

PHYSICAL HEALTH EDUCATION

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2019

J. E. PURKYNE UNIVERSITY IN USTI NAD LABEM
FACULTY OF HEALTH STUDIES



EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education


MINISTRY OF EDUCATION,
YOUTH AND SPORTS

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Usti nad Labem 2019

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ISBN xxxxxxxxx (online: PDF)

DOI: xxxxxxxxx

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Introduction

Summary:

This course is conceived as practical. Students will obtain information about methodological procedures of musculoskeletal, respiratory and cardiovascular system disorders. Content of this course builds on the knowledge of physical education and presents the use of health physical education in physiotherapy.

Course knowledge:

The student can define and analyze individual types of disorders.

Course skills:

The student is able to create a physical education plan in individual indication areas.

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1 INTRODUCTION TO THE COURSE OF PHYSICAL HEALTH EDUCATION

Quick overview

This chapter introduces the course of physical health education, defines the basic concepts related to physical health education

Goal of the chapter

The chapter presents basic information about physical health education and complex information about health groups, aims and tasks of PHE. It describes the types of the workout.

Keywords

Adaptation process - workout - health groups

Physical health education is a specific form of physical education (PE) intended for physically impaired individuals (Table 2), therefore individuals included in the III. health groups according to medical classification. It is intended for all age groups.

Health groups

- healthy individuals, adequately developed with a high degree of training, ready for full physical exercise
- healthy individuals, less trained
- disabled individuals (permanent or temporary disability in physical development, physical structure and health) - have some limitations
- ill individuals



Objectives of PHE

The objective of PHE is to eliminate or alleviate health weakness in a rational way, to strengthen the organism, and thus to create conditions for the universal harmonious development of a physically weakened individual. And also provide the handicapped persons the possibility of sports activities in relation to their abilities and health condition.

These tasks are subordinate to this objective

- *medical*
Positively influence the health weakness / disorder (specific according to the type of weakness - keep, or improve, do not worsen!).
- *educational*
Learn the trainee basic physical skills and habits, to deepen their knowledge of their own health impairment (suitable and inappropriate physical activities, their dosage,...)
- *pedagogical*
Lead the trainee to a permanent exercise regime and to create a sense of self-confidence in one's own abilities (keeping the principles of physical education process - regularity, development of mental and social abilities - coping with a certain handicap, communication,...).

Management and organization of PHE

- PHE sections (sports unions and organizations,...) - trained instructor (ČASPV - Czech Association of Sport for All)
- PHE course at all kinds and types of schools - primary, high and university (as needed, often as a PE club), special schools, auxiliary schools (course 3-4 times a week), etc.

Specialization - special PE sections on individual types of health impairment, or mixed.

PE resources

- *General*
 - basic gymnastics
 - movement games
 - rhythmic gymnastics
 - elements of individual sports - swimming
- *Compensatory*
 - Release exercises (release joints and muscle contractures)
 - Stretching exercises (restore physiological muscle length)

- Strengthening exercises (increase performance of weakened muscles and muscle groups) - dynamic / static
- Breathing exercises (static / dynamic, types of breath)
- Relaxation exercises (importance, position, conditions, types)
- Endurance exercise (meaning, selection, measurement, Zott table)
- Balance exercises (static / dynamic / balancing objects) Cvičení uvolňovací (uvolnit klouby a svalové kontraktury)

Workout / PE lesson

- It is the basic organizational form of work in health physical education
- Duration - 45, 60, rarely 90 minutes, frequency 1-3 times per week
- The workout has a warm-up, a main (balancing and developing) and a final part

The content of the workout / PE lesson and its individual parts is adapted to:

- the type of health impairment
- medical condition
- biological age
- gender
- physical development of trainees / pupils and their previous physical training
- functional fitness of trainees
- the interest of trainees

Load in workout / PE lesson

The load is schematically represented by a curve obtained by measuring the heart rate in each part of the workout / PE lesson. Overall, the level of body load in the physically impaired is lower than in healthy individuals. There are 3 basic load curves:

- *single-peak* (the peak is in the developing part) - for weak locomotor system
- *two-peak* (2 peaks in the developing part) - for asthmatics
- *with balanced load in the developing part* (slightly fluctuating load of interval character) - for individuals with overweight, obesity and for cardiac patients

Reaction and adaptation of organism to stress (load)

There are the responses of the organism to the disorder of homeostasis (internal environment), which arises due to some pathological processes in connection with individual types of health impairment.

The reaction is an immediate response to an external stimulus, which is always the same and genetically anchored.

The adaptation is the ability of living matter to adapt to the same or similar stimulus coming from the external environment - to adapt and thereby reducing the effect of that stimulus and increasing the ability to withstand a more intense stimulus.

The whole set of adaptation mechanisms is called **adaptation syndrome**. We distinguish between the stressor (intense physical load, cold, heat, hunger, etc.) - an external factor and stress - a process taking place inside the body.

Definition of stress: it is a set of regulatory mechanisms occurring when the internal homeostasis of an organism is threatened.

3 stages of adaptation syndrome:

1. *Stage of alarm reaction*

Mobilization of the body's defenses - washout of hormones ACTH, cortisol, adrenaline and norepinephrine (heart rate increases, blood pressure increases, breathing deepens, glucose levels increase, etc.), everything is done for the organism to manage the stressor.

2. *Stage of adaptation*

Gradual adaptation and better management of the stressor, which results in increased resistance. The body responds by increasing washout of catecholamines and endorphins - reducing pain perception and causing a sense of satisfaction.

3. *Stage of destruction*

If the stressor is excessive, the exhaustion occurs, continuing into organism failure and death.

The manifestations of adaptation:

- ***Musculoskeletal system adaptation***
 - bone strengthening in the direction of tension and pressure by changing the architecture of bone tissue
 - increased deposition of mineral salts in the bones

- reinforcement of tendons, increase of tensile resistance
- muscle mass increase by hypertrophy
- increase of efficiency of contractile muscle fiber elements during strength training, increase of oxidative capacity in mitochondria during endurance training
- multiplication of blood vessels and improvement of microcirculation in muscle
- improvement of muscle coordination, movement techniques
- improving neuromuscular adaptation - the ability to turn on multiple muscle units simultaneously
- overall improvement of muscle mass, strength and resistance of ligament and bone system, increase in muscle strength and endurance
- *Transport system adaptation*
 - economization of heart work
 - increased myocardial contraction
 - changes in blood distribution
 - improvement of orthostatic tolerance
 - economizing muscle activity with reduced cardiac system requirements
- *Metabolic adaptation*
 - decrease in the risk component of LDL cholesterol, increase the protective HDL component of cholesterol
 - decrease insulin secretion by increasing receptor sensitivity
 - faster fat utilization by increasing lipase activity
 - decrease of sympathicotonia at low load, increase of sympathicotonia at high load
- *Neurovegetative adaptation*
 - increase the economizing effect of the parasympathetic system
 - decrease sympathetic tone
- *Mental adaptation*
 - obtaining a pleasant experience with higher physical activity (by endorphins washout)
 - compensation of stress effects from everyday life
 - increase self-confidence, self-realization
 - active attitude to one's own health
 - improving the relationship within group

Summary



Questions

1. Describe the health groups.
2. What are the manifestations of adaptation?
3. What adapts the content of the workout?



Notes



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2 TRAINING OF EACH INDIVIDUAL TYPE OF BREATHING PATTERNS

Quick overview

This chapter introduces the different types of breathing, body positions and their effects on breathing.

Goal of the chapter

This chapter introduces breathing movements and breathing control. It also introduces the positions of the body and its effects on breathing. It describes the practice of breathing wave.

Keywords

Respiratory muscles - breathing movements - full yoga breathing

RESPIRATORY MUSCLES

Breathing muscles

The breathing muscles elevate the ribs, thus increasing the volume of the thoracic cavity. The main muscles include diaphragm, mm. scaleni and mm. intercostales externi. The following muscles are auxiliary breathing muscles: m. serratus anterior, m. pectoralis major et minor, m. subclavius, m. serratus posterior superior.

Exhalation muscles

In normal resting breathing, expiration is a passive event, exhaling muscles only become involved when the breathing effort increases. The main exhalation muscles are mm. intercostales interni, m. rectus abdominis, m. obliquus internus et externus, m. transversus abdominis. The auxiliary



exhaling muscles are m. transversus thoracis, m. serratus posterior inferior, m. quadratus lumborum and m. iliocostalis.

BREATHING MOVEMENTS

„The movements of the thoracic spine affect the dynamics of breathing, respiration affects the dynamics of the spine“ (Dylevský 2001).

The starting position of the chest during breathing movements is the position of the terminated normal exhalation, ie. the resting position of the diaphragm muscle where most of the other muscles are relaxed.

Both the active and passive factors contribute to changes in the volume of the thoracic cavity. The active factors are respiratory muscles, the passive factor is the skeleton (Th spine, ribs, sternum), non-contractile soft tissues of the chest wall (rib cartilage, muscle fascia, pleura) and the pulmonary parenchyma itself. Also, the connective tissue in the thorax (connecting the ribs to each other and the ribs with the Th spine) is an important passive energy source (accumulated by the activity of the inspiratory muscles) for expiration, which is normally a matter of the elasticity of the thoracic and lung tissue. Mediastinal ligament is also important because it allows the diaphragm to lift the lower ribs and thereby participate in chest breathing. The diaphragm performs about 60 % of the breathing work, the rest is divided by mm. intercostales externi and some neck muscles.

Inspiration

Inspiration arises from the activity of inspiratory muscles, which increases the volume of the chest by reducing the diaphragm arch and elevating the ribs, creating a chest vacuum in the cavity that leads to air flow to the lungs. Part of the inspiratory muscle energy is used to overcome the elastic resistance of the chest and lungs.

The diaphragm itself contributes to the changes in the shape of the chest in several ways. By shortening the diaphragm fibers, the diaphragm descends into the abdominal cavity and thus increases the cranio-caudal diameter of the chest. In addition, its contraction causes the lower part of the rib cage to widen by a dual mechanism: the increase in abdominal pressure acts through the part of the diaphragm that is attached to the chest wall and thus leads to the widening of the lower part as well as the skeletal part of the diaphragm. With calm breathing, the piston movement

of the diaphragm in the cranio-caudal direction is probably more significant in volume than the extension of the lower thoracic aperture.

During inhalation, the rib cage enlarges in all three directions: frontal, sagittal and transversal. The diaphragm, as the main inhaling muscle, is therefore able to ensure the rise of all these dimensions. By decreasing the central ligament part, it enlarges the chest vertically while increasing the volume of the thoracic cavity. Elevating the lower ribs increases the transversal dimension and elevating the upper ribs with the sternum increases the anteroposterior dimension of the rib cage.

The mechanism of respiratory muscle work changes with physical exertion.

During resting breathing, the rib cage widens mainly in the anteroposterior direction and the ribs with the sternum rise cranially.

In the case of more intensive breathing, the lower ribs are elevated, the lower thoracic aperture widens and the rib arch is straight. Even in this form of rib breathing, the diaphragm remains relatively calm and only when the breathing is hardened will its dome drop against the abdominal cavity.

During resting breathing the excursions of the diaphragm are 1-2 cm, while strenuous it is up to 10 cm. The frenostal (costodiaphragmatic) angle, ie the angle between the diaphragm and the rib wall formed by the ribs, opens up during inspiration.

Exhalation

Expiration creates a pressure in the chest cavity, which expels air from the lungs. This overpressure occurs when the inspiratory muscles relax, releasing the energy accumulated in the elasticity of the stretched chest and in the lung tissue. The contraction of stretched elastic elements leads to a reduction in the volume of the chest, while the gradual decontraction of the inspiratory muscles slows the exhalation slightly. It is only during intense exhalation that the function of the expiratory muscles is necessary for this purpose. Frenostal angle at exhalation is sharp to flattened, peripheral parts of the diaphragm approach the chest wall.

Although the diaphragm is considered to be the main inspiratory muscle, electrical activity was measured in all its parts during both expiratory and pre-expiratory respiratory phases. This phenomenon is explained as an eccentric contraction designed to inhibit the elastic contraction of the lungs along with the entire chest. This is compared to the

eccentric contraction of the knee and hip extensors counteracting the gravitational force at a slow squat. The absence of any electrical activity at maximum exhalation only confirms this.

Body postures and their influence on breathing

The basic positions are either **vertical** or **horizontal**, the other positions are rather modifications of the two basic positions. It is important to ensure the **stability** of the body in every position..

- **Standing posture:** breathing is limited by the weight of the upper limbs, but is still physiological and most convenient for breathing, as the freedom of the chest and spine is ensured in all directions,
- **Sitting upright with lowered legs:** pressure of the organs of the abdominal cavity restricts the movement of the diaphragm, the upper thoracic respiration is free,
- **Child's sitting:** the whole spine is arched, the diaphragm movements are again limited, lower thoracic breathing prevails,
- **Supine position:** chest gets into an inspirational position, exhale is more difficult, chest has limited movements in dorsal direction,
- **Prone position:** the chest is fixed on the pad, the diaphragm is in a higher position and thus the inspiration is limited,
- **Side lying position:** the chest is fixed on the side which the client is lying, the other side can expand better (increase breathing movements),
- **Upper limbs located along the body:** stimulation of upper thoracic respiration,
- **Upper limbs placed in candlestick position** (90 ° ABD and 90 ° ER in shoulder joints, 90 ° FL in elbow joints): supports lower thoracic respiration,
- **Elevated upper limbs:** allow more abdominal breathing,
- **Sloping surfaces:** they can be used for supine position / prone position / side lying position, for semi-sitting, they are used for positioning, for relief, for expectoration.

The following methods are ideal for practicing the correct common breathing stereotype:

1. *Practice of chest breathing* - for most people this breathing is more natural.
2. Lie on the mat, bend your legs, feet to the width of the pelvis. Put one hand on the belly, the other on the chest. Take a deep breath and try to make sure that only the chest fill with the air. If you can do that, then put both hands under the breasts and try to inhale as much as possible into the chest.
3. *Practice of abdominal breathing* - we take the same position as during the training of thoracic breathing, with the difference that now we are trying to inhale only into the abdomen, ie we only want to fill the abdomen. If we are not successful in training, the idea of inflating a large balloon in the belly can help. When this happens, we put one hand under our back, the other on our stomach and we try to spread our belly in all directions (ie. inflate the belly upwards, but also slightly backwards towards the back and sides).
4. *Full yoga breath* - take the same position as in the previous two exercises. Take a deep breath, first breath directed into the abdomen, after it is filled, continue into the chest and after the chest is filled finish under the collarbones, which should slightly arch up (even with the throat). We exhale and inhale slowly.
5. *Combining chest and abdominal breathing in motion* - now we are trying to engage both chest and abdominal breathing during activity. We start with a slower walk, we can gradually add more dynamic movement such as running or cycling.

The benefits of proper breathing

Proper breathing during the day can lead to a reduction in stiffness and pain in muscles, back pain, migraines and generally headaches, removal of bad thoughts and relaxation of the mind, and even improve immune system function.

The practice of full yoga breath should begin gradually, ie first we practice abdominal breath, chest breath, and subclavian breath. For each of them we also focus on breathing to the front, side and back. Most people breathe the front of the lungs most of the time, so we focus more on the lateral, but mainly on the back, which is very little sensitive and the breathing is perceived poorly in this area. In the beginning the breath cannot be perceived in the back of the lungs without the application of hands.

When practicing, it is important that we are not disturbed by our perception

of breath. Therefore, it is necessary to take a comfortable position, in which any part of our body will not hurt, and we will be able to observe our breath. For better concentration it is also good to close our eyes so that we are not disturbed by the stimuli from the surroundings, or to put a hand on the breathed area.

We normally breathe for some time before exercise to soothe both our breath and our thoughts. Breathing should be slow, relaxed and always run through the nose. Given that it is necessary to take a position in which we can relax, but at the same time we have a straight spine, it is suitable to sit upright, such as a vajrasana, or lie on the back, which relieves abdominal muscles.

It is very important that the body and breath are relaxed throughout the exercise and that there is no tension or even convulsions. Sometimes, with too much effort to “stuff” as much air into one part of the lungs, we can bend, twist, or contract the muscles of the face without realizing it. During exercise, it is not important how the body part inflates, but whether we are able to feel that part and whether we feel breath in it. Therefore, we breathe freely and do not try to take as much air as possible.

Thus, the practice of full yoga breath begins by breathing into all parts separately (abdominal, chest and subclavian region, all divided into anterior, lateral and posterior part - a total of nine parts) so we can feel them. Only then can we combine it all and breathe with full yoga breath.

Summary



Questions

1. What is happening during inspiration?
2. In what sectors are respiratory movements taking place?
3. What part of the breath is limited in the supine position?



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3 USE OF COMPENSATORY EXERCISES IN INCREASED THORACIC KYPHOSIS, LUMBAR LORDOSIS AND SCOLIOTIC POSTURE

Quick overview

This chapter introduces the poor posture (increased thoracic kyphosis, lumbar lordosis and scoliotic posture) and the subsequent use of compensatory exercises in these disorders.

Goal of the chapter

This chapter introduces the poor posture (increased thoracic kyphosis, lumbar lordosis and scoliotic posture) and the subsequent use of compensatory exercises in these disorders.

Keywords

lumbar lordosis - scoliotic posture - increased thoracic kyphosis

Poor posture

Poor posture refers to posture that deviates from proper posture but is not due to structural change. It is basically a *functional disorder of postural function*. The changes caused by this disorder can be compensated by active voluntary effort, as opposed to actual deformities or orthopedic defects.

A number of causes, sometimes even quite distant at first sight (eg visual or hearing defects, airway obstruction, delayed mental development, etc.) may contribute to the development of poor posture. Thus, one can say that the internal factors (injuries, congenital defects, illnesses) come to the forefront and sometimes the external factors (incorrect sitting, long standing, inappropriate physical habits). Often several factors are applied at



the same time and their adverse effects add up. Most of the postural defects can be derived from impaired muscle balance, muscle imbalance.

Muscle imbalance

Muscle imbalance is a condition in which the functional balance of the muscular system of tonic and phasic muscles is disrupted. A typical picture of muscle imbalance is the development of shortened and weakened muscles, impaired movement stereotypes and muscle coordination.

Causes of muscle imbalance:

- hypokinesis, lack of muscle work
- chronic muscle loading above the limit given by muscle quality
- asymmetric loading without sufficient compensation
- change of movement stereotype eg due to injury, illness

Classification of muscle imbalances:

According to localization, Janda (1982) divided muscle imbalances into three syndromes:

▪ ***Lower cross syndrome***

- a) Weakened mm. glutei maximi and shortened hip flexors (m. iliopsoas, m. rectus femoris, m. tensor fasciae latae).
- b) Weakened abdominal muscles and shortened lumbar extensors.
- c) Weakened mm. glutei media and minimi and shortened mm. tensores fasciae latae and mm. quadrati lumbos.

Imbalance results in increased anterior pelvic tilt and lumbar hyperlordosis. Statics and dynamics parameters in the pelvic area, the lumbar part of the spine (the so-called unstable cross) and in the hip and knee joints are violated.

▪ ***Upper cross syndrome***

- a) Weakened lower scapular fixators and shortened upper scapular fixators.
- b) Weakened interscapular muscles and shortened mm. pectorales.
- c) Weakened deep neck flexors and shortened neck extensors.

This imbalance also changes statics and moving stereotypes. We can find head forward, increased cervical lordosis, significant overload of cervicocranial and cervicotoracal transitions, changed position of the scapulas. Increased tension of the pectoral muscles will cause round back and forward posture of the shoulders, the so-called button-like shoulders.

▪ ***Layer syndrome***

In this syndrome, the areas of hypertrophic and weakened muscles alternate. Viewed from the rear and with caudocranial direction are hypertrophic hamstrings, above them the hypotrophic buttocks and paravertebral muscles in

the lumbosacral region are seen. Another hypertrophic zone consists of extensors in thoracic-lumbar transition, above it is the hypotrophic zone of the lower scapular fixators and the last hypertrophic zone consists of the upper fibers of m. trapezius and m. levator scapulae. On the ventral side, the lower part of the straight abdominal muscles is weak and it arches forward, but further laterally the abdominal wall is pulled in at the places of hyperactive oblique abdominal muscles. It is also hypertrophic m. pectoralis major and m. sternocleidomastoideus.

Types of poor posture

Poor posture may have a different clinical picture. Poor posture can be thus divided into several more or less differentiated groups..

The different numbers and definitions of these groups as presented by different authors, as well as the unstable terminology, testify that such a division is only approximate. In practice, however, it has its significance, for example, when selecting compensatory exercises..

▪ **Flat-back posture**

- flattened physiological curvature of the spine, straightening of the thoracic and lumbar spine
- tendency to scoliotic posture, decreased resistance to greater static and dynamic load
- forward head posture, posterior pelvic tilt, hip and knee joints in extension
- flabby muscles, weakened hip flexors, hamstrings shortened

▪ **Sway-back posture**

- generally lower muscle tone
- increased physiological curvature of the spine
- a large difference between a relax standing and upright standing
- the individual does not tolerate hold in active position, back pain with long standing
- forward head posture
- posterior pelvic tilt
- hyperextension of hip and knee joints
- slight extension of the cervical spine, extension of the kyphotic curve, flattening of the lower part of the lumbar spine

▪ **Thoracic spine hyperkyphosis (round back)**

- Static failure of the upper torso

- forward head posture, cervical spine hyperlordosis, cervicocranial and cervicothoracic overload
- weakened inter-scapular muscles, scapula alata
- shortening of pectoral muscles, protraction of shoulders
- There are also mechanical changes in the area of the shoulder joints. Weakening of the lower scapular fixators and subsequent protraction of the shoulder joints leads to abduction and verticalization of the glenohumeral joint, which adversely affects the biomechanics of the shoulder, overloading m. supraspinatus and m. levator scapulae.

- **Lumbar spine hyperlordosis**

- enlarged lordosis of lumbar spine
- anterior pelvic tilt
- head in neutral position, natural curve of thoracic and cervical spine
- flexion of hip joints, slight hyperextension of knee joints
- weakened abdominal muscles and hip extensors
- shortened lumbar extensors and hip flexors
- change of pressure distribution on hip joints and LS segments
- change in static and dynamic conditions in the pelvic area and lower lumbar sector
- insufficient extension in the hip joint during walking, subsequent deepening of the anterior pelvic tilt and overloading of the LS segment

- ***Kyphotic-lordotic posture***

- a combination of hyperkyphosis and hyperlordosis
- the relief of the body resembles a sway-back posture, but differs in the fact that when the spine is actively held the curvature of the spine remains excessively curved
- forward head posture (compensatory hyperextension of cervical spine)
- anterior pelvic tilt
- flexion of the hip joints, slight hyperextension of the knee joints
- shortened hip joint flexors
- weakened abdominal, back and neck muscles

- ***Scoliotic posture***

- curvature of the spine in the frontal plane of a functional nature, ie without changes in the shape and position of the vertebrae
- it can be caused by inclined position of the pelvis at uneven length of lower limbs
- asymmetry of the figure (different height of shoulders, shoulder blades,

etc.)

- asymmetry of paravertebral walls

Flat-back and sway-back posture are examples of postural defects that arises on a congenital, constitutional causes, but some of the cause also comes from a lack of functional load on the musculoskeletal system. In contrast, hyperkyphosis and hyperlordosis are entirely acquired postural defects.

Workout for poor posture

WORKOUT WITH PHYSIOBALL

1. Learn the right sitting position

Choose a suitable ball size, hip and knee joints at 90 °, hip joints should not be lower than knee, anterior pelvic tilt, upright chest, upper limbs girded down, arms hanging freely, head extended (in elongation), feet fully supported on the ground. Hold for 15 seconds and release.

2. Warm-up – sitting on the ball

- bobbing and bouncing on the ball
- moving the pelvis back and forth, sideways
- lift one lower limb stretched forward and clap underneath and change
- upper limbs elevated, inhale, upper limbs back, exhale
- sit with feet apart, hands on hips and do large circles with torso
- sit with feet apart, upper limbs elevate - inhale, exhale - deep forward bend to legs

3. Strengthening

inter-scapular muscles - the correct sit on the ball, the upper limbs in candlestick position, pull elbows to the body

abdominal muscles - from sitting on ball slowly by moving lower limb forward, upper limbs are crossed on chest, then back to sit

4. Stretching

m.trapezius - sitting on the ball - one upper limb is laid over the head, the palm touches the ear, the other upper limb is stretched along the body, the palm pushes down, the head bow with inhalation, the patient pushes slightly against the palm, exhale and one more bow, change the sides

m. pectoralis - supine position, upper limbs freely spread - inhale, upper limbs slightly lifted - exhale, release

m. quadratus lumborum - sit with feet apart; one upper limb on the hip, the other upper limb flexing, lateroflexion with the torso to the side, inhale and exhale and the torso drops even more to the side

m. triceps surae - sit on the ball, one lower limb forward with the stretched toe, withstand a slight tension and relieve

hamstrings - sit with feet apart, deep lean forward to one lower limb, then to the other lower limb

WORKOUT WITH OVERBALL

1. Right sitting position

- ball at the level of the peak Th kyphosis
- ball in lumbar region or
- ball under the buttocks

2. Warm-up – standing

- stand with feet slightly apart, the ball is held with upper limbs fully elevated above the head
- side circles, the ball is held by one upper limb and is exchanged behind the back
- stand with heels together, throw the ball up, grab him, do calf raise with right lower limb and back
 - change lower limbs

3. Strengthening

inter-scapular muscles - prone position, upper limbs holding the ball, extend arms behind back, hold and relax

muscles of the cervical spine - stand with feet slightly apart by the wall, ball on the forehead and push into it; stand with feet slightly apart by the wall, ball on the nape and push into it

abdominal muscles - supine position, ball under the shoulder blades, upper limbs crossed on the chest, lower limbs flexed, elevate scapulas from the ball, go back and relax on the ball

4. Relaxation and stretching

- sit on the chair, lower limbs stretched, toes pulled together, roll ball with hands to toes and back
- stand sideways to the wall, ball under the elbow, upper limb elevated, push to the ball and move it with elbow up and down
- supine position, upper limbs slightly upstretched, palms facing up, hips in 90 °, knees also, ball is between knees, turn the knees to one side and the other
- side lying position, on upper limb is under the head, the other one leans on the palm in front of the chest, lower limbs stretched under the upper

limb, ball is under the instep, patient pulls the knee to the abdomen and back down on the ball

- stand with feet slightly apart back to wall, ball is under the lumbar spine, bend lower limbs, ball goes up on the spine

WORKOUT WITH THERA-BAND

1. Right sitting position

Sit on a chair, Thera-Band is sprung, it goes across the chest, around shoulders, cross over the back and we sit down the ends of the Thera-band.

2. Stretching and strengthening

m. pectoralis (stretching), inter-scapular muscles (strengthening)

- sit, Thera-band is around the palms, one upper limb propped up, the other upper limb is in horizontal abduction, patient performs opposite movement and back
- or the same exercise only the upper limb is in abduction with scapula elevated
- stand with feet slightly apart, Thera-band is stretched out in the extended upper limbs, the patient goes back and forth, does the circles with chest and the Thera-band must always be stretched

WORKOUT WITHOUT TOOLS

1. Warm-up – standing

- slight squat with feet slightly apart, swirl back and forward with shoulders and breathe regularly
- march on the place
- calf-rises, change lower limbs
- tiptoe walking
- galloping aside
- stand with feet slightly apart, lift up slightly flexed lower limb and quickly clap under the knee, change sides

2. Relaxation, stretching

deep breath training

- supine position, lower limbs flexed, one upper limb is laid with the palm on the abdomen, the other upper limb is with the palm on the chest, inhale into the abdomen, then into the chest, exhale from the chest then from the abdomen
- supine position, lower limbs flexed, inhale and exhale at letter S
- kneeling and on all fours, the fingers are pointing forward, move the pelvis

backwards - sit on the heels, stretch arms the distance and breathe in this position

- kneeling and on all fours (knees in the air), extend left leg - hold
- kneeling on the right knee, put the hand against the left knee, transfer the bodyweight and push pelvis forward, pull heel of right lower limb to the buttocks
- support kneeling, hunch out, exhale, bend, inhale
- support kneeling, extend right arm and left leg into the distance and stretch
- stand on the right lower limb, crouch down the left lower limb, grasp the instep with hand and stretch backwards and push the heel to the buttocks
- stand with feet together, deep bent forward bend to, hold

3. Strengthening

Inter-scapular muscles

- Turkish sitting, arms in candlestick position, push the shoulder blades to each other
- prone position, arms in candlestick position, palms leaning on mat, lift arms, turn palms up, turn palms back and relax
- prone position, arms in "V" shape, slightly lift them up over the pad, flex elbows and pull shoulder blades, exhale and relax

abdominal muscles - supine position, lower limbs flexed, patient is embracing the knees with the hands - relax, stretch them and slowly let go over the mat, eccentric contraction.

Summary

Questions

1. Describe the lower cross syndrome?
2. What is scoliotic posture?
3. What aids can be used in the workout?



Notes

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4 USE OF COMPENSATORY EXERCISES IN HIP JOINT AND FLAT FOOT DISORDERS

Quick overview

This chapter introduces hip joint and flat foot disorders and the subsequent use of compensatory exercises for these disorders.

Goal of the chapter

This chapter introduces hip joint and flat foot disorders and the subsequent use of compensatory exercises for these disorders.

Keywords

arthrosis - active foot - dynair

Arthrosis of the bearing joints of the lower limb

Arthrosis refers to degenerative joint disease for various causes. Primary arthrosis is based on genetic predisposition, inferiority of articular cartilage and other factors. Secondary arthrosis develops after previous injuries, illnesses, musculoskeletal disorders and overloading. Arthrosis is characterized by so-called starting pain.

Koxarthrosis

These are arthritic changes in the area of the hip joints, often in combination with functional disorders of the lumbar spine, sacro-iliac joints. Hip range of motion is limited, and it is also painful (internal rotation, extension, abduction, adduction, external rotation, flexion).

Flat foot - pes planus is a descriptive term denoting abnormal reduction or disappearance of longitudinal or transverse arches of the foot. Thus, it is possible to speak of a longitudinally flat foot and laterally flat foot, or a



combined condition. However, the term of a transversely flat foot is inaccurate, since it is created not by the reduction of the existing arch but by the elevation of the marginal metatarsals.

Use of compensatory exercises in hip joint disorders

*Starting position: **stand***

- relaxation with pendulum movement - anterior-posterior, laterolateral

*Starting position: **supine position***

- extend both knees to the mat, pull the buttocks together
- push the right knee, pull it slightly into the distance, in the axis of the limb, do the same with the left lower limb
- stretch your knee, abduction (ensure proper movement stereotype)
- hands on hips, abduction with both legs
- rotate both knees and toes in and out (inner and outer rotation, beware of hip replacement!)
- actively alternating double-flexion
- actively alternating triple-flexion (second limb is stretched)
- knees bent, relax knees to external rotation (heels together)
- lay the right and left knees alternately to the mat (beware of gonarthrosis or meniscus lesions)
- extend right knee, pull tip, back
- same + lower limbs extended, knee tightened by upper limbs, add head flexion
- hug both knees with your hands, pressing your head against your knees
- pelvic lift
- strengthening the abdominal muscles
- event. spinal rotating exercises with knees bent to relax the lumbar spine

*Starting position: **side lying position***

- isometric contraction of m. quadriceps femoris, active hip abduction to the chest level, going up and down (paying attention to the correct movement stereotype)
- same position - small circles in the hip joint
- hip abduction to the chest level, hip flexion, hip extension
- same position - actively pull the knee to the abdomen (possibly with

help)

- same position - actively do hip extension
- same position - bent knee
- same position - bend the knee and lay it alternately into external and internal rotation (if possible)
- same position - combination of triple-flexion and hip extension (step mechanism)
- same with bent knee

*Starting position: **prone position***

- contraction of gluteal muscles
- hip extension
- hip joint abduction
- extension of the hip joint with a flexed knee
- pull the heels to the buttocks - alternately, simultaneously, with hand tightening
- knees bent, loosening the shins to inner rotation
- shoulder abduction, push the bent knee to the elbow
- strengthening of inter-scapular muscles (upper limbs in candlestick position)

CORE MUSCLES

*Starting position: **supine position***

- inhale, press the lumbar spine into the mat, exhale, relax
- pull the tip of the right lower limb, push the lower limb into the distance
- pull the tip of the right lower limb, hip abduction (without turning the limb into external rotation)
- knees bent, flexed the left knee into to same level as the right knee, pull the tip of the toe, slightly swing up and down
- alternately pull the right and left knee to the belly
- inhale, pull both knees to the belly when exhaling
- knees bent, shoulder abduction, lay both knees alternately right, left
- posterior pelvic tilt
- strengthening the abdominal muscles
- strengthening of oblique abdominal muscles

*Starting position: **prone position***

- lean lower limbs on tiptoe, contraction of gluteal muscles, extend knees
- slight hip abduction of the right lower limb, left lower limb
- hip extension with flexed knee (only when mastering the previous exercise)
- adduction of shoulder blades
- extension of the upper limbs
- the upper limbs in the candlestick position, lifting the upper limbs from the mat
- the upper limbs in the candlestick position, pull the elbows to the chest, elevate into the "V" shape, back into the candlestick position
- hands under the forehead, a slight back extension

*Starting position: **side lying position***

- positioning correctly
- hip abduction to the level of the chest
- same + pull the knee to the abdomen, back
- hip extension of the lower limb
- hip abduction, pull the the knee, back, hip extension

*Starting position: **kneeling and on all fours***

- inhale, hunch lumbar spine, exhale, flatten the spine
- pull the knee to the abdomen, back
- extend lower limb, back (beware of the pelvis movement)
- approach the right knee to the left wrist and vice versa
- upper limb abduction, torso rotation

*Starting position: **stand***

- instructing the correct standing position

Use of compensatory exercises in flat foot disorders

Dynamic exercises of the acral parts of the lower limbs *starting position - upright sitting*

- flex and relax your fingers
- spread your fingers apart and close them again
- flex and stretch the feet

- turn the feet in and out
- rotate the feet in and out (alternately, simultaneously)

Flat foot *starting position - upright sitting*

- close the soles of the feet against each other, rotate to the right, left (at different heights above the mat)
- close the soles of the feet against each other, pull them to the body and pull them away
- move your big toe and foot on the shin of the other lower limb
- whistle
- put the sock on with the other foot toes
- sweeping - heel on the ground, "forefoot as if sweeping"
- writing with big toe on the ground
- cycling

starting position – stand

- swing on the front of the feet
- changing load from left to right leg
- stand on tiptoe, on heel (we pay attention to fluent roll of the sole of foot)
- walking on the toes, on the heels, on the outside of the foot
- walking on uneven surface (sand, grass), on an inclined plane
- stand on one leg, stand on one leg and squat
- grasp object by foot (pebble, coin, scarf, chalk, ball)
- pushing the heavier object from the outer edge of the foot
- manipulation with the objects - handing objects from foot to foot, moving, throwing, moving objects, rolling the object between the feet
- wrap the scarf, wave the scarf, try to break it
- write and draw with chalk, pencil (between big toe and other fingers)
- rolling, throwing, pressing the ball

Active foot - we want to shorten and narrow the foot in the longitudinal and transverse axis with the fingers extended. We try to activate the muscles involved in maintaining the arch.

starting position - upright sitting (chair, ball), stand

- passive modeling

- active with help
- active
- active with movement - semicircles
- slight (later deeper) squat, knees outward
- move the weight to the outside of the feet
- move the weight forward, backward, side to side on one leg
- rhythmic stabilization - the therapist pushes the patient, who corrects the balance
- squat from mild to deeper with an co-movement of upper limbs

Balance surfaces (lens, cylindrical, circular segments) *starting position - stand*

- hold in stand
- slight squat, knees pushed externally
- move the weight to the outside of the feet
- move the weight forward, backward, side to side
- stepping from one foot to another
- stand on one leg
- rhythmic stabilization
- lunges
- jumps on both lower limbs, jumps on one lower limb
- walking on balance surfaces
- sit on a chair, sole of the foot on the balance surface, lean forward and gradually stand up, train stamina at some stage of this exercise

Balance sandals

- stand and step on the spot
- small steps forward, backward, sideways
- walking

Workout for strengthening inter-scapular, abdominal and buttock muscles

Strengthening of the inter-scapular muscles

- sit on the ball, pull the shoulder blades together, extension in shoulder joint, make fists
- sit on the ball, flex your shoulders and elbows, pull the shoulder blades back and together
- sit on the ball, abduction with the upper limbs, dorsal flexion of the wrist, push the arms back and do circles with the whole arms

- sit on the ball, candlestick position, pull your elbows towards the body
- kneeling on all fours, ball under belly, with inhalation arms go into the candlestick position, with exhalation they go back and relax, head in elongation, do not lean back

strengthening the abdominal muscles

- supine position, ball under calves, torso at right angle with thighs, arms behind the head, with pressure of calves to roll sideways and back
- supine position, knees bent, hands behind the head, posterior pelvic tilt, during exhale unwind the head, shoulders and upper back from mat (together with rotation), do not lift shoulder blades, inhale, back, do not lift feet from mat
- supine position, upper limbs alongside your body, bend knees, push lumbar spine to the mat, tighten belly, posterior pelvic tilt, lift buttocks from mat, do not lift shoulder blades
- supine position, lower limbs stretched, hands behind the head, during exhale pull chin to chest, do not lift shoulders
- supine position, lower limbs flexed, push lumbar spine to the mat, abduction of upper limbs, slowly pull lower limbs to the chest

strengthening the buttocks

- support kneeling on the forearms, alternately extend lower limbs in hip joints
- prone position, arms alongside the body, alternately extend lower limbs in hip joints, do not lift the pelvis, do not leaning back the head
- support on palms and knees, chest parallel to the mat, head in elongation with the spine, alternately pull the knee to the abdomen and extend lower limb in hip joint
- side lying position, hands lean in front of the body to stabilize the torso, the other arm under the head, abduction, hold, back
- prone position, lean on your toes, contract your buttocks, extend your knees

Workout with using aids

overball, ball

- sit on a chair, ball under foot, push whole foot into ball, hold, relax
- sit on a chair, ball under foot, push the heel or tiptoe into the ball, hold, relax

- sit on a chair, grab the ball between your feet and push your feet together, hold, relax
- stand, ball under the foot, push and roll the ball on the mat, do the circles
- try to pass the ball from one foot to the other

Thera-band - is wrapped around the back of foot

- dorsal and plantar flexion
- turn the feet inward in the direction of the big toe and outward in the direction of little toe
- swing your feet in and out

Workout for stretching the paravertebral muscles

- sit on your heels, bend forward so the head touches the mat, arms alongside the body, inhaling deeply and exhaling
- sit on your heels, elevate your arms, put your palms on the mat in front of your body, pull your arms out into the distance
- prone position, elevate your arms, during inhaũe pull the arms out into the distance, relax with exhalation, stretch the upper left limb and lower right limb simultaneously
- lean against the palms and knees, chest parallel to the mat, during inhale hunch the chest and hang down the head, with exhalation back to basic position
- sit on the ball, feet slighty apart, hold the ball with one hand, lift the other hand over your head, inhale, during exhale bow the torso to one side, hold

Summary

Questions

1. What is part of the workout for hip joint disorder?
2. What is included in the flat foot workout?



Notes



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5 USE OF COMPENSATORY EXERCISES IN CARDIOVASCULAR, METABOLIC AND ENDOCRINE DISORDERS

Quick overview

This chapter introduces the cardiovascular, metabolic and endocrine disorders and the subsequent use of compensatory exercises in these disorders.

Goal of the chapter

This chapter introduces the cardiovascular, metabolic and endocrine disorders and the subsequent use of compensatory exercises in these disorders.

Keywords

Cardiovascular diseases belong to civilization diseases. According to the WHO, they are the most common cause of death in the so-called western civilization. Most diseases of the cardiovascular system, with the exception of birth defects, occur more frequently in adulthood. After 50 years of age, the number of cases of circulatory diseases is increasing. Men are more often affected. Women are protected by female sex hormones (estrogens) at productive age. In the climacterium, this protective effect disappears.

Cardiovascular diseases includes

- Ischemic heart disease
 - Angina pectoris
 - Heart-attack
- Congenital heart disease
- Acquired heart defects



- Cardiomyopathy (impaired myocardial function without valve failure)
- Hypertension
- Stroke
- Coronary artery disease in lower limbs
- Inflammation of the veins
- Chronic venous insufficiency (varicose veins)

Symptoms of heart disease

- *chest pain*

in the chronic form (angina pectoris) there are pains, called stenocardia, after exertion (other provocation is cold, emotion, overeating) located on the sternum, chest, shoulder and upper limb (most often left). In the acute form (heart attack), severe, prolonged pain with the same location as the chronic form.

- *rhythm disorders*

they occur in various parts of the cardiac conduction system and manifest themselves as: slowing (bradycardia), accelerating (tachycardia), irregular rhythm. The cause is:

- excitation disorder
- excitation conduction disorders

- *shortness of breath*

at first only at higher load, gradually even at minimal load, eventually at rest (for coronary heart disease, heart inflammation)

- *edema*

in heart failure (right part)- swelling on the lower limbs, left part - pulmonary edema

- *cyanosis*

bluish skin and mucosa resulting from insufficient saturation of blood in the lungs, mixing of arterial and venous blood, congestion in the venous circulation (in some heart defects, right heart failure)

- *cough*

associated with pulmonary edema and expectoration of pink foam

Symptoms of vascular diseases

- lowered blood pressure (shock, fainting)
- elevated blood pressure
- pain and sensitivity disorders (vascular occlusion, vascular obstruction)
- swelling (various causes)
- color and thermal changes of the skin (inflammations, arterial closures)

- tissue nutrition disorders (insufficient blood supply for various causes) leading to, for example, leg ulcer or gangrene of part of the limb and in complications it can lead to amputation

Risk factors of **sedentary lifestyle play a very important role** in the treatment and prevention of these diseases:

- atherosclerosis
- obesity
- diabetes mellitus second type
- hypercholesterolemia
- elevated level of uric acid in blood
- insufficient physical activity
- heredity
- stress
- age
- smoking
- long-term usage of contraception in women

Use of compensatory exercises in cardiovascular disorders

PE remedies suitable for cardiacs

Endurance training suits best the health objective of contributing to economic circulation, optimal weight, lowering fat levels and a number of other circulatory complications. Importantly, these exercises are also among the best, longest known and least harmful tranquillizers. The effect of endurance training is directly therapeutic.

The choice of endurance activity adapts to the age, sex, physical condition of the trainee, his hobbies and skills. E.g. running is suitable for those who used to do it and return to running is both motivation and psychological encouragement. For all others walking is suitable (except for severe lower limb disorders).

Tourist activities are more suitable as endurance training, especially those with natural locomotion, e.g. hiking. Cycling and cross-country skiing are also suitable. It is difficult to choose exercises for the gym. Aerobic exercises with music and games are best suited. Similarly, it is necessary to adapt the game activities. It is suitable to practice the game elements, small and large games in a smaller space, shorter time, with more players, with fewer and more frequent substitutions, putting the player in a less demanding place, etc.

Another important principle is to determine the optimal load both in general and for endurance training. The advantage is that the physician determines the level of exercise according to the examination on a bicycle ergometer and passes it on to the trainer in heart rate values. For beginners, this is usually 50–60 % of the maximum value achieved on an ergometer. HR values are a basic indicator of the load in the cardiovascular exercise process, so it is the primary task of the trainer to teach the trainee the most accurate measurements even after a heavy load.

Breathing exercises help to improve blood oxygenation, which is really important to cardiacs, as well as chest enlargement and elasticity. Recently, natural breathing has been preferred. This also applies to the harmonization of breathing with movement. We will draw attention to the influence of the breathing rhythm on the heart rhythm. We lead trainees to the perception and experience of the soothing effects of breath wave and diaphragm breathing (abdominal).

Relaxation exercises build on the soothing effect of abdominal breathing, they are irreplaceable for cardiac patients. It should result in total relaxation, which is anti-stress. The effect of long-lasting relaxation in lying position should be discussed with cardiacs, because some of them experience deeper relaxation when their pulse slows down or becomes less palpable. This can cause them to become depressed. It is necessary to remember and use, for example, music, because its selection can well control the depth of experience. With music at the beginning of exercise / relaxation we shift the attention of trainees from their worries. Relaxation exercises are included in the compensatory or final part of the lesson.

If cardiac patients are diagnosed with a functional disorder of the locomotor system, we include compensatory exercises to eliminate these disorders.

Workout examples

Workout 1

We include exercises mainly of aerobic character, mainly walking and running, in older people only walking. If they play a game, it should not be stressful. Of a competitive nature, yes, but it should not cause excessive excitement, uncertainty, fear, anxiety, so we do not emphasize it.

Busy part

The trainee goes through track made of overballs and pads. Trainee changes tempo according to music, slow music = slow walking, faster music = fast walking.

Preparation part

- With slower music, trainees standing in with feet slightly apart and breathe in. They don't do deep forward bends (risk of head entanglement and loss of orientation).
- After inhalation each trainee gets one overball. This is passed by trainees from the right hand to the left hand. The hand without the ball is in abduction. There is a deep inhalation with each abduction. They watch the ball - muscle relaxes in the cervical spine.
- While walking in any direction around the gym, they pass the ball from hand to hand while doing large circles with their arms.
- While they are still walking, they pull up as high as possible to the ceiling, their arms still holding the ball. Repeat 4x. Then they repeat the exercise while walking on tiptoes (according to age and dexterity - this exercise can only be performed while standing).
- We divide them into pairs that stand side by side. One overball for each pair. They pass the ball over their elevated hands. They can also do the exercise facing each other, bending straight and only up to 90 °. The ball is guided again through the top through the elevated outstretched hands.
- Everyone puts their overball on the ground. Marching through the gym and crossing all the balls. Steps should be to the distance and high to loosen the hips. We change walking style and walk sideways. Then we cross the balls sideways. The range of motion in the hip should be greater but still pleasant.
- We also release the ankles with circular movements when the tip is on the ground. This will prevent loss of balance.
- The following exercise is performed while sitting. Sit, roll the ball from knees to ankles, spine straight (stretching back side of thighs). We roll back. This is repeated several times. The knees should be taut. While sitting with ball on the thighs, we tip the toes.

Main part

- We do variations of walking, hopping and running.
- To begin with, we can include a blind-man game where one player with or without a blindfold tries to catch an opponent in the designated area. It may be allowed only to walk, or to make it more difficult for the catcher to move if he does not want a scarf. Catches can then "fall out" of the game or take turns and be in the position of a catcher.

- Trainees stand on one side of the gym. They go to the other side of the gym by step. Depending on how the trainer applauds, they go faster. And they applaud with him.
- While the trainer is preparing the track, the trainees march on music around the gym while talking. Talking is good - when walking, the "talkative" lungs become more stressed and thus increase. (Beware - this does not apply if you exercise outdoors in autumn or winter - most of them would have a cold soon). In the gym, we are preparing smaller and larger balls that they will bypass and cross, exercise plates and everything that the room equipment offers.
- We divide the group in half, and we have two tracks. Whistling will start the competition in which the team that has passed (or ran) the track faster wins.

Strengthening

- Strengthening is best done on large balls - you can practice all muscle parts. We can also use light dumbbells and Thera-Bands.

Final part

- Stretch the most used muscle groups - especially the muscles of the lower limbs.
- We also include relaxation of the whole body.

Workout 2 (for middle-aged hypertensive patients)

The goal is to improve the performance of the cardiovascular system, relax the joints and improve the stereotype of breathing.

Opening busy part (5–8 mins)

- Walking - alternating walking rhythm, stride length
 - walking on the heel and tiptoe
 - swinging with shoulders
 - circling your wrists, pinching your hands into a fist with relaxation

Main part – balancing part (10–15 mins)

- Sit on the ground - swing your shoulders, pull your shoulders down when exhaling. The purpose is to loosen the shoulder joint.

- Sit on the ground - bow head aside, exhale and arch forward. The purpose is to release the cervical spine and upper parts of trapezius muscle.
- Sit on the ground - sit with feet apart, when inhaling the feet goes inward, when exhaling goes outward with contraction buttocks. The purpose is to loosen the hip joint.
- Stand against the wall - alternating hip extension with exhalation, the purpose is to activate the gluteal muscles.
- Stand against the wall - alternating hip abduction with exhalation, the purpose is to activate abductors.
- Stand with feet slightly apart - bend downwardly, backs of the hands on the lumbar spine, torso rotation left and right with exhalation, the purpose is to relax the spine and stretch the pectoral muscles.

Developing part

- Endurance training according to the performance of the trainees, 15–20 mins. best in nature, alternating running and walking, HR about 60-80 % max.

Final part (5–8 mins)

- Sit on the ground relieving tension in the lower limbs by shaking the muscles.
- Deep diaphragm breathing with chest movement monitoring.
- Measure HR and monitor the relaxation phase.

Workout 3 (focused on II. functional group of cardiacs)

We change slower and faster rhythm, when discovery of a problem, the client can relax at any time, necessary regulation according to individual feelings, we repeat each exercise 10 times.

Introductory part

- walking forward, backward, sideways
- walking on the circle alternate with running for 10 sec.
- while walking, alternately elevate and extend left and right upper limb - while walking around move upper limbs opposite to lower limbs
- while walking, move upper limbs together with lower limbs

- while walking, upper limbs in flexion and alternately flex and extend the elbows
- while walking, boxing with upper limbs
- while walking, do large circles with upper limbs
- walking (lower limbs over each other)

Preparatory part

- *stand with feet apart* - hand behind head, turn the chest left / right and back to the basic position, bow left, extend left arm in, right arm elevate, reverse upper limbs into abduction, lunge left / right, elevate arms, straight bend forward, go back;
- *kneeling sit* - with support on hands, knees left aside, back to basic position, opposite hands grab knees, slight chest extension and bend forward;
- *in kneeling position sit on heels* - with support on hands, upright kneel on right, extend left hip, back to basic position, vice versa
- *supine position* - elevate arms, go back, abduction in shoulder while doing hip abduction, flex lower limbs, hands behind the head, right lower limb flexed, then left lower limb, pulling knees to the chin and grabbing knees, shoulder abduction, hip flexion, crouch to knee to left side, hip flexion, crouch, same on the right side;
- *side lying position* - lying down on the right side we practice the left half of the body. Alternating hip and shoulder abduction, alternating hip and shoulder flexion, lower limb makes "eight", alternately flex and extend lower limb, upper and lower limb doing circles.

Final part, relaxation

- free marching on music with exhaling
- supine position, relax
- short-term relaxation with diaphragm breathing

Use of compensatory exercises in metabolic and endocrine disorders

Physical activities suitable for diabetics

Physical health education instructor works only with compensated diabetics without serious organ diseases.

Properly selected physical activity (PA) leads to an increase in muscle mass, which is a reservoir of glycogen. Glucose may be released from this reservoir in the event of a decrease glucose blood levels, which results in minor fluctuations in blood glucose during the day and during exercise. PA is also an important means of weight reduction, especially in the second type of diabetes. In addition, continuous sports training increases the sensitivity of the cells to insulin.

In terms of preventing hypoglycaemia, the following recommendations should be followed:

1. Exercise after a meal to get the initial glucose level higher and always have some form of sugar with you.
2. Observe the drinking regime.
3. Always consult your doctor about adjusting your insulin dose in case of repeated problems during exercise.
4. On insulin therapy, control blood glucose before and after exercise, and especially if exercise is performed after a long time, for more than an hour or with unusual intensity.

Principles for safe management of physical activity in diabetics

1. It is necessary to know the patient's medical condition (whether he / she is in the insulin regime or only uses oral antidiabetics - PAD. If insulin is administered, it is necessary to know where and if the organ complication occurs).
2. To know the symptomatology of all acute conditions of diabetes.
3. Being able to properly solve the acute condition of diabetes.
4. Do not ignore the needs of diabetics for the momentary need of thirst, sugar.
5. Do not include decompensated diabetics, especially with ketoacidosis or frequent hyperglycaemia, in PHE.
6. Do not exceed the possibilities of exercisers, measure HR.
7. Workout must adapt to the age of diabetics, their type of diabetes and level of physical fitness.
8. Especially in children and seniors it is necessary to cooperate with a diabetologist.
9. In case of more pronounced polyneuropathy do not load the feet statically.

Workout and its content depending on the type of diabetes and stage of the disease

We start the workout at least 2 hours after the meal and two hours after the insulin injection. Insulin should be injected into a muscle that is not overloaded during exercise. Blood glucose should be measured before exercise.

In the introductory part of the workout we focus on warming up and activating the organism.

In the balancing part, we will focus primarily on improving joint mobility and relaxing muscle stiffness. It is important to focus on increasing muscle mass. In the fitness part of the work we include various aerobic activities, such as aerobics on large balls, crossfit type training, various dance forms, movement games and more. The final part is used for relaxation, to calm down and eliminate tension. Regular physical activity of individuals with diabetes should also include outdoor activities. We include walking, nordic walking, swimming, cycling or exercise bike and more.

Workout for diabetics using insuline

The intensity in the fitness part should not exceed 60-70 % of the maximum heart rate. Aerobic and strength exercises are interleaved with relaxation pauses according to the needs of the trainees. We do physical activity at least 4 times a week for about 40 minutes.

Diabetics using PAD or without treatment

Trained diabetics without major organ complications can also attend regular sports clubs. They maintain their load at 70 % of their maximum heart rate. Diabetic patients with organ complications and atrophied muscles maintain the intensity of exercise at 50 % of the maximum heart rate. They should exercise at least 20 minutes a day. Here is better to consult a doctor. Walking is recommended from outdoor activities (however, it loads the foot and increases the risk of developing a so-called diabetic foot). It is therefore better to include swimming, cycling, rowing, aerobics on a chair or gymnastic balls.

Summary



Questions



1. Describe the composition of the workout.
2. What are the principles of preventative exercises?

Notes



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6 USE OF COMPENSATORY EXERCISES IN GYNECOLOGICAL, NEUROPSYCHIC AND SENSORY DISORDERS

Quick overview

This chapter introduces the gynecological, neuropsychological and sensory disorders and the subsequent use of compensatory exercises in these disorders.

Goal of the chapter

This chapter introduces the gynecological, neuropsychological and sensory disorders and the subsequent use of compensatory exercises in these disorders.

Keywords

Pelvic floor muscles activation - psychomotor exercises - spatial perception

Gynecological disorders can be encountered in various periods of the woman's life with regard to the physiological processes that take place in the woman organism during pubescence, adolescence, maturity (pregnancy and childbirth), during the period of climacterium. They may present with a number of symptoms, such as low back pain, pelvic tension and pressure, feeling of falling out of the genitals, constipation and urinary incontinence. Any discomfort requires medical examination. If your doctor does not find it to be a more severe disorder (eg cancer), you should include medical exercise. In a number of gynecological problems, insufficiently trained muscles - especially pelvic floor muscles - play an essential role.



Gynecological disorders

Gynecological disorders include various more or less pathological conditions of the urogenital tract, which can be positively influenced by the targeted effect of compensatory exercises on the muscular system, especially in the pelvis. These include the following:

- delayed uterine development
- irregular menstrual cycles
- ligament pain
- inflammation
- backward uterus
- infertility
- uterus decline
- urinary incontinence (urinary retention disorder)

Use of compensatory exercises in gynecological disorders

First we exercise on supine position with the involvement of more muscle groups, gradually differentiate the pelvic floor muscles (eg by pulling it) and finally we come to phase 3, differentiating the muscles of the front and back of the pelvic floor. Between each exercise, it is necessary to perform twice as long relaxation, so that we do not overload the muscles and get rid of unwanted tension that would prevent us from relaxed exercising and perceiving our feelings.

- Pelvic floor muscle activation with the cooperation of large muscle groups

Supine position, lower limbs flexed, feet on the ground - lifting up and down the pelvis.

Supine position, lower limbs crisscrossed - pushing the outer ankles together, knees, thighs, contracting the buttock muscles.

Supine position, lower limbs flexed, feet on the ground - push feet together.

Cross sitting (turkish sitting), palms on knees - pushing against palms.

- Pelvic floor muscle activation for awareness and sensation of pelvic floor muscles separately

Supine position, hands alongside the body - breathe freely and pull in all sphincters - contract for 5–30 sec. (relaxation is 2 times longer than pull)

We can also perform the exercise in prone position, kneeling, standing,...

- Activation of pelvic floor muscles to differentiate front and back of pelvic floor muscles
 - ***the front part of the pelvic floor muscles - around the urethra and vagina***
(repeated pelvic floor muscles contraction in the following positions)
Stand, the toes together, the heels apart.
Stand, slightly bend forward.
Stand with feet apart, lower limbs and feet turned in, stand, anterior pelvic tilt, stick out your buttocks.
 - ***the back part of the pelvic floor muscles - around the rectum***
(repeated pelvic floor muscles contraction in the following positions)
Stand, heels together, the tiptoes more apart.
Stand, a slight back extension.
Stand with feet apart (wider), tiptoes out.
Stand, posterior pelvic tilt.

Exercise during pregnancy

- ***Influencing the negative change of the neurovegetative system***
In the first months of pregnancy, hormonal effects cause neurovegetative disorders (loss of appetite even nausea, tearfulness, moodiness, fear of childbirth, etc.). To put it simply, in practice, a woman who concentrates on the exercises is „free from her worries“. Exercise distracts from anxious self-observation, and by practicing relaxation one can induce and improve overall relaxation and the ability to rest rationally. We also assume that physical exertion causes the „wash out“ of endorphins!
We include relaxation exercises. The best way to practice is that the relaxation is preceded by maximum tension.
- ***Strengthening the abdominal muscles***
Weakened abdominal muscles adversely affect the course of labor because the woman cannot push properly, they can cause some complications after delivery.
We therefore include exercises for oblique and straight abdominal muscles, with which we can improve the strength and flexibility of these muscles.
- ***Strengthening the pectoral muscles***

During pregnancy, the mammary glands become larger. At the same time as the volume of the mammary gland increases, the pectoral muscles weaken. After birth, with the onset of lactation, this process is even more pronounced. Therefore, during pregnancy, we focus on strengthening the large and small pectoral muscles.

We practice resistance exercises of upper limbs - eg palm pressure against overball.

- ***Strengthening the pelvic floor muscles and training their relaxation***

The pelvic floor muscles do not suffer significantly during pregnancy, but they are damaged during labor. Therefore, it is necessary to exercise pelvic floor muscles during pregnancy. More importantly, learning to relax these muscles. In the first stage of labor, during contraction, the pelvic floor muscles must remain relaxed! If the mother can do it, the birth canal opens quickly.

- ***Creating habit of correct posture***

Poor posture arises in a pregnant woman by a disorder of the spine statics. The spine is maintained in physiological position by the joint strength of the abdominal and back muscles. The increasing content of the abdominal cavity during pregnancy compensates for the woman's increased bending of the lumbar spine.

We therefore include relaxation exercises for the lumbar region and pelvis, exercises for stretching the back muscles, activation exercises for the deep stabilization system and other phasic muscles. Practice of posterior pelvic tilt and active posture stereotype.

- ***Avoiding flat feet***

In pregnancy, the ligaments and muscles of the lower limbs are leaking. Increasing body weight causes a heavy load. Muscles and ligaments get tired, relax and stretch. Foot arch decreases. This results in feet pain when walking and standing. We try to prevent the formation of a flat foot or deterioration of flat feet by strengthening the muscles holding the foot arch. In addition to exercise, pregnant women can be advised to walk bare foot on uneven terrain (sand, grass, etc.), as well as footwear with a not very high heel, frequent rotation of the type of footwear, or orthopedic insoles.

- ***Prevention of varicose veins***

The enlarging uterus pushes the venous output of the lower limbs. Blood in the veins is stagnant. The return of venous blood from the lower limbs

is facilitated by exercise. In supine position, we perform movements in the small joints of the lower limbs, while the entire lower limb is raised above the body level. It is called position exercise. In addition to position exercises, we recommend that pregnant women sit and lie down with elevated lower limbs.

- ***Maintaining or increasing the vital capacity of the lungs***

The increasing content of the abdominal cavity pushes the diaphragm upwards, compresses the chest and causes pregnancy shortness of breath. Vital capacity of the lungs decreases. We practice breathing exercises that improve vital capacity of the lungs, maintain chest elasticity and promote adequate oxygenation of blood passing through the lungs. This ensures sufficient oxygen supply to both mother and fetal tissues.

- ***Supporting of intestinal peristalsis - prevention of constipation***

Increasing abdominal cavity and frequent abdominal muscles weakening cause intestinal passage and constipation. Exercise will accelerate intestinal peristalsis and thus prevent constipation. With pregnant women we practice abdominal muscles exercises, lower limbs swing exercises and abdominal breathing, which improves peristalsis and accelerates the return of venous blood from the lower part of the body to the heart.

Exercise after childbirth and puerperium

- ***Exercise in the puerperium***

Its purpose is to stimulate blood circulation, thereby preventing embolism and thromboembolic disease; to strengthen muscles that have been overloaded during pregnancy (abdominal and lumbar muscles) and those that have been damaged during labor (pelvic floor muscles); accelerate the uterus wrap and ensure proper uterine placement in the small pelvis; to stimulate the activity of the mammary glands (lactation); accelerate the return to overall physical and mental condition.

- ***Exercise after delivery***

Exercise begins 12 to 24 hours after delivery, according to the doctor's advice and the way of the birth itself. We exercise in a well-ventilated room with a window open. It is necessary for the woman to empty the bladder before exercising! It is practiced in the morning before breakfast for 10–20 minutes, each exercise is repeated as recommended by the physiotherapist and woman's own abilities. They practice on a bed that is straight (no pillow or blanket).

Use of compensatory exercises in neuropsychic disorders

The structure, function and of the nervous system is one of the most complex systems in all living nature. We therefore encounter a relatively large number of different diseases. There are a number of causes involved in weakening the nervous system. These are mainly the following diseases:

Seizure diseases of CNS - Epilepsy

It is more common in children and is a manifestation of brain dysfunction due to excessive excitability of nerve tissue. The most common causes of its origin include:

- brain damage at an early age;
- fever, inflammation, brain injury;
- the influence of heredity is also considered.

The main clinical manifestation are seizures. They can occur suddenly without warning signals and without a known cause. The seizure itself may take various forms - generalized, the so-called grand mal, manifested by unconsciousness, convulsions, and the so-called temporal lobe epilepsy, which may be manifested by affective symptoms, memory loss.

Recommended exercises

Physically undemanding physical activities aimed at improving movement coordination, balance, short-term muscle relaxation.

Inappropriate exercise

Exercise in which the body is overloaded is not recommended due to safety, exercise in water and heights, some ball games and long-term relaxation due to the risk of falling asleep.

Cerebrovascular diseases of CNS

It refers to the brain damage caused by a cerebral infarction of thrombotic or embolic origin, or bleeding into the brain. The most common cause of these events is vascular disease, which is very often associated with high blood pressure. These are short-term disorders of brain function that disappear within 24 hours. As a result of these disorders speech disorders, partial paralysis of one half of the body (so-called hemiparesis) and unconsciousness can occur. It is

necessary to stabilize the vital functions of the victim and to provide medical treatment as soon as possible.

Recommended exercises

Physically undemanding physical activities aimed at restoring impaired physical stereotypes (especially walking), restoring self-sufficiency in everyday daily activities. Furthermore, exercises aimed at recognizing the difference between muscle tension and relaxation, fine motor skills and wrist relaxation to maintain gripping functions, relaxation exercises to improve joint mobility, relaxation and breathing exercises, muscle massage.

Degenerative diseases

This is the so-called “old age disease”. Alzheimer's dementia also belongs to this group. The causes of the origin are not entirely known, the main risk factor is age. The disease is accompanied by a gradual loss of memory, thought and orientation, which leads to a loss of self-viability. As a result of the disorder, phases of confused or aggressive behavior or depression may occur.

Recommended exercises

Exercises in the field of PHE to maintain correct posture, physical activity focused on the development of cognitive and memory functions, psychomotor exercises and games focused on the development of self-sufficiency.

ADHD syndrome

ADHD Syndrome - Attention Deficit Hyperactivity Disorders (formerly referred to as light brain dysfunction - LBD). The title implies that it is a brain damage disorder. It is reported that the disorder can only be safely recognized after 3 years of age.

The basis of ADHD is LBD, a factual change in the structure of the nervous system, which causes a change in energy distribution (primarily a developmental change in the distribution of dopamine neurotransmitters). This affects virtually all cognitive functions.

ADHD usually *does not occur alone*, with up to 44 % of children suffering from another mental disorder. For example, specific learning disabilities such as **dyslexia** (reading disorder), **dyscalculia** (mathematical ability disorder),

dysortography (spelling disorder), etc. Essential to ADHD is that it is not specifically targeted but affects overall behavior and plays a crucial role in the decision-making process.

Recommended exercises

Exercises in PHE, psychomotor exercises and games aimed at developing coordination and balance, sensory perception, perception of the difference in muscle tension and relaxation, fine motor skills, developing self-confidence and social contacts. Swimming, various forms of tourism, winter outdoor sports, gymnastics, collective games performed in a fun way. Properly conducted early exercise can bring individuals to the level of movement of healthy individuals!!!

Principles of exercise

- exercise with only a small group of children;
- personality of the trainer is important (attitude towards children, behavior, conflict resolution);
- take advantage of the presence of a parent (engage in activities)
- make use of appropriate motivational means (diversity, tolerance, joy of movement, music, etc.);
- change activities (attractive, entertaining);
- during the course do short relaxation exercises.

Possibilities of physical activities

Children with ADHD are offered several different types of physical activity for themselves and for adults. Everyone can choose whether they want activities that are slow, calming, relaxing, or fast, stimulating, moving. In addition, various drawing circles and other handicraft activities are recommended. Special educational centers offer the possibility of trips around the area for children with ADHD and their parents or family members or multi-day trips with learning, relaxation, etc. The aim is to create the most pleasant environment for children and their loved ones, so they want to come back, initially the exercises are very difficult to concentrate and maintain a certain social cohesion. It is very common to have children with pedagogical staff, which helps to make the child more relaxed and open.

Composition of physical activities

Physical activities that are recommended for children with ADHD can be divided into two categories. The first is **relaxing**, where children (or adults) learn to relax, inner peace and listen to themselves. The second, on the other hand, is **very busy**,

where the child (or adult) gets all the stress and tension out of it by movement. Various aids are used for this purpose, such as: drums, canopies, drumsticks, Tibetan bowls and more..

Below are examples of two workouts. One as an example of relaxation lesson and the other as an example of active lesson.

- **Example 1 - Relaxation lesson**

Exercises are usually carried out in a smaller number of children to maintain calm. The example of the lesson we present is based on the basics of yoga exercises. It is focused on calming the body, harmonizing the inner space and overall learning to control oneself. The hour is very calm and there are no fast movements, that is, nothing that can force the child to show its hyperactivity. The exercise begins with a very nice yoga salute, where each of the practitioners greets the others as some kind of animal, which they then show, and others do it as well. This will tune in children to exercise and relax together. This is followed by a general stimulation of the body by stomping into the mat, where the legs are perfused, as the children stood in one place for a long time. Then they say what they want to release today, what they are afraid of, worrying about or afraid of. After this short stop, a “monkey track” is built, which the children go through at a very calm pace. The point is to gradually involve a large number of muscle groups. Barrels are rolling, crossing chairs, crawling like snakes and rolling over a large ball. A short relaxation on the mats follows. Then the children train the observation and coordination of the brain with the body. The group leader determines the body parts to be lifted by the child. If he / she tells once, the child will lift that part, if he / she tells a second time, the child will put her back on the mat. Another activity is also perception and concentration. The children close their eyes and the trainer slightly changes the environment where she is practicing. E.g. bring the book in the middle, etc. After opening their eyes, children explore what has changed around them. Then the roles change and everyone always somehow changes the space. This is followed by physical activity, in which children walk in a small space and must not collide. At the instruction, they stop and create a statue, and the rest of the group guesses what he is expressing by his attitude. Then the final relaxation follows. Children lie on a mat and imagine that they are in a quiet place somewhere far from civilization. The teacher

tells them what they can do or see in that place to further develop their imagination. Finally, we perform breathing relaxation exercises. Frequent activity alternation is very important for all physical activities so that the child does not stay in one exercise for a long time and not lose concentration.

- **Example 2 - Active lesson - Drumming**

Drumming lessons are all about getting the child away with all their excess energy. Hyperactive children still need some activity, to create something, to be interested in something, etc. It is therefore very important to change the rhythms, position of children (they can walk around, lie, change legs while walking to the rhythm, etc.). When drumming, children sit in chairs in a circle to see each other and control each other. First they breathe out, calm down and prepare for the exercise lesson. Then there is a practice of fingers and hands to drum.

Drum training

Children try different movements with each hand. One time they caress their belly and the other they tap the top of their head.

Drumming

Warm up is performed eg by alternating drumming with right and left hand. This is followed by drumming different rhythms with variations of the starting hand.

Other variations

The children sit closer together to reach the drum of a neighbor, and when drumming at a certain moment hits a foreign drum, we change the sides change to which the "foreign" hit. With one hand, the child knocks into the drum and the other rides up and down the membrane. For a while the right and left drums glide and vice versa.

In the lessons we use other musical instruments and sound aids, such as acoustic bowls, shamanic drum, hourglass. These and similar activities are suitable for both hyperactive children, who can thus drain their excess energy and also for hypoactive children.

Functional disorders - neuroses

Functional mental disorders are those whose cause is very often psychogenic. If the functional disorder is not positively affected, irreparable damage to brain tissue may occur. Most often these are sleep disorders, irritability, depression,

anxiety, hysterical manifestations, hypochondria, feelings of inferiority, various kinds of phobias.

Classification of neuroses

- neurasthenia,
- psychasthenia,
- hysteria.

Recommendations – stay calm even in situations we know we can't change. To approach situations with humor, insight, not to rush, to engage in appropriate physical activity or hobby every day..

Recommended exercises

Relaxation and stretching exercises, rhythmic exercises with music, psychomotor exercises, dance, rhythmic gymnastics, movement games, swimming and water exercises, walking in the nature, golf, tennis, winter hiking and winter physical activity (skiing, skating).

Use of compensatory exercises in sensory disorders

The sensory organs are receptors that mediate contact with the external environment, feelings and perceptions. Their activity is closely related to that of the nervous system and brain. We distinguish five basic senses - sight, hearing, smell, taste and touch (including the perception of warmth and position). From the point of view of physical health education, we will be most interested in sight, hearing and position sense.

Impairment of the senses, degrees of weakness.

The disorders may be:

- congenital
- gained

Visual disorders

- *Refractive defects*

These are disorders of visual acuity (vision is not sharp), where the ratio between the refractive power of the optical apparatus of the eye and its antero-posterior length is broken.

- *Nearsightedness (myopia)* - you see fuzzy to a distance, see nearby objects without problems, but blurry. At higher stages degenerative changes may occur on the retina, resulting in an uncorrigible decrease in vision. This disorder can be corrected

with diffuser glasses.

- *Farsightedness (called hypermetropia)* - one does not see well at close range. The defect can be corrected with conjunction glasses.
- *Astigmatism* - eye defect caused by incorrect curvature of cornea. In humans, a distorted line-like vision occurs. The disorder can be corrected by glasses with so-called cylindrical lenses. The curvature of these lenses compensates for the cornea curvature.
- *Perspectiveness* - a person loses the ability to observe close for a longer period of time due to lens aging. Can be corrected well with couplings.

At present, correction of refractive disorders (except glasses) can be achieved very well by using contact lenses or by refractive surgery (laser).

- *Visual field disorders*

If different parts of the eye or different sections of the visual pathway are affected.

- *Disorders of binocular (bilateral) vision*

These are disturbances of spatial vision, distance estimation, size of objects, etc.

- *Blindedness* - occurs in childhood, especially in squinting, and when the perception of one eye is suppressed by the visual center due to poor quality of vision. It is a reduction in visual acuity that can be treated in childhood.

- *Degenerative diseases*

- *Glaucoma* - an eye disease that develops in middle and older age. Retinal nerve cells (caused by increased intraocular pressure) are destroyed. It can be treated conservatively or operatively.
- *Cataract* - degenerative disorder of the transparency of the lens of the eye, which causes a reduction in visual acuity. Can be corrected with glasses or removed cloudy lens and replaced with artificial.
- *Retinal detachment* - a serious disorder often occurring in the elderly population. It is characterized by the formation of cracks in the places of degenerative weakening of the retina. Very often there are failures in the field of view and a typical symptom is

the so-called phosphines - light flashes.

- **Blindness and remnants of sight**

The World Health Organization of the Blind states that 150 million people with severe visual impairment live in the world, of which 38 million are blind. Year by year, these numbers increase with increasing life expectancy and higher rates of visual illness for the elderly. In Europe, about every 60th person has vision problems. In the Czech Republic, there are 150-200 thousand such people. Prescription glasses are worn by most adults, but we speak of serious visual impairment only when the glasses do not help correct the visual defect.

Usually, people with visual impairments are divided into:

- **Blind**

In such afflicted individuals there is a visual organ disorder to the extent that a person loses sight. Caused blindness is manifested by undeveloped or total loss of vision. As a result of blindness, the visual impairment and the creation of visual images are prevented. Such a person has not preserved light-sensitivity, does not distinguish between light and darkness, does not perceive colors and has no central vision. The blind have a difficult movement and spatial orientation. These persons require special care in developing touch and hearing, training in reading and writing in Braille, and developing orientation skills.

- **Individuals with remnants of sight**

These people are characterized by damage to the visual organ to such an extent that they have only leftovers of sight. Remnants of vision cause deformation of all visual abilities, severely restricting the creation of correct vision and decreased orientation.

- **Poor-sighted**

Poor-sighted is an irreversible decrease in visual acuity in the better eye in the range of 0.4 to 0.5 normal vision. The visually impaired see only half or twentieth as sharply as a healthy person. It usually has a narrowed field of view below 10 degrees in both eyes - this is a tubular vision. This visual impairment manifests itself in partial impairment of visual abilities and distorted images of the outside world.

- **Vascular disorder of the retina**

As in other organs, retinal and vascular changes are due to aging. Typical changes in the background of the eye can be seen in hypertension.

- **Color vision disorders**

This is a condition in which the affected person does not recognize any or only some color tones. It is called color blindness (Daltonism). At full color blindness, the surrounding world is perceived as a black and white photograph with gradations of different brightness levels. Some people are not able to discern certain colors, while others are only weakened.

Principles for exercise and sport

The sight analyzer is the most important organ in terms of orientation and coordination, so it is very important that when performing physical activity, there is no further risk to impaired vision. When choosing physical activity it is necessary to approach *very individually* - *we consider the type and degree of visual impairment*.

We pay attention to the training of movement stereotypes, prevent muscle imbalances, especially in the area of the head and neck, and develop the movement skills that prepare the weakened individual to handle normal human activities. The trainee should manage the required exercises without major difficulties (safety at the 1st place - watch out for injuries!!!). Exercises in pairs are suitable.

Sports grounds should always be well lit, contact lenses should be worn during exercise, or care should be taken to ensure that the goggles are well attached.

Suitable physical activities

Exercises that lead to the *development of spatial orientation* - movement in everyday life will be safer. The purpose of exercise is to improve locomotion and safe walking.

Examples - line walking, wavy lines walking, counting down steps in different directions, maneuvers, estimating distance in space, familiarizing with terrain, determining directions, imitating movements, rhythmic exercises and dances, etc. For severely visually impaired individuals, we use wires or audio signals.

Exercises that positively affect *balance skills* - they contribute to safe walking and movement in general.

Examples - exercise of balance on the ground, on a raised ground (bench or beam, exercise with a short skipping rope, balance exercise).

Breathing exercises - to improve the quality of breathing and to improve blood flow of the visual analyzer and central nervous system.

Exercises that *strengthen tactile and acoustic perception* - to better develop knowledge of the material environment and improve the correctness of response to auditory perception.

Relaxation exercises - suitable for relieving tension caused by visual impairment.

Psychomotor exercises - individually they can affect individual visual impairments.

Exercises *for improvement of visual analyzer, optical-motor coordination training*.

- *coordination of visual and motor analyzer*
eg. grabbing and serving, catching and throwing, striking all kinds of balls, practicing stride length and rhythm, undershooting a long jump rope
- *exercise orientation skills*
eg. games on red and white, on fishermen, walking, running between cones
- *visual localization exercises*
eg. throwing a target on the spot, on the go, bowling, petanque
- *exercise of visual perception speed*
eg. collecting items - coins, balls, clothes pegs, relay games
- *exercise of sight accommodation*
eg. throwing at different distance bases
- *observation and discernment exercises*
eg. games - what has changed in the room, silent mail

Inappropriate physical activities

Due to problems that could be associated with a higher risk of further impairment of the visual apparatus, the following physical activities are not recommended:

- Jumps, hard rebounds
- Rapid head movements
- Positions where head congestion occurs (forward bends)
- Static strength exercise
- Contact movement games

Hearing and position sense disorders

Hearing is the ability to perceive sounds by the sensory organ - the ear. The sound passing through the ear canal strikes the drum, which vibrates and transmits the vibration through the hammer, anvil and stirrup to the snail. There

the sensory cells react to the vibrations, which the information about the captured sound leads through the auditory nerve to further processing into the brain. Hearing is primarily associated with communication. After sight, it is the second most important sense, allowing not only perception of sounds but also spatial orientation. Hearing impaired individuals (especially deaf people) are a very isolated group due to communication with others. These individuals often experience impaired balance and movement coordination due to the lack of orientation and information ability of the auditory analyzer. Very often we find a defect of fine and gross motor skills. Often, we also observe general muscle weakness, wrong movement, postural and respiratory stereotypes in these individuals. Many also experience poor cardiovascular performance.

The classification of hearing disorders is given in the literature most often according to the following criteria:

- According to the amount of hearing loss.
- According to the place of hearing defect.
- Depending on when the hearing loss occurred.

In 1980, the World Health Organization (WHO) established *an international range of degrees of hearing impairment*:

- Mild hearing impairment (26–40 dB).
- Medium hearing loss (41-55 dB).
- Moderate hearing impairment (56–70 dB).
- Severe hearing impairment (71-91 dB).
- Total hearing loss.

From the point of view of localization and cause we divide the disorders:

- *Transmission* - mostly damage to the eardrum or auditory ossicles, eg. due to frequent inflammations of the middle ear.
- *Perceptive* - these are disorders of the nerve pathways or cortical center.
- *Mixed* - are a combination of the above disorders.
- *Vestibular apparatus* - so-called kinetosis, manifested when driving vehicles by vomiting or nausea.

Disorders can be corrected in some ways by wearing different hearing aids.

Balance disorders (position sense)

The balance is also one of the senses. As already mentioned, the auditory system has an anatomically-functional connection with the balance system. The causes of balance disorders are very diverse, since the entire balance system comprises a

relatively wide complex of the organs - visual, visceral, locomotor - muscles, bones, joints, tendons.

The symptoms of dizziness - eg. weakened or extinct labyrinth function. It is possible to influence vestibular habituation training (to practice position changes, head movements - rotation). Here we can see the interdependence of the balance, visual and internal systems.

Meniere's syndrome - characterized by an increase in the fluid in the inner ear due to an unknown cause. It is often manifested by dizziness, loss of hearing and perception of non-existent sounds (tinnitus, whistling, etc.).

Principles for exercise and sport for hearing disorders

PHE includes individuals with mild hearing loss. We create a positive relationship to physical activities. Visual demonstration is very important for motor learning, supplemented by tactile and kinesthetic information. It is always necessary to speak appropriately loud, to articulate well, to stand as close as possible to the trainees and facing them. For hearing aids, keep a maximum distance of 1 m, so that it is possible to perceive partially by hearing. In the case of severely hearing impaired people it is about 4 m to read the furthest distance. In the gloom of the room it is good to use artificial lighting, to the light source we stand so that hearing impaired person is not dazzled. It is advisable to establish precise signs and gestures in advance to establish personal contact, to clarify how a hearing impaired individual is able to communicate with us. In case of serious damage we can also use writing.

Suitable physical activities

We pay close attention to the practice of balance, both static and dynamic, with the aim of improving the balance ability.

Examples - exercise on bench, balance beam, balance aids, pedal, BOSU, narrow rubber, stepper.

Exercises that lead to the *development of sensory perception*.

Examples - making sounds by various subjects, classifying auditory sensations, searching by sound, melody, etc.

Physical activities positively influencing *social inclusion*.

Examples - making and fastening contacts using exercises in pairs. Exercises in the field of psychomotorics using non-traditional aids (cups, beer mats, parachute, scarves, newspapers, various kinds of balls, wine corks, pedal, balance bowls).

Aerobic exercises that maintain and / or reduce weight.

Inappropriate physical activities

Generally, we discard exercises in which trainees have subjective problems.

Inappropriate are exercises that cause:

- Shock and head movements
- Exercise with head down
- Exercise with breath hold
- Quickly rotate body positions
- Exercises on machines
- Diving

Summary

Questions

1. What are the appropriate physical activities for visual disorders?
2. What are the appropriate physical activities for hearing disorders?
3. What are the appropriate physical activities in ADHD?
4. What are the appropriate physical activities in degenerative CNS diseases?

Notes

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