbs bent at the knee.

Movement description: while raising arms in bent position towards the ceiling, we inhale deeply through our nose.

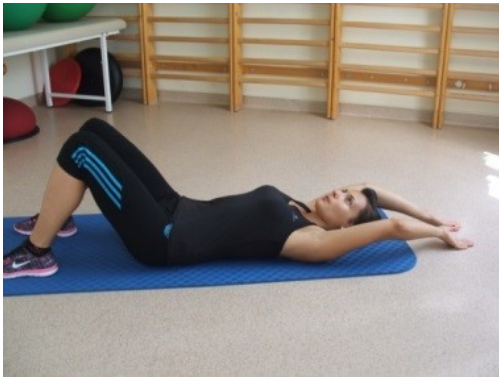
End position: both hands on shoulder of the same side, elbows raised towards the ceiling

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: expand your chest when inhaling, let your ribs raise.

Note: the process of breathing should not be forced, breathing should be done at one's own pace, in line with vital capacity.

With long lever arm



(SP), (EP)



(1)



(2)



(3)

Starting position: body in supine position, both arms extended overhead, lower limbs bent at the knee.

Movement description: while lowering arms next to body, we exhale through the mouth, then raise arms while inhaling and raise arms to the air.

End position: both arms are raised overhead, chest in inhaling position.

Tempo: exhale in 1-2-3-4 sec, inhale in 1-2-3 sec.

Communication, exercise instructions: we blow out the air through our mouth, chest contracts, then we inhale air through our nose, chest expands and ribs rise.

Note: the process of breathing should not be forced.

5.3. Breathing exercises – exercises to support exhalation

Exercises supporting exhalation using the upper arm



(SP), (EP)



(1), (3)



(2)

Starting position: body in supine position, both hands at shoulder height stretched straight on each side, lower limbs bent at the knee.

Movement description: exhale through mouth while crossing arms in front of body, hands stop on opposite shoulder, arms' weight on chest.

End position: arms crossed on chest, exhaling end position.

Tempo: exhale in 1-2-3-4 sec, inhale in 1-2-3 sec.

Communication, exercise instructions: chest contracts while exhaling, ribs move down, inhalation should be deep and calm.

Note: the process of breathing should not be forced, effect of moving limbs should be felt and should help exhaling.

Exercises supporting exhalation using upper and lower limbs



(SP), (EP)



(1)

Starting position: body in supine position, both hands at shoulder height stretched out straight on each side, lower limbs bent at the knee.

Movement description: exhale through the mouth while pulling up right knee in front of the body, embrace knee with both arms gently pressing it against chest.

End position: pulled up right knee in front of body, knee embraced with both arms, knee gently pressed against chest, chest in exhaling end position.

Tempo: exhale in 1-2-3-4 sec, inhale in 1-2-3 sec.

Communication, exercise instructions: while knee is pulled up and embraced by both arms, simultaneously chest contracts while exhaling, ribs move down.

Note: the process of breathing should not be forced, knee should be only slightly pressed to chest, only to help exhalation.

Exercises supporting exhalation using upper and lower limbs and the trunk



(SP), (EP)



(1)

Starting position: body in supine position, both hands at shoulder height stretched out straight overhead, lower limbs bent at the knee.

Movement description: exhale through the mouth while pulling both knees in front of body, embrace knees with both arms and touch knees with head bent.

End position: knees pulled up in front of body, embrace with both arms, gently pressed against chest, head bent to knees, chest in exhaling end position.

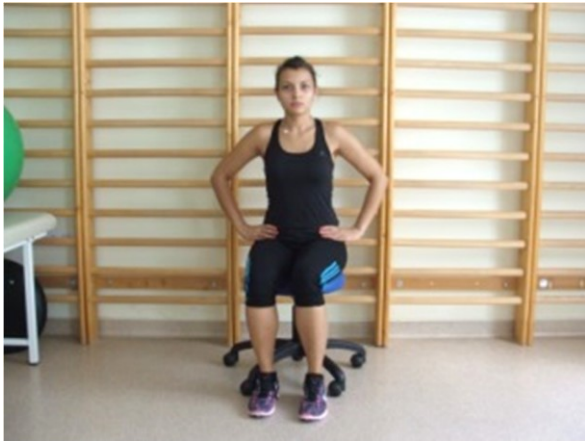
Tempo: exhale in 1-2-3-4 sec, inhale in 1-2-3 sec.

Communication, exercise instructions: chest contracts while exhaling, ribs move down; simultaneously knees are pulled up in front of body, knees are embraced with both arms, head is bent to knees.

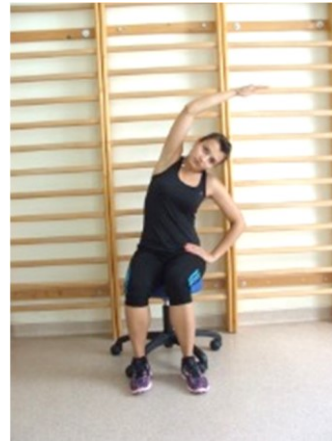
Note: the process of breathing should not be forced, limbs should be only slightly pressed to chest, only to help exhalation.

5.4. Breathing exercises - involving the trunk in different positions

In sitting position, with lateral flexion of the trunk



(SP), (EP)



(1)

Starting position: sitting on a chair, exercise ball, or stool, both hands on hip, lower limbs bent at the knee.

Movement description: while stretching right arm overhead and lean to the left, we inhale deeply.

End position: right arm is above head slightly bent; trunk is also bent to the left, chest in inhaling end position.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: right arm is raised over the head, trunk is bent to the left and we deeply inhale; we return to mid-position while exhaling, chest contracts; ribs move down, hands are placed back on the hip.

Note: the process of breathing should not be forced, the exercise should be repeated to the right.

In sitting position, with rotation of the trunk



(SP), (EP)



(1)

Starting position: sitting on a chair, exercise ball, or stool, both hands on hip, lower limbs bent at the knee.

Movement description: turn trunk to the right while stretching the right arm sideways above shoulder-height and inhale deeply.

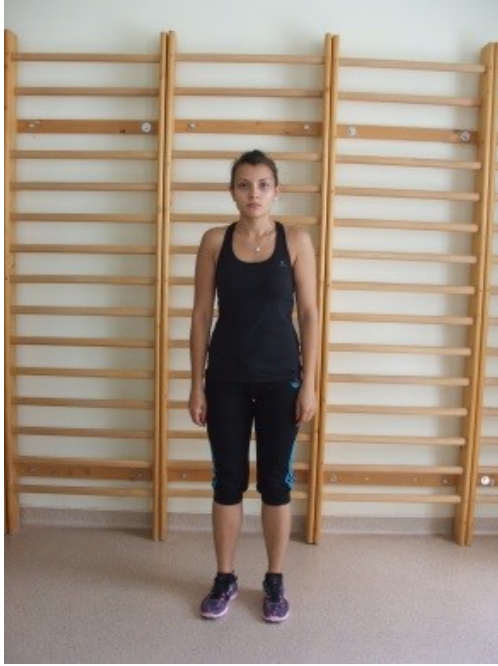
End position: arms are over the head, body turned to the right, chest in inhaling position.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

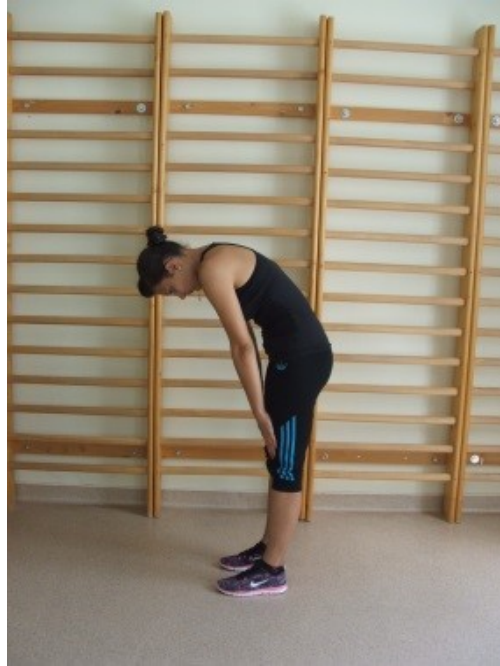
Communication, exercise instructions: arm is raised while inhaling, chest expands, trunk is turned to the right; then while exhaling chest contracts, ribs move down and with hand on hips we go back to mid-position.

Note: do the exercise to the other side.

In standing position, with flexion of the trunk



(SP), (EP)



(1)

Starting position: stand with your feet hip width apart with both arms along the body.

Movement description: bend trunk gradually, as low as possible, sliding your hands on the front part of thighs towards your knees and exhale deeply.

End position: head in bent position, back slightly curved, hands on thighs, chest in exhaling position.

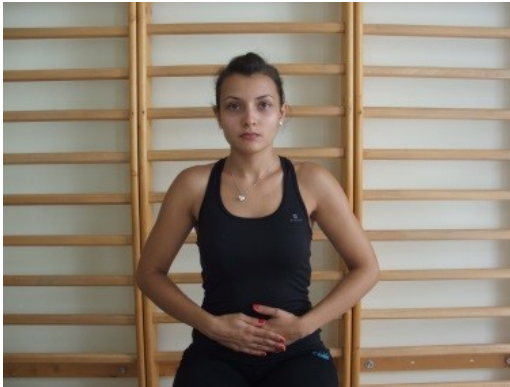
Tempo: exhale in 1-2-3-4 sec, inhale in 1-2-3 sec.

Communication, exercise instructions: bend forward, chest contracts while inhaling, ribs move down, slide hands downwards and chest expands while straightening up.

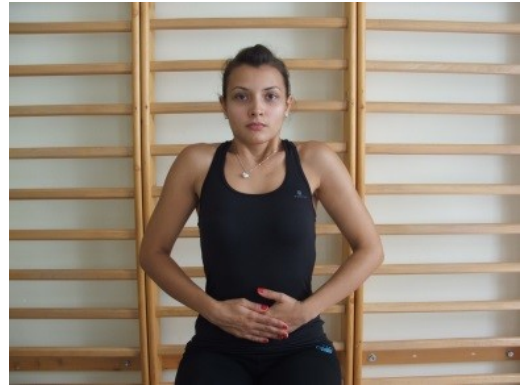
Note: movement supports process of breathing, bending forward should not be forced.

5.5. Muscle strengthening exercises using different breathing techniques

Strengthening muscles by controlled (periodic) breathing – “Sniffing”



(SP), (EP)



(1)

Starting position: sitting on a chair, exercise ball, or stool, both hands on hip, lower limbs bent at the knee.

Movement description: we breathe through nose by periodically sniffing air.

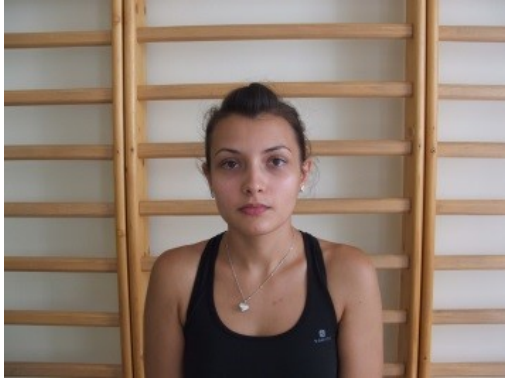
End position: chest in maximum inhaling end position.

Tempo: inhale in 1-2-3-4 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: periodical inhalation, chest expands, even breathing, chest contracts, ribs move down.

Note: inhalation is controlled (periodical) and exhalation is even, calm and relaxed.

Strengthening muscles by controlled (periodic) breathing – “uttering the “p” sound



(SP), (EP)



(1)

Starting position: sitting on a chair, exercise ball, or stool, both hands on stomach, lower limbs bent at the knee, taking a deep breath through the nose into the chest and the abdomen.

Movement description: exhale all the air periodically pronouncing the sound “p”.

End position: chest in exhaling end position.

Tempo: exhale in 1-2-3-4-5-6-7-8 sec, inhale in 1-2-3-4 sec.

Communication, exercise instructions: chest contracts when exhaling, ribs move down, exhalation is periodical; stomach and chest should rise as much as possible during inhalation.

Note: periodical exhalation, applying small volumes of air; inhalation is calm and relaxed with larger volumes of air.

5.6. Muscle strengthening exercises against external resistance

Muscle strengthening breathing exercises against manual resistance



(SP), (EP)



(1)

Starting position: sitting on a chair, exercise ball, or stool, both hands on stomach, lower limbs bent at the knee.

Movement description: we deeply inhale through nose into the abdomen, while hands are pressed against the stomach.

End position: stomach in inhaling position, pushed out against hands.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: stomach should rise, we attempt to push hands away from abdominal wall while inhaling deeply; chest contracts while exhaling, stomach and ribs move down.

Note: provide manual resistance during inhalation; exhalation should be relaxed with no resistance.

Muscle strengthening breathing exercise with weight resistance



(SP), (EP)



(1)

Starting position: body in supine position, both arms on floor placed along body, lower limbs bent at the knee, 1 kg sandbag placed on stomach.

Movement description: inhale deeply into the stomach.

End position: stomach raised, inhaling end position.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: stomach should rise and protrude as much as possible, chest contracts and ribs move down during exhalation.

Note: deep inhalation through nose, relaxed exhalation through mouth applying large volume of air.

5.7. Muscle strengthening breathing exercises with individual, internal resistance

On incline bench



(SP), (EP)



(1)

Starting position: on an incline bench, in supine position, with head towards the floor, both arms along the body, lower limbs bent at knee.

Movement description: we deeply inhale through the nose into the stomach.

End position: inhaling end position, abdominal wall pushed up.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: raise stomach as much as possible, contract chest and lower down ribs during exhalation.

Note: relaxed but deep inhalation, calm exhalation.

Muscle strengthening breathing in deep crawl pose applying one's individual, internal resistance



(SP), (EP)



(1)

Starting position: in deep crawl pose.

Movement description: inhale deeply through nose into the stomach.

End position: inhaling end position, abdominal wall moves up.

Tempo: inhale in 1-2-3 sec, exhale in 1-2-3-4 sec.

Communication, exercise instructions: stomach should rise as much as possible, stomach moves down during exhalation, chest contracts, ribs move down.

Note: relaxed but deep inhalation, calm exhalation.

Questions, practice exercises:

1. Give instructions for 10 exercises that support inhalation and make them repeat the exercises 10 times! Make sure the exercises are carried step by step and that the correct positions are taken up!
2. Give instructions for 5 exercises supporting exhalation in three different positions and taking the principle of grading into account! Make sure that the correct positions are taken up!
3. Give instructions for 10 breathing exercises against resistance! Make sure the exercises are carried step by step and that the correct positions are taken up!
4. Describe and demonstrate the various ways of feeling our breath!
5. Give instructions for 10 exercises supporting exhalation to be carried out in different positions! Make sure that the correct positions are taken up!

References:

1. Gardi Zs. (1998) Alapozó gyógytorna elmélet és gyakorlat [The Basics of Physiotherapy: Theory and Practice], HIETE, Budapest
2. Gardi Zs, (2000) Gyógytorna gyakorlatok gyűjteménye [A Collection of Physiotherapy Exercises], SE, Budapest
3. Zaletnyik Z., Szánthó K. (2001) Pulmonológiai fizioterápia, [Physiotherapy in Pulmonology] SE Egészségügyi Kar jegyzete, Budapest

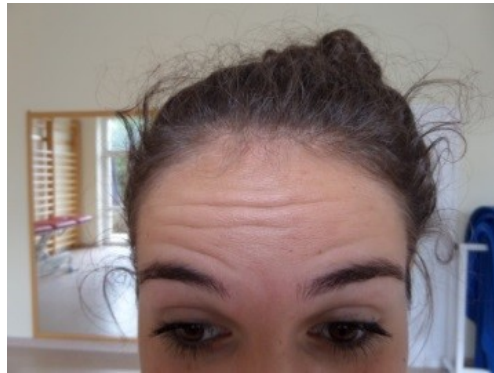
6. FACIAL GYMNASITCS (MÁRTA HOCK)

6.1. Facial exercises to strengthen muscles used for mimics

Wrinkling our forehead



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, or seated in front of the mirror, smooth forehead.

Movement description: raising our eyebrows we wrinkle our forehead and go back to starting position.

End position: raised eyebrows and wrinkled forehead.

Tempo: wrinkle in 1 sec, keep frown for 1 sec, release in 1 sec.

Communication, exercise instructions: raise eyebrows, wrinkle forehead, relax and release.

Note: the other parts of the face should be loose, free of tension.

Frowning



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: we frown by moving eyebrows close to each other, then release.

End position: eyebrows drawn close to each other.

Tempo: in 1 sec we wrinkle eyebrows, for 1 sec we keep position, in 1 sec we release.

Communication, exercise instructions: we draw eyebrows towards each other, frown above bridge of nose, then relax and release.

Note: the other parts of the face should be loose, free of tension.

Opening eyelids



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, eyelids closed.

Movement description: open and close eyelids.

End position: eyelids raised, eyes open.

Tempo: Raise eyelids in 1 sec, close eyelids in 1 sec.

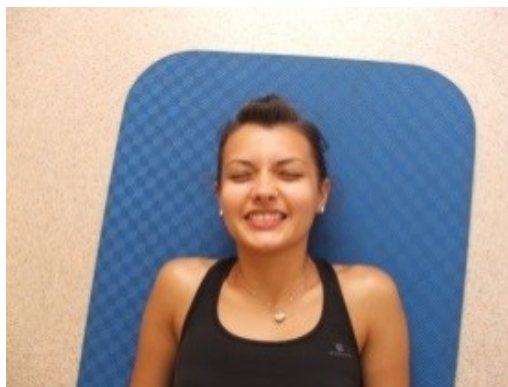
Communication, exercise instructions: raise eyelids, open eyes, then release hold and drop eyelids.

Note: the rest of the face should be loose and relaxed.

Pulling up nose and lip



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: upper lips raised, nose wrinkled, then release.

End position: raised lip, wrinkled nose bridge.

Tempo: raise upper lip in 1 sec, wrinkle nose and keep position for 1 sec, and release in 1 sec.

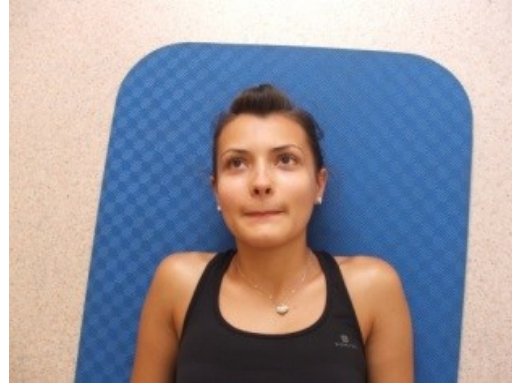
Communication, exercise instructions: upper lip raised, nose wrinkled then relax.

Note: brief facial massage is recommended before doing exercise.

Pressing upper and lower lip together



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: press upper and lower lip then release.

End position: upper and lower lip pressed together.

Tempo: press upper and lower lip in 1 sec, keep position for 1 sec, release in 1 sec.

Communication, exercise instructions: press upper and lower lip together then release.

Note: lips should be kept parallel during the exercise.

Pressing the lips with concentric contraction



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: press lips together and contract concentrically, then relax and release.

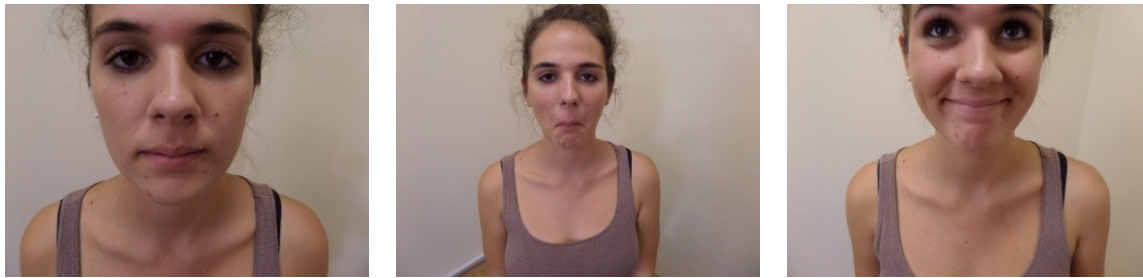
End position: lips closed and in a contracted position.

Tempo: purse lips in 1 sec, keep position for 1 sec, release in 1 sec.

Communication, exercise instructions: press upper and lower lip together, to imitate a whistle, then release.

Note: do exercise after completing facial massage.

Elevation of the corners of the mouth



(SP), (EP)

(1)

(2)

Starting position: seated in front of the mirror, smooth forehead, lips gently pressed.

Movement description: pull the corners downwards, upwards then relax.

End position: lips gently pressed.

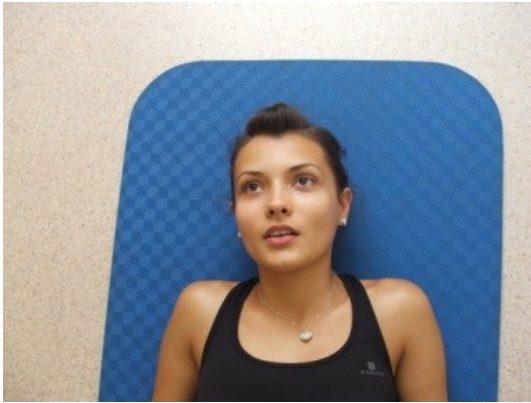
Tempo: pull the corners downwards in 1 sec, pull the corners upward in 1 sec and go back to Starting position.

Communication, exercise instructions: pull the corners downwards and upwards, then sideways as if you were smiling, then relax.

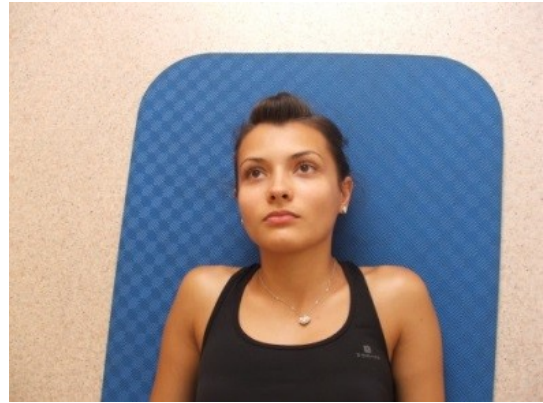
Note: exercise can be done in supine position, with the arms along the body, and with the lower limbs bent at the knee.

6.2. Exercises to reinforce chewing

Closing lower jaw



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed, lower jaw in a relaxed position dropped low.

Movement description: move lower jaw to upper jaw.

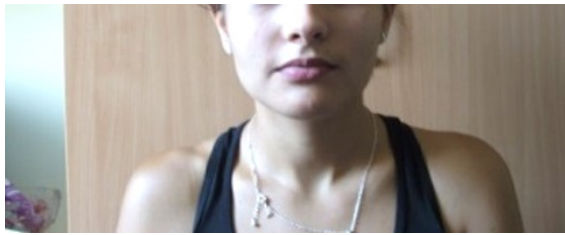
End position: lower jaw is brought together with upper jaw so that the mouth is closed.

Tempo: close lower jaw in 1 sec, keep position for 1 sec, release in 1 sec.

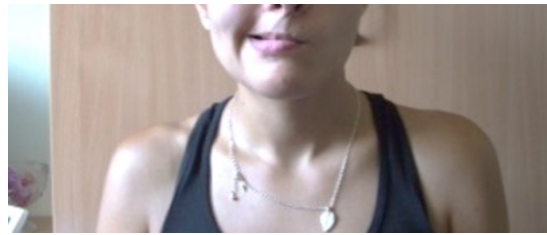
Communication, exercise instructions: close lower jaw to upper jaw, then gently release

Note: do the exercise dynamically but not too forcefully.

Pulling the jaw to the side



(SP), (EP)



(1)

Starting position: sitting position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed, relaxed lips.

Movement description: we pull the jaw to the right side with slightly open lips then to the left and back to middle position.

End position: jaw in mid-position, lips slightly open.

Tempo: pull jaw to the right in 1 sec, pull jaw to the left in 1 sec, pull jaw to mid-position in 1 sec.

Communication, exercise instructions: with slightly open lips jaw should be pulled to the side, then to the other side, then back to starting position.

Note: practice the movement until we reach end position. Exercise can also be done in supine position.

6.3. Exercises to improve swallowing and speaking

Strong exhalation



(SP), (EP)



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: exhale forcefully through the mouth with lips pressed together and contracted concentrically.

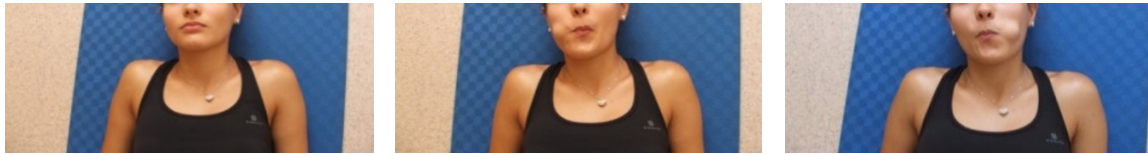
End position: concentrically contracted lips, exhaling end position.

Tempo: exhaling in 1-2-3-4 sec inhaling in 1-2-3 sec.

Communication, exercise instructions: lips contracted concentrically, strong exhalation through the mouth, slow inhalation through the nose.

Note: the exercise should be done dynamically.

Moving tongue inside to push face out



(SP), (EP)

(1)

(2)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: move tongue to the side of the mouth inside to push face out, first right, then left, then back to mid-position.

End position: lips gently pressed, tongue in mid-position.

Tempo: move your tongue to the right side of the mouth inside to push your face out in 1 sec, do the same on the other side in 1 sec, then put your tongue into mid-position in 1 sec.

Communication, exercise instructions: move your tongue to the side of the mouth inside to your push your face out, first right, then left, then relax in mid-position.

Note: during the exercise the rest of the face should be kept relaxed.

Sliding the tongue on the alveolar ridge



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: slide the tongue on the alveolar ridge (the area behind the top teeth) first right to left, then left to right, and finally back into mid-position.

End position: lips gently pressed, tongue in mid-position.

Tempo: slide tongue along the alveolar ridge from right to left in 1 sec, repeat the same from left to right in 1 sec and move tongue back to mid-position in 1 sec.

Communication, exercise instructions: Slide your tongue the along the alveolar ridge from right to left, then from left to right and slide your tongue back to mid-position.

Note: during the exercise the rest of the face should be kept relaxed.

Sliding the tongue along the top front teeth from the outside



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: slide tongue along the outside of the top front teeth, first from right to left, then from left to right, then side tongue into mid-position.

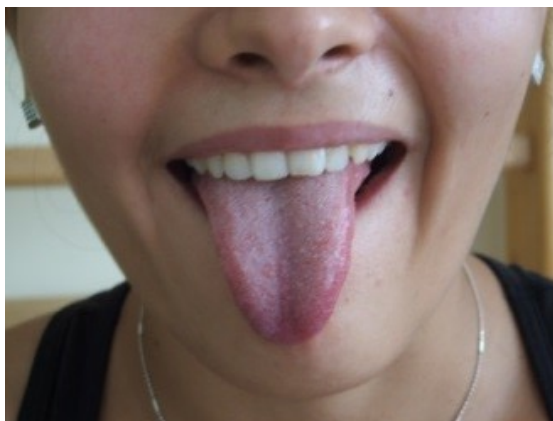
End position: lips gently pressed, tongue in mid-position.

Tempo: slide tongue along the front teeth on the outside from right to left in 1 sec, repeat the same from left to right in 1 sec and move tongue back to mid-position in 1 sec.

Communication, exercise instructions: slide tongue along the front teeth on the outside from right to left repeat the same from left to right and move tongue back to relax in mid-position.

Note: during the exercise the rest of the face should be kept relaxed.

Sticking tongue out to reach chin with the tongue tip



(1)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee, smooth forehead, lips gently pressed.

Movement description: stick tongue tip straight out and downwards towards the chin, then pull back.

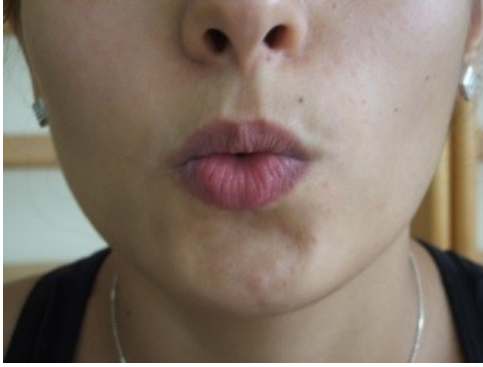
End position: tongue stuck out to the furthest possible point towards the chin.

Tempo: stick out your tongue tip downwards towards the chin 1 sec, pull the tongue back in 1 sec.

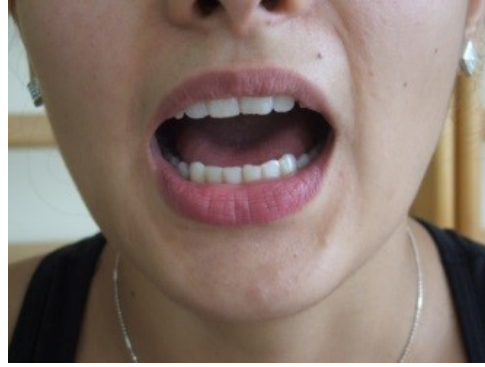
Communication, exercise instructions: stick your tongue tip straight out and move it downwards as if you were trying to reach your chin.

Note: tongue should be held at the furthest possible point, as near the chin as possible.

Uttering vowels



(1)



(2)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee/sitting position, smooth forehead, lips closed.

Movement description: utter long vowels “o” ([ɔ:] as in *draw*) and “á” ([a:] as in *far*).

End position: lips closed.

Tempo: utter “o” [ɔ:] in 1 sec, utter “á” [a:] in 1 sec, close lips in 1 sec.

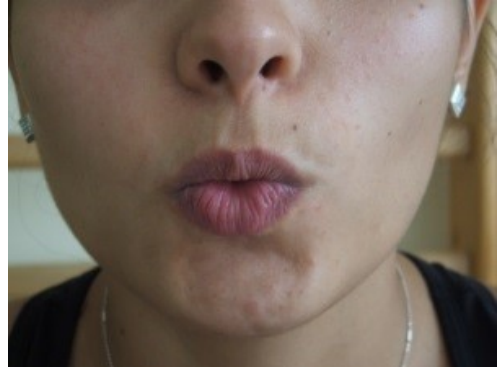
Communication, exercise instructions: open your mouth, gently open your lips, form the sounds “o” and “á” with your lips.

Note: switch between the two vowels at a slow pace, trying to form the vowels firmly and accurately.

Uttering syllables



(1)



(2)

Starting position: body in supine position, arms along the torso, lower limbs bent at the knee/sitting position, smooth forehead, lips closed.

Movement description: Utter the syllables ni-no in close succession ('no' is not a diphthong but an [ɔ:] sound).

End position: lips closed.

Tempo: utter "ni" in 1 sec, utter "no" in 1 sec, close lips in 1 sec.

Communication, exercise instructions: open your mouth, gently open your lips and form the syllables "ni" and "no" [ɔ:] with your lips.

Note: switch between the two vowels at a slow pace, trying to form the sounds of the syllables accurately.

6.4. Exercises with a device

Exercise with a light ball



(SP), (EP)



(1)

Starting position: sitting at a table, forearms on the table, or on the lower limb bent at the knee, smooth forehead, lips closed, chin on the table, a table tennis ball or a glass bead, etc. placed in front of us.

Movement description: we blow the device powerfully.

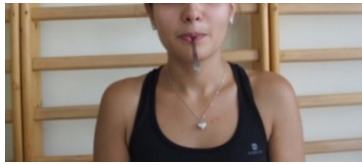
End position: gently closed lips, inhalation through nose.

Tempo: blow device in 1-2-3-4 sec, inhale in 1-2-3 sec.

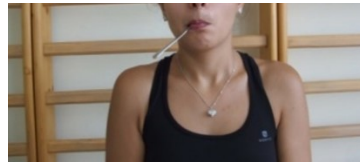
Communication, exercise instructions: blow at the device powerfully, then inhale slowly and deeply.

Note: inhale slowly but deeply, exhale strongly when doing the exercise.

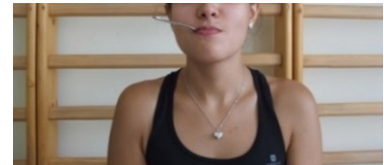
Exercise with thin wooden stick or teaspoon



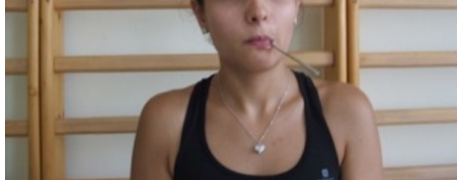
(SP), (EP)



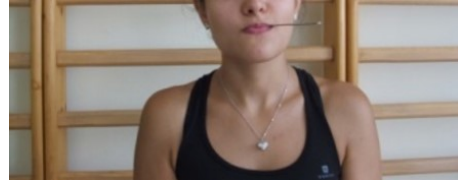
(1)



(2)



(3)



(4)

Starting position: sitting in front of a mirror, lower limb bent at the knee, smooth forehead, closed lips, wooden skewer or teaspoon between the lips.

Movement description: draw an infinity sign (8 sideways) with the help of the wooden skewer or teaspoon.

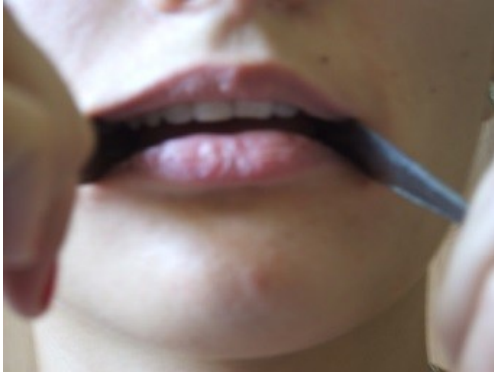
End position: lips gently closed.

Tempo: draw infinity sign in 1-2-3 -4-5-6 sec.

Communication, exercise instructions: we attempt to draw an eight sideways (infinity sign) in front of us into the air.

Note: try to keep your head steady and slowly moving the skewer or the teaspoon around as evenly paced as possible.

Exercise with teaspoon



(1)



(2)

Starting position: sitting in front of a mirror, smooth forehead, closed lips.

Movement description: we pull the oris (the corners of the mouth) with two teaspoons.

End position: lips pulled apart.

Tempo: pull lips apart in 1-2-3 sec, release in 1-2-3 sec.

Communication, exercise instructions: open mouth, lips slowly opened, free of tension, lips slightly apart.

Note: do the exercise at a slow pace.

Questions and practice exercises:

1. Give instructions for ten exercises aiming to improve swallowing and chewing! Make sure the exercises are carried out step by step!
2. Give instructions for five exercises aiming to improve mimic. Again, make sure the exercises are done one step at a time.
3. Collect five more exercises that can be performed with different devices to improve facial mimics!
4. Give instructions for 10 exercises to improve speech, again applying the step-by-step approach! Use different devices! Give instructions for ten different exercises that aim
5. to improve mimics and can be performed in a sitting position. Check if body position is appropriate and make sure the exercises are done step by step. Apply manual resistance and make any corrections verbally during the exercise!

References:

1. Gardi Zs. (1998) Alapozó gyógytorna elmélet és gyakorlat [The Basics of Physiotherapy: Theory and Practice], HIETE, Budapest
2. Gardi Zs. (2000) Gyógytorna gyakorlatok gyűjteménye [A Collection of Physiotherapy Exercises], SE, Budapest
3. Zaletnyik Z., Szánthó K. (2001) Pulmonológiai fizioterápia, [Physiotherapy in Pulmonology] SE Egészségügyi Kar jegyzete, Budapest

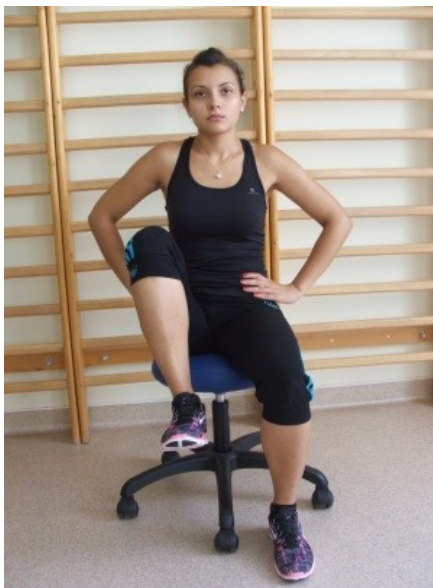
7. AEROBIC EXERCISES (HOCK, MÁRTA)

7.1. Aerobic exercises in sitting position

Aerobic exercise, in sitting position



(SP), (EP)



(1)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we pull up the bent knee.

End position: lower limb pulled up bent at the knee.

Tempo: in 1 sec we pull up the lower limb bent at the knee.

Communication, exercise instructions: pull up the knees taking turns; lift one leg/knee, back, then the other one; lift one leg off the ground, back, then the other one.

Note: use a stable chair with brakes and without armrests, the height of the chair should correspond the height of the body.

Aerobic exercise, in sitting position, with knee extension



(SP), (EP)



(1)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we extend one leg from the knee, forward into the air.

End position: from sitting position one leg extended from the knee forward into the air.

Tempo: in 1 sec one leg reaches the position of being extended from the knee forward into the air.

Communication, exercise instructions: taking turns, extend your knee forward into the air, back, then the other one, and back.

Note: maintain rhythm during the exercise.

Aerobic exercise, in sitting position, with repeated knee extension



(SP), (2), (EP)



(1), (3)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we extend one leg from the knee twice.

End position: sitting position one leg extended from the knee forward into the air.

Tempo: in 1 sec one leg reaches the position of being extended from the knee forward into the air, in 1 sec back.

Communication, exercise instructions: extend your knee twice, put it back, extend the other knee twice into the air, then put it back.

Note: the thigh should not be lifted off the seat pan, use a chair without armrests, we should not lean on the seat pan.

Aerobic exercise, done with the lower limb



(SP), (2), (4), (6),
(EP)

(1), (3)

(5), (7)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we pull up the bent knee (2x), back, then we extend the same leg forward into the air (2x), and put it back.

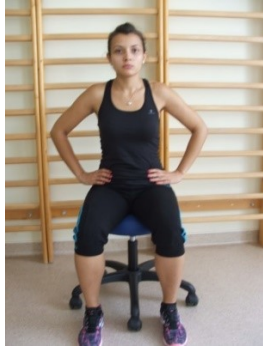
End position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Tempo: in 1 sec we pull up one leg with bent knee, in 1 sec back, in 1 sec we pull the same leg up with bent knee, in 1 sec back, in 1 sec we extend the same leg forward into the air, in 1 sec back, and in 1 sec we extend the same leg forward into the air, in 1 sec back.

Communication, exercise instructions: pull up your knee (2x), back, then extend your leg forward into the air (2x) and put it back, do the same with the other leg.

Note: we should not kick into the air powerfully, do the exercise with both legs, do the exercise dynamically.

Aerobic exercise, with crossing the bent leg



(SP), (2), (4), (8),

(1), (3), (5), (7), (9), (11)

(6), (10)

(EP)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we extend the bent knee into the air, release it back (2x), then we extend the same leg forward into the air and cross it in front of the bent leg while releasing it, back into the air and put it down (2x).

End position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Tempo: in 1 sec we extend the bent knee into the air, in 1 sec we release it back, we repeat it twice, and in 1 sec we extend the bent knee into the air, in 1 sec we cross it in front of the other one, we extend it and put it down, we repeat this twice as well.

Communication, exercise instructions: extend your leg forward, release it back (2x), repeat with the same leg, extend it forward into the air, cross it in front of your bent leg while releasing (2x), extend it back into the air and put it down, do the same with the other leg.

Note: we should not kick into the air powerfully, lean on the seat pan if necessary.

Aerobic exercise, in sitting position, moving the lower limb laterally



(SP), (EP)



(1)

Starting position: sitting on a chair, arms on the hips, lower limb flat on the floor, bent at the knee.

Movement description: we extend the bent leg slightly to the side, touch the ground with the heel.

End position: sitting on a chair, arms on the hips, lower limb extended slightly to the side, heel touching the ground.

Tempo: in 1sec we extend the bent leg slightly to the side, heel touching the ground, in 1 sec return to starting position.

Communication, exercise instructions: extend your right leg forward and slightly to the side, onto your heel, back, repeat with the other leg.

Note: we should not kick into the air powerfully, the heel should only tap the ground, use a stable chair without armrests and with brakes, the height of the chair should be appropriate.

Aerobic exercise, in sitting position, moving the upper and the lower limb



(SP), (EP)



(1)

Starting position: sitting on a chair, arms along the body, bent at the elbow, lower limb flat on the floor, bent at the knee.

Movement description: we extend the bent leg to the side, touch the ground with the heel, while lifting up the opposite arm bent at the elbow to the other side.

End position: leg extended to the side, heel touching the ground, the opposite arm lifted up to the side with bent elbow.

Tempo: in 1 sec we extend the bent leg to the side, to the heel, and we also lift up the opposite arm with bent elbow to the side.

Communication, exercise instructions: extend your right leg to the side, in the meantime lift up your opposite arm with bent elbow to shoulder-height, then repeat the exercise with the other leg and arm.

Note: we should not kick into the air powerfully, the heel should only tap the ground, we should not bang down powerfully, arms bent almost squarely, lifted up to shoulder-height.

Aerobic exercise with lower and upper limbs on the same side



(SP), (EP)



(1)

Starting position: sitting on a chair, arms along the body, bent at the elbow, lower limb flat on the floor, bent at the knee.

Movement description: we extend the bent leg forward and slightly to the side, touch the ground with the heel, while we extend the arm on the same side to the side at shoulder-height.

End position: leg extended forward, slightly to the side, heel touching the ground, the arm on the same side extended to the side at shoulder-height.

Tempo: in 1 sec we extend the bent leg forward and slightly to the side, touch the ground with the heel, while lifting up the arm on the same side to the side at shoulder-height.

Communication, exercise instructions: extend your right leg forward and slightly to the side, in the meantime lift up your arm on the same side to the side at shoulder-height, then repeat the exercise with the other leg and arm.

Note: we should not kick into the air powerfully, the heel should only tap the ground, lift the arms up to shoulder-height only.

Aerobic exercise, including multiple limbs



(SP), (EP)



(1)

Starting position: sitting on a chair, arms bent along the body, lower limb flat on the floor, bent at the knee.

Movement description: we extend the bent right leg forward and slightly to the side, touch the ground with the heel, while extending both arms to the right side at shoulder-height.

End position: leg extended forward and slightly to the side, heel touching the ground, arms extended to the side at shoulder-height.

Tempo: in 1 sec we extend the bent leg forward and slightly to the side, touch the ground with the heel, while lifting up the arms to the side at shoulder-height.

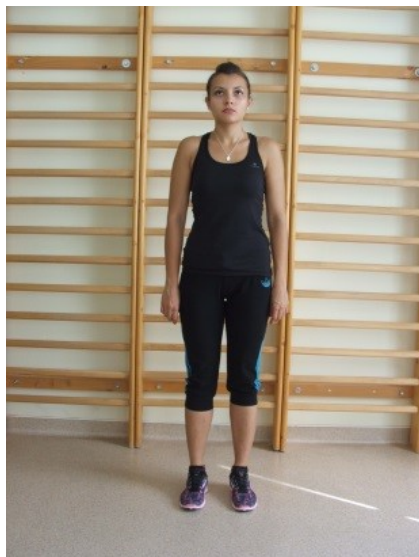
Communication, exercise instructions: extend your right leg forward, slightly to the side, in the meantime lift up both arms to the right side, at shoulder-height, then repeat the exercise with the other leg and both arms.

Note: we should not kick into the air powerfully, the heel should only tap the ground, lift the arms up to shoulder-height only.

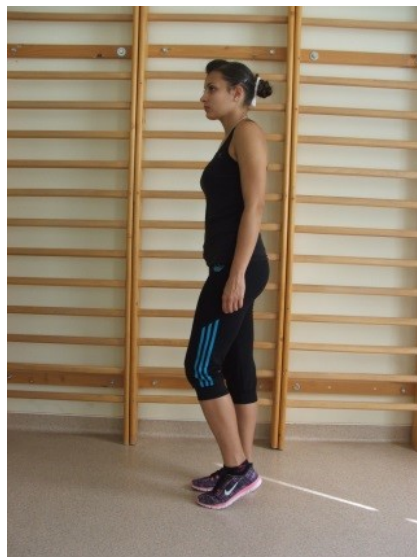
7.2. Aerobic exercises in standing position

7.2.1. Aerobic exercises in standing position with arm movement below shoulder-height

Aerobic exercise in standing position, marking time



(SP), (EP)



(1)

Starting position: standing position, arms along the body.

Movement description: we lift one heel off the ground.

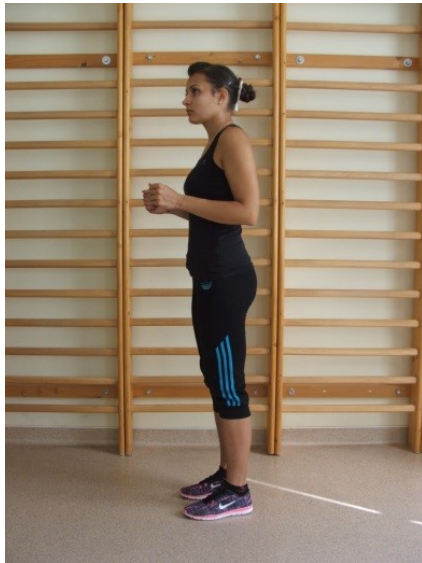
End position: heel lifted off the ground.

Tempo: in 1 sec heel up, in 1 sec down.

Communication, exercise instructions: lift up your heel, back, lift the other heel up and back / lift heels taking turns / mark time.

Note: maintain rhythm during the exercise, arms loose along the body all the time, the knees are slightly bent while lifting the heels.

Aerobic exercise in standing position, marking time with arm movement



(SP), (EP)



(1)

Starting position: standing position, arms along the body, bent at the elbow.

Movement description: we lift one heel off the ground and lift the opposite bent arm forward.

End position: heel above the ground, in lifted position, the opposite arm slightly in front of the line of the body, bent at the elbow, the one on the same side behind the line of the body.

Tempo: in 1 sec we lift the heel up and the arm on the opposite side forward, in 1 sec put the heel back and the arm on the opposite side backwards.

Communication, exercise instructions: lift your right heel and move your bent left arm forward, back, then the other heel and arm / mark time arms moving in opposite direction.

Note: maintain rhythm, do the exercise dynamically, the arms should follow the movement bent and freely all the time.

Aerobic exercise in standing position, marking time with high knee lift



(SP), (EP)



(1)

Starting position: standing position, arms along the body bent at the elbow.

Movement description: we lift one foot off the ground lifting the knee, and we move the opposite arm bent at the elbow forward.

End position: the knee of one leg lifted up, the opposite slightly bent arm lifted in front of the line of the body, the other arm behind the line of the body.

Tempo: in 1 sec lift the knee and lift the opposite arm forward, in 1 sec put the leg back, and the arms backwards.

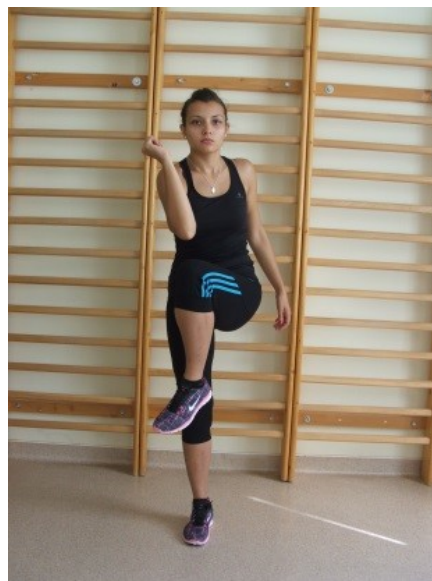
Communication, exercise instructions: lift your right knee and move your left arm forward, then back, then exchange, repeat the exercise with the other knee and arm / mark time with lifting knees and moving arms.

Note: maintain rhythm, do the exercise dynamically, arms should follow the movement bent all the time, we should monitor appropriate body position.

Aerobic exercise, approaching the opposite arm and leg



(SP), (EP)



(1)

Starting position: straddle, arms extended to the sides not exceeding shoulder-height, neutral spine alignment.

Movement description: lift one leg off the ground by lifting the knee, and move the opposite bent arm forward.

End position: one leg lifted off the ground with lifted knee, the opposite bent arm moved and lifted forward.

Tempo: in 1 sec lift up the knee and move the arm forward, in 1 sec put the leg and the arm back.

Communication, exercise instructions: lift your right knee and move your arm bent forward, back, then the other knee and arm, legs slightly bent, dynamic arm movement.

Note: maintain rhythm during the exercise, arms follow the movement in a bent position, knees bent, trunk in a slightly bent position.

7.2.2. Aerobic exercises in standing position with arm movement above shoulder-height

Aerobic exercise, stepping out to the side



(SP), (2), (EP)



(1), (3)

Starting position: standing position, arms at breast-height, bent at the elbow, closed next to each other.

Movement description: we step out to the side with the right foot, and move the arms open on both sides at shoulder-height.

End position: right foot on the side, arms opened on both sides at shoulder-height.

Tempo: in 1 sec we step out to the side with the right foot, while opening the arms on both sides at shoulder-height.

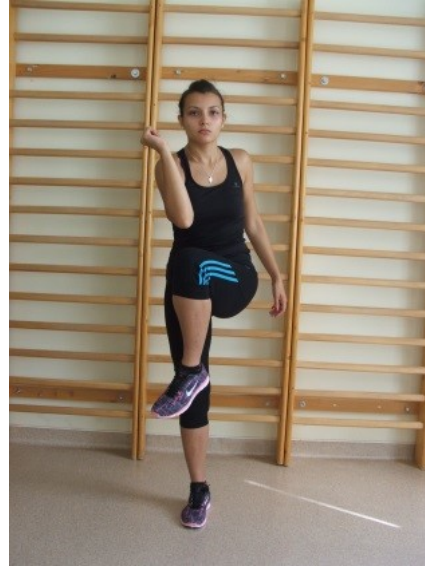
Communication, exercise instructions: step out with your right foot, in the meantime move your arms bent at the elbow to the side, close your feet, and touch your arms bent at the elbow in front of the body, repeat the exercise stepping out to the left.

Note: maintain rhythm, do the exercise dynamically, repeat the exercise stepping into both directions taking turns.

Aerobic exercise, with elbow-knee touch



(SP), (2), (EP)



(1), (3)

Starting position: straddle, arms extended above the head.

Movement description: we lift one leg off the ground by lifting the knee, touch it with the elbow of the opposite bent arm.

End position: knee-joint of one leg touching the elbow of the opposite bent arm.

Tempo: in 1 sec we meet the knee and the elbow.

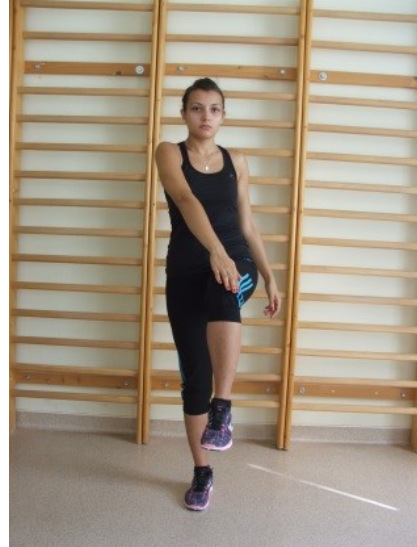
Communication, exercise instructions: meet your right knee and left arm lowering it in front of the body, then return into starting position, then meet the other knee and elbow and extend the arm back above the head and put down your leg.

Note: maintain rhythm, do the exercise dynamically.

Aerobic exercise in standing position, with opposite hand and knee touch



(SP), (EP)



(1)

Starting position: standing up in straddle, arms extended above the head.

Movement description: we lift one leg off the ground by lifting the knee, and meet it with the opposite hand lowered in front of the body.

End position: knee-joint of one leg touching the opposite hand.

Tempo: in 1 sec we meet the knee and the hand.

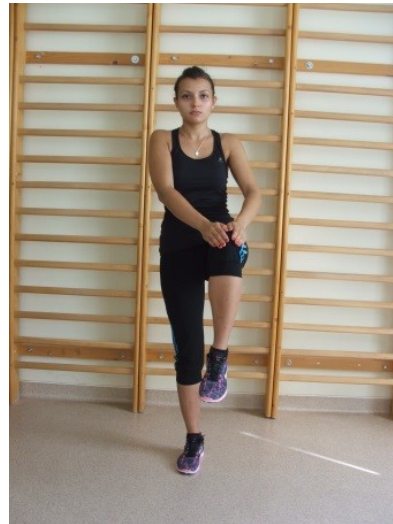
Communication, exercise instructions: meet your right knee and left hand in front of the body, then return into starting position, then meet the other knee and hand and return to starting position.

Note: do the exercise dynamically.

Aerobic exercise in standing position, both hands touching the knee



(SP), (EP)



(1)

Starting position: straddle, arms extended up diagonally over the head.

Movement description: we lift one leg off the ground by lifting the knee, and touch it with both hands lowered next to each other.

End position: knee-joint of one leg touching the hands lowered together.

Tempo: in 1 sec we meet the knee and the hands.

Communication, exercise instructions: meet your right knee and both hands in front of the body, then return to starting position, then meet the other knee and both hands.

Note: arms in a slightly bent position while touching the knee.

7.3. Axial elastic collision

7.3.1. Axial elastic collision on stepper

Axial elastic collision, stepping up



(SP), (EP)



(1)



(2)



(3)

Starting position: standing up, facing the stepper, arms freely along the body.

Movement description: we step on the stepper with the right foot.

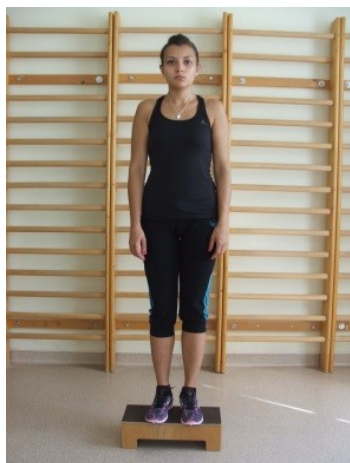
End position: right foot on the stepper, left on the ground behind the stepper.

Tempo: in 1 sec we step on the stepper with the right foot and in 1 sec we close the left foot next to it, in 1 sec we step back with the right foot and in 1 sec we close the left foot next to it.

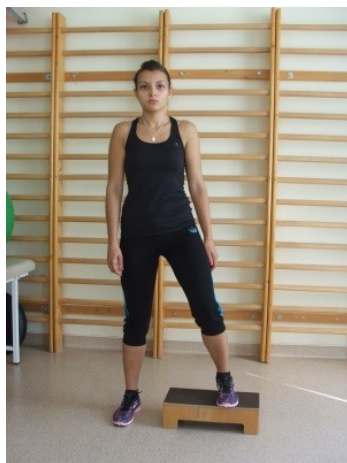
Communication, exercise instructions: step up with your right foot, close your feet, step back with your right foot and close your feet.

Note: in neutral spine alignment, look forward during the exercise, maintain rhythm.

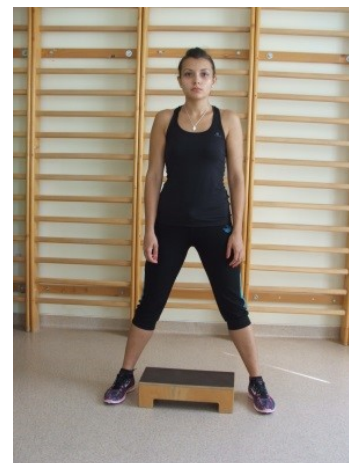
Axial elastic collision, stepping to the side



(SP), (EP)



(1)



(2)

Starting position: we stand on the stepper with both feet.

Movement description: we step next to the stepper with the right foot to the side.

End position: right foot next to the stepper.

Tempo: in 1 sec we step next to the stepper with the right foot, in 1 sec we step down with the left foot, in 1 sec we step back with the right foot, in 1 sec we step back up with the left foot.

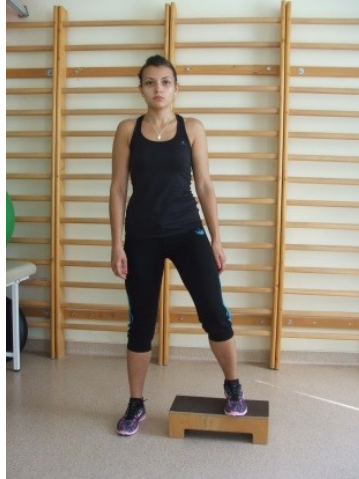
Communication, exercise instructions: step down with your right foot to the right of the stepper, step down with your left foot on the left, step back with your right foot and close your feet.

Note: in neutral spine alignment, look forward during the exercise, we do the exercise at a rhythmic, relaxed pace, arms freely along the body.

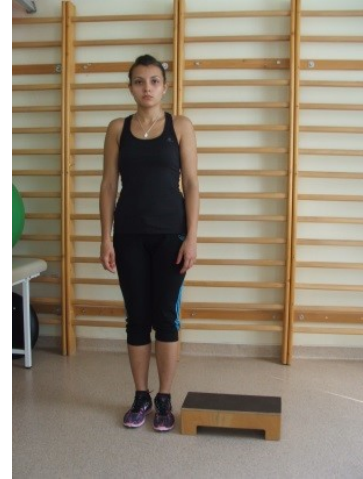
Axial elastic collision, stepping to the side with both feet



(SP), (EP)



(1), (3)



(2)

Starting position: We stand on the stepper with both feet.

Movement description: step down to the side with the right foot.

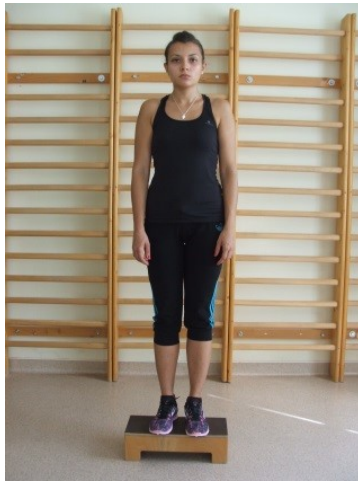
End position: right foot next to the stepper, the left foot on the stepper.

Tempo: in 1 sec we step down with the right foot, in 1 sec we step next to it with the left foot, in 1 sec we step back up with the left foot, in 1 sec we step back up with the right foot.

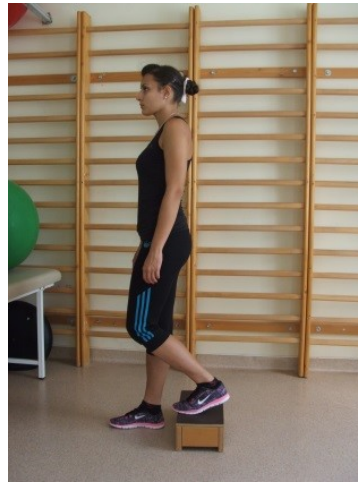
Communication, exercise instructions: step down with your right foot on the right side of the stepper, step next to it with your left foot, step back on the stepper with your left foot and close your feet.

Note: in neutral spine alignment, look forward during the exercise, we should do the exercise at a rhythmic, relaxed pace, repeat the exercise starting to the left side as well.

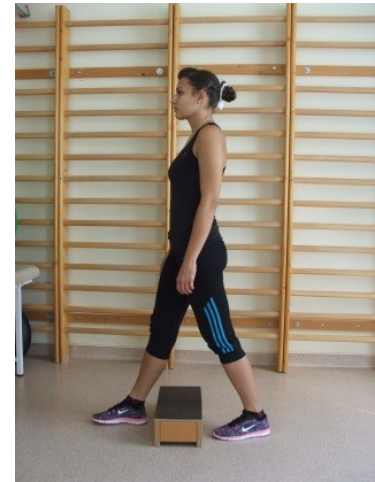
Axial elastic collision, stepping forward and backward



(SP), (EP)



(1), (3)



(2)

Starting position: We stand on the stepper with both feet.

Movement description: we step forward with the right foot.

End position: right foot in front of the stepper, left foot on the stepper.

Tempo: in 1 sec we step forward and down with the right foot, in 1 sec we step backwards and down with the left foot, in 1 sec we step back up with the right foot, in 1 sec we step back up with the left foot.

Communication, exercise instructions: step forward and down in front of the stepper with your right foot, behind the stepper with your left foot, step back with your right foot and close your feet.

Note: in neutral spine alignment, look forward during the exercise, we should repeat the exercise starting with the other foot at a rhythmic, relaxed pace as well.

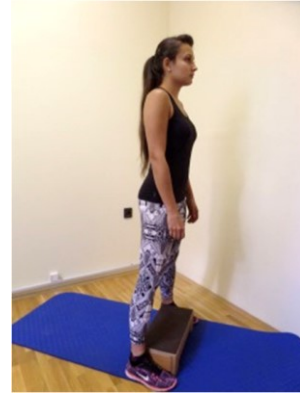
Axial elastic collision, stepping up from different sides with both feet



(SP), (EP)



(1)



(2)



(3)



(4)

Starting position: we stand behind the stepper on the ground, arms freely along the body.

Movement description: we step to the right of the stepper with the right foot, we step to the left of the stepper with the left foot, we step up the stepper with the right foot, and close the left foot next to it.

End position: we step back behind the stepper with the right foot and we close the left foot next to it.

Tempo: in 1 sec we step to the right of the stepper and in 1 sec to the left of the stepper with the left foot, in 1 sec we step up the stepper with the right foot, in 1 sec we our feet, in 1 sec return the right foot behind the stepper and in 1 sec the left foot as well.

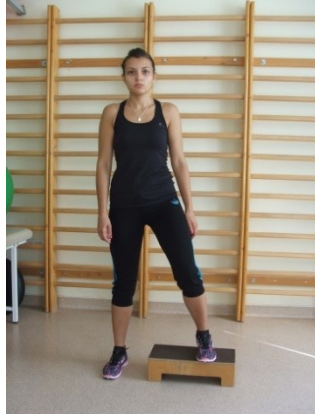
Communication, exercise instructions: stand behind the stepper on the ground with both feet, step to the right of the stepper, and with your left foot to the left of the stepper, step up the stepper with your right foot, close your feet, return your right foot behind the stepper and close your feet.

Note: in neutral spine alignment, look forward during the exercise, at a rhythmic, relaxed pace, arms follow the movement automatically, repeat the exercise starting with the left foot as well.

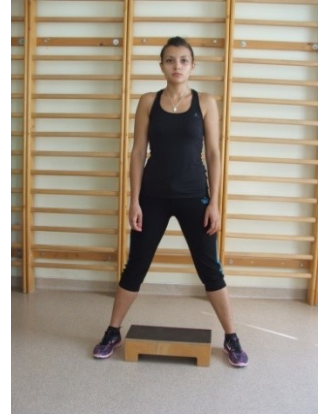
Complex exercise involving axial elastic collision



(SP), (3), (EP)



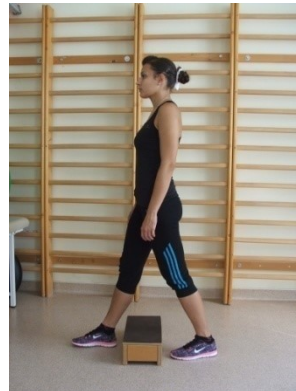
(1)



(2)



(4)



(5)

Starting position: We stand on the stepper with both feet, arms freely along the body.

Movement description: we step to the right of the stepper with the right foot, we step to the left of the stepper with the left foot, we step up the stepper with the right foot, we close the left foot next to it, then we step forward with the right foot, we step backwards with the left foot, we step back up the stepper with the right foot and close the left foot next to it.

End position: We stand on the stepper with both feet, arms freely along the body.

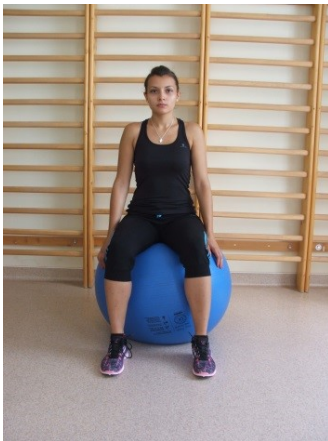
Tempo: in 1 sec we step to the right of the stepper with the right foot, in 1 sec to the left of the stepper with the left foot, in 1 sec we step up the stepper with the right foot, in 1 sec we close the left foot next to it, in 1 sec we step forward and down with the right foot, then in 1 sec we step backwards and down with the left foot, in 1 sec we step up with the right foot, in 1 sec we step up the stepper with the left foot as well.

Communication, exercise instructions: step to the right of the stepper with your right foot, step with your left foot to the left of the stepper, step up the stepper with your right foot, close your feet, step forward and down with your right foot, step backwards with your left foot, step back on stepper with your right foot and close your feet

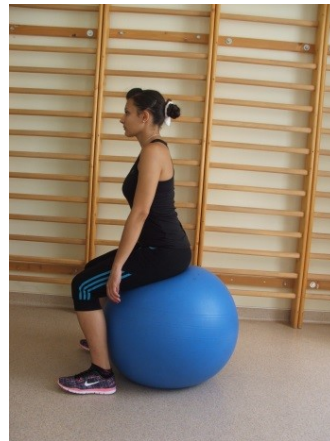
Note: in neutral spine alignment, look forward during the exercise, at a rhythmic, relaxed pace, arms follow the movement automatically, repeat the exercise starting with the left foot as well.

7.3.2. Axial elastic collision on a ball

Bouncing on a ball



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body.

Movement description: sitting on a ball we bounce slowly, maintaining rhythm.

End position: slightly lifted while bouncing, torso still touching the ball.

Tempo: in 1 sec we lift up, in 1 sec we sit back on the ball.

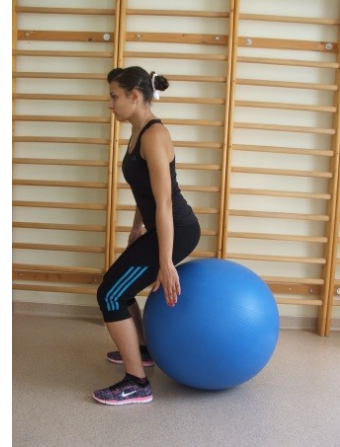
Communication, exercise instructions: gently bounce on the ball, the torso should not lift off the ball significantly, it should maintain contact with the ball on a smaller or larger surface.

Note: before starting the exercise the appropriate body position has to be set very accurately.

More dynamic bouncing on a ball



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body.

Movement description: sitting on the ball we bounce more dynamically.

End position: being lifted while bouncing, but one hand touching the ball.

Tempo: in 1 sec we lift up, in 1 sec we sit back on the ball.

Communication, exercise instructions: bounce on the ball more dynamically, the torso should not lift off the ball significantly, one hand should touch the ball all the time during the exercise.

Note: the appropriate body position has to be set very accurately and maintained during the exercise, one hand should touch the ball all the time.

Bouncing on a ball with arm movement



(SP), (EP)



(1)



(2)

Starting position: sitting on the exercise ball, arms along the body, bent at the elbow.

Movement description: sitting on the ball we bounce more dynamically, arms bent at the elbow swing forwards and backwards simultaneously.

End position: being lifted while bouncing, the torso touches the ball, arms in front of the body.

Tempo: in 1 sec we lift off, arms in front of the body, in 1 sec we sit back on the ball, arms slightly behind the torso.

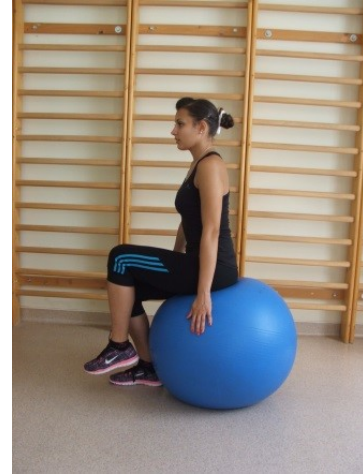
Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, the torso touches the ball all the time during the exercise, swing your arms forward when you lift off the ball.

Note: the appropriate body position has to be set very accurately and maintained during the exercise.

Bouncing on a ball, lifting the lower limb



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body, touching the ball.

Movement description: sitting on the ball, we bounce more dynamically, while we lift our knees taking turns.

End position: being lifted while bouncing, but touching the ball with the hand, one knee slightly lifted in front of the body.

Tempo: in 1 sec we lift off pulling up our knee, in 1 sec we sit back on the ball.

Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, touch the ball all the time of the exercise, lift one knee up and forward when you lift off the ball.

Note: the appropriate body position has to be set very accurately and maintained during the exercise, we check the position of the ball by hand.

Bouncing on the ball, approaching the opposite elbow and knee



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body, bent at the elbow.

Movement description: sitting on the ball we bounce more dynamically, while lifting up the knees taking turns, in the meantime lift the opposite arm up and forward, the arm on the same side gets slightly behind the line of the torso.

End position: being lifted while bouncing, touching the ball, right knee slightly lifted in front of the body, left arm lifted up and forward bent at the elbow.

Tempo: in 1 sec we lift off, pulling up our knee and lifting the arm forward, in 1 sec we sit back on the ball.

Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, the torso touches the ball all the time during the exercise, lift your right knee and left arm up and forward when lifting off the ball, put your foot on the ground when returning, your arms get behind the line of the torso, then repeat with your left arm and right leg.

Note: keep changing the limbs during the exercise, correct inappropriate body position.

Bouncing on a ball, with knee extension



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body, bent at the elbow.

Movement description: sitting on the ball we bounce more dynamically, while we extend one knee forward, while we lift the opposite arm up and forward, then repeat with the other arm and knee as well.

End position: being lifted while bouncing, but touching the ball, right knee extended in front of the body, left arm slightly lifted up and forward bent at the elbow.

Tempo: in 1 sec we lift up while extending our knee and lifting our arm, in 1 sec we sit back on the ball.

Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, the torso touches the ball all the time during the exercise, extend your right knee and lift your left arm slightly bent up and forward when being slightly lifted off the ball.

Note: the appropriate body position has to be set very accurately and maintained during the exercise.

Bouncing on a ball, with arm extension



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body, arms on the shoulders on the same side, bent at the elbow.

Movement description: sitting on the ball bounce more dynamically, while extending the arms, taking turns.

End position: being lifted while bouncing, but touching the ball, right arm extended in front of the body, left arm bent at the elbow.

Tempo: in 1 sec we lift off while extending the arm, in 1 sec back.

Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, the torso touches the ball all the time during the exercise, extend your right arm forward.

Note: the appropriate body position has to be set very accurately and maintained during the exercise.

Bouncing on a ball, with arm and leg extension



(SP), (EP)



(1)

Starting position: sitting on the exercise ball, arms along the body, arms on the shoulders on the same side, bent at the elbow.

Movement description: sitting on the ball we bounce more dynamically, in the meantime we extend one arm and the opposite leg forward from the knee, then the other arm and leg.

End position: being lifted while bouncing, but touching the ball with the torso, right arm and left leg extended in front of the body, left arm bent at the elbow behind the line of the body.

Tempo: in 1 sec we lift off while extending our arm and knee, in 1 sec back.

Communication, exercise instructions: bounce on the ball more dynamically, do not lift the torso off the ball significantly, the torso touches the ball all the time during the exercise, extend your right arm and your left leg.

Note: the appropriate body position has to be set very accurately and maintained during the exercise.

Test questions, practice exercises:

1. Give instructions for ten aerobic exercises which are done standing up. Pay attention to gradualness and setting the appropriate body position.
2. Give instructions for ten aerobic exercises which are done sitting down. Pay attention to gradualness and setting the appropriate body position.
3. Collect five further exercises involving axial elastic collision which are done on a ball.
4. Give instructions for five-five exercises involving axial elastic collision which are done on a ball and on a stepper considering the principle of gradualness. Correct verbally during the exercise. Give instructions for ten aerobic exercises which are done standing up involving arm movement below the shoulder. Pay attention to gradualness and setting the appropriate body position.
5. Give instructions for ten aerobic exercises which are done standing up involving arm movement above the shoulder. Pay attention to gradualness and setting the appropriate body position.

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