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Physical Activities for Prevention and Health Promotion

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Physical activity is a basic physiological need of both children and adults. Even though we do not perceive a lack of physical activity as intensively as we perceive a lack of food or liquids (hunger, thirst), physical activity is indispensable for the right development and functioning of human organs.

From birth a child's muscular system develops thanks to natural movement (crawling, climbing etc.) thus building the *muscle corset* which is necessary for the correct development of the skeleton and good body posture in different natural positions: sitting, standing, walking, running, etc. Body movement enhances the functioning of internal organs and accompanies almost every mental activity of a child.

The amount of physical activities in pre-schoolers often takes up several hours a day. Yet according to the recommendations of many authors including American sources (e.g. NASPE), the minimal requirement regarding spontaneous physical activity is merely 60 minutes a day, which we consider as insufficient. However, experts recommend supplementing spontaneous physical activities with directed ones, lasting at least 60 minutes.

Following the beginning of compulsory school attendance, children's spontaneous activity quickly disappears and a sedentary way of life starts to prevail: sitting at the school desk, over their homework, in front of the television, at the computer, on different means of transport, etc. This excessively lowers the physical strain on the organism, weakens the muscle apparatus and worsens the child's overall *physical fitness*. The lack of physical activity leads, apart from other things, to *muscle imbalance*, which at the beginning shows itself in a *slouched body posture* causing progressive development of orthopaedic problems later. Such weakening is currently a serious health problem in primary school children, and, according to the latest research, it concerns 50% of the child population.

The absence of aerobic strain (i.e. a longer lasting strain on big muscle groups) contributes to the development of cardiovascular, respiratory as well as endocrine diseases and adds to being overweight and obesity, i.e. it negatively affects body composition.

Therefore physical activity is an essential part of human life and an investment for the future for both children and adults. It is not necessary to assign excessive importance to the level of physical performance or achieved sports results. We should rather focus on the development of positive attitudes and interest children take in physical activity, which should result in lifelong physical activity as part of their healthy lifestyle. To achieve this we need to understand the basic requirements regarding the physical strain on a human organism and comprehend the significance of *health-oriented fitness*. To make this concept clear for teachers who do not have specialised instruction in physical education, the following text presents some examples relevant to both children and adults.




Motor skills and physical activity in individual life stages

In every life stage a person is able to use their motor skills and abilities in different ways. Also, motor skills manifest themselves in each life stage differently. At a young age, there is a growth in the development of gross and fine motor skills, whereas later in adulthood the skills stagnate and in old age the motor skills capacity decreases. The choice of particular physical activities corresponds to individual stages of human life.

Neonatal stage

In the neonatal stage (0 – 1 month), the baby needs to adapt to life outside the mother's body. It interacts with the environment through reflexes and innate behaviour modes. All activities aim at meeting its biological needs. Given an adequate number of stimuli, auditory, visual and kinaesthetic perception develops (differentiation of various sound stimuli, distinction of shapes within 20 – 30cm distance, perception of touches, temperature, changes of position). Movements occur unintentionally.

Infancy

In infancy (from 1 month to 1 year) individual differences in the development, behaviour and perceptions of each baby can be observed. Motor skills development is closely related to the child's general development – the competences develop in the cephalocaudal direction, i.e. from the head towards the lower limbs, and in the proximodistal direction, i.e. from big movements of the whole limb to more subtle movements of its extremities. The child usually lifts their head in the first month, sits up approximately in the sixth month and in the period between 9 – 12 months attempts their first independent locomotion (crawling, later followed by the first steps). Thanks to the changing position of the head followed by the upright position of the body, the child's visual and auditory perception becomes easier and the interplay of motor and cognitive processes brings about not only further cognitive development, but also improved manipulation with objects.

Toddler years

In the toddler years (1 – 3 years) the child becomes more independent, is very active and their whole personality develops (depending on individual dispositions). The child finds physical activities interesting on their own, tests their physical limits and gains new physical skills which are subsequently repeated, practised and improved. Thanks to independent locomotion (crawling, walking, running, overcoming obstacles, etc.), the toddler can reach further into the broader surroundings and find their way round, which motivates them to engage in other physical activities. Movements which at the beginning are imprecise gradually gain in precision, the child becomes more confident and attempts

more complex physical tasks. If the child does not have enough stimuli for physical activities or for activities which would motivate the child to move, their further motor skills development can be negatively affected.

Pre-school age

At pre-school age (from 3 to 6 or 7 years of age) children become even more independent, asserting themselves and adapting to the company of adults as well as their peers. Children process information intuitively and using their imagination. They need to be challenged thus confirming their own qualities. They use their abilities in practice, coordinate their movements better, the dexterity of their hands, legs and torso improves (standing on one foot, hopping on one foot). Children become more skilful, fine motor skills develop (stringing beads, cutting with scissors, or doing up shoelaces). Games are the dominant element of every activity and as such they influence the further development of physical abilities and skills, thinking, learning, emotions and imagination.

Younger school age

Younger school age (prepubescence, from 6-7 to 11-12) is a relatively calm period without any dramatic developmental changes. A breakthrough in physical and social development comes when the child starts school, when the child faces new reality and requirements – school duties, classmates, and teachers. Laterality should be settled. Motor skills improve – gross motor skills are highly developed (throwing and catching a ball, jumping, riding a bike, kicking a ball, overcoming obstacles, balance, self-care skills), while fine motor skills are still not very precise (writing). A huge development occurs in speed, movement, dexterity and coordination. Children seek spontaneous physical activities, which should be supported in both natural physical activities and sports activities.

Older school age

In the *older school age* (pubescence, from 11-12 to 15) the differences in physical activities from the point of view of sex deepen. The performance of all organs and muscle coordination increases, the child is very active. However, due to the dramatic physical development (growth in height, increase in weight, sexual maturation, lengthening of limbs, etc.) the neuromuscular coordination often worsens. Hormonal changes affect the psyche and people at this age are emotionally unstable, uncertain, lacking confidence and increasingly anxious.

Adolescence

Adolescence takes place as a sign of maturation and the development of motor skills gradually culminates. At the age of 18 in girls and 20 in boys the speed of growth slows down, and the body is completely differentiated from the point of view of sex. Boys demands regarding physical strain increase, their performance grows and they prefer physical activities which can become part of their free-time activities. Girls at this age prefer exercising to music as well as physical activities which affect their appearance. Their performance starts to stagnate. Adolescents frequently quit performance focused sports activities or do them as a form of recreation. Their interests go beyond the area of physical activities (e.g. interest in culture).

Adulthood

Adulthood is a long period of life which can be divided into shorter stages. *In early adulthood* (up to 35) motor skills capacity is at its best, and sports activities culminate. Performance differences in

people of the same age are given by their level of fitness, somatotype, lifestyle and also their background (e.g. job or family). If the person leads a mainly hypokinetic way of life, a significant drop in performance takes place as early as at this age.

In *early middle age* (up to 45) some motor skills naturally worsen (dexterity, agility, speed), but the level and speed of the fall can be influenced by regular training. The strength and endurance can be maintained by training at an appropriate level up to old age. In this period the *subjective age* (how people feel, tends to be 10 – 15% lower than their real age) is important. People are at their prime and their main aim is to keep a satisfactory work position and a stable family. Physical activities are a form of recreation. There is a growing tendency to think about oneself (inner world), a tendency to take stock of one's life. Currently, there is an increasing requirement to maintain young looks and the same performance as at a young age.

Late middle age (up to 65) is connected with the awareness of gradual, irreversible worsening of physical and mental fitness. Physical power and coordination decrease, speed and promptness of reactions lower, health problems appear. The person is slower, less efficient, and less flexible. Sensual perception worsens (eye-sight, hearing) and tiredness is more frequent. In the course of the period, typical signs of old age start appearing – wrinkles, grey hair, changes in proportions, changes in pigmentation, loss of skin elasticity, and uneven storage of fat. The speed of aging is rather individual and depends on internal as well as external factors. The speed of loss of motor skills efficiency can be influenced by suitable physical activities.

Late adulthood

Late adulthood (over 65) or rather aging is a natural process in one's life. It is very individual and variable. Two people of the same calendar age can have a different biological age. The latest research shows that 60 – 70% of life expectancy is genetically given and 30 – 40% is influenced by external factors. Aging is manifested by physical limitations and diseases, which leads to lower physical activity, psychological problems, weight loss, etc. The most frequent problems of the musculoskeletal system are osteoporosis and arthritis of joints, especially in lower limbs, which reduces the range of motion of the joints. Apart from the problems of the solid components of the musculoskeletal system, changes occur also in the active components (reduction in muscle tissue, decrease of muscle power, weakening and shortening of muscles, worsened coordination, worsened muscle imbalance and therefore also poor body posture, old-age kyphosis can also appear, etc.). Diseases of the musculoskeletal system manifest themselves as the most frequent cause of the loss of self-sufficiency of old people. To prevent the above listed health problems, specialists recommend physical activities of an appropriate intensity and focus. A well-chosen physical activity can, up to a certain point, slow down the aging of a human organism. Thanks to regular exercise one can influence the quality and amount of muscle tissue, basic motor skills and capacity, endurance, slow down the development of osteoporosis, etc. Apart from physical indicators regular physical activity can also positively influence the psychological and social areas – it improves stress resistance, positively influences the quality of sleep, has therapeutic effects in the case of mild depression and anxiety, improves the ability to learn (especially short-term memory), and broadens opportunities to make social contacts with people of the same age category.

Video: Physical activities in individual life stages

Health promoting physical activities

Let's ask ourselves a question which physical activity best promotes human health. To put it simply, the human organism does not care whether we participate in a sports contest, engage in a recreational physical activity or work physically. Disregarding the emotional aspect and appeal of sports contests as well as their socializing and other effects, the main indicators important for health are known under the initialism FITT: *frequency, intensity, time* (duration) and *type of physical strain*. The type or kind of physical activity to fit these FITT indicators is not prescribed, therefore we can include among suitable physical activities any common everyday activity including walking. In other words, physical movement is important for everybody, including people who are not gifted at sports. The decisive thing is that every physical activity of higher intensity strain lasts for at least 1 hour a day for children and at least 30 minutes a day for adults. This more intensive exercise should be supplemented with activities of lower intensity strain, such as ordinary walking. Short-term high intensity of strain enhances a number of bodily functions; however, it is not necessary to maintain good health.

When judging the level of physical strain, we can in general rely on the following overview:

- Low intensity exercise
  - ordinary kind of work done around the house or in the garden, slow, ordinary walking, riding a bike on flat terrain, an intensive walk with a dog, sports recreation activities (volleyball, badminton, etc.).
- Moderate and higher intensity exercise
  - harder work around the house or in the garden, quick walking, jogging, faster cycling, fitness exercise, sports recreation activities (basketball, table tennis, skating, downhill skiing, cross-country skiing, swimming shorter distances, aerobics, etc.).
- High intensity exercise
  - hard manual work (forest, construction site, etc.), intensive cycling, intensive long-distance run, running with a coach, racing sports activities.

Personal *intervention exercise programmes*, which take into consideration everybody's specific abilities and preconditions, are extremely important for one's exercise routine. In order to be effective they have to meet two basic criteria:

1. affect the main components of physical fitness,
2. include individually acceptable and suitable physical activities.

Assuming that a school staff is composed mostly of women, a more detailed and precise manual focused on the design of personal exercise programmes can be found for example in the book *Fit Programmes for Women.* However, this book is rich in information and inspiring ideas also for men.

Children can understand the requirements regarding daily exercise routine and the FITT indicators for instance using the *Pyramid of Physical Activities for children* (Fig. 1):

- Frequency is represented through everyday completion of the whole pyramid of physical activities.

- Intensity of strain is differentiated by the division into individual floors of the pyramid. Children can understand the concept of intensity of exercise in analogy with their effort and breathlessness.
- The length of the physical activity is represented by cubes which stand for 15 - 30 minute portions of exercise. The whole pyramid thus represents approximately 45 – 90 minutes of low intensity exercise and 45 – 90 minutes of moderate or high intensity exercise.
- Types of activities are represented by various physical activities on the cubes, i.e. portions of activities.
- The pyramid is completed with a little roof which represents short-term high intensity exercise.

The pyramid corresponds to the internationally recognised requirement of at least one hour of more intensive exercise a day.

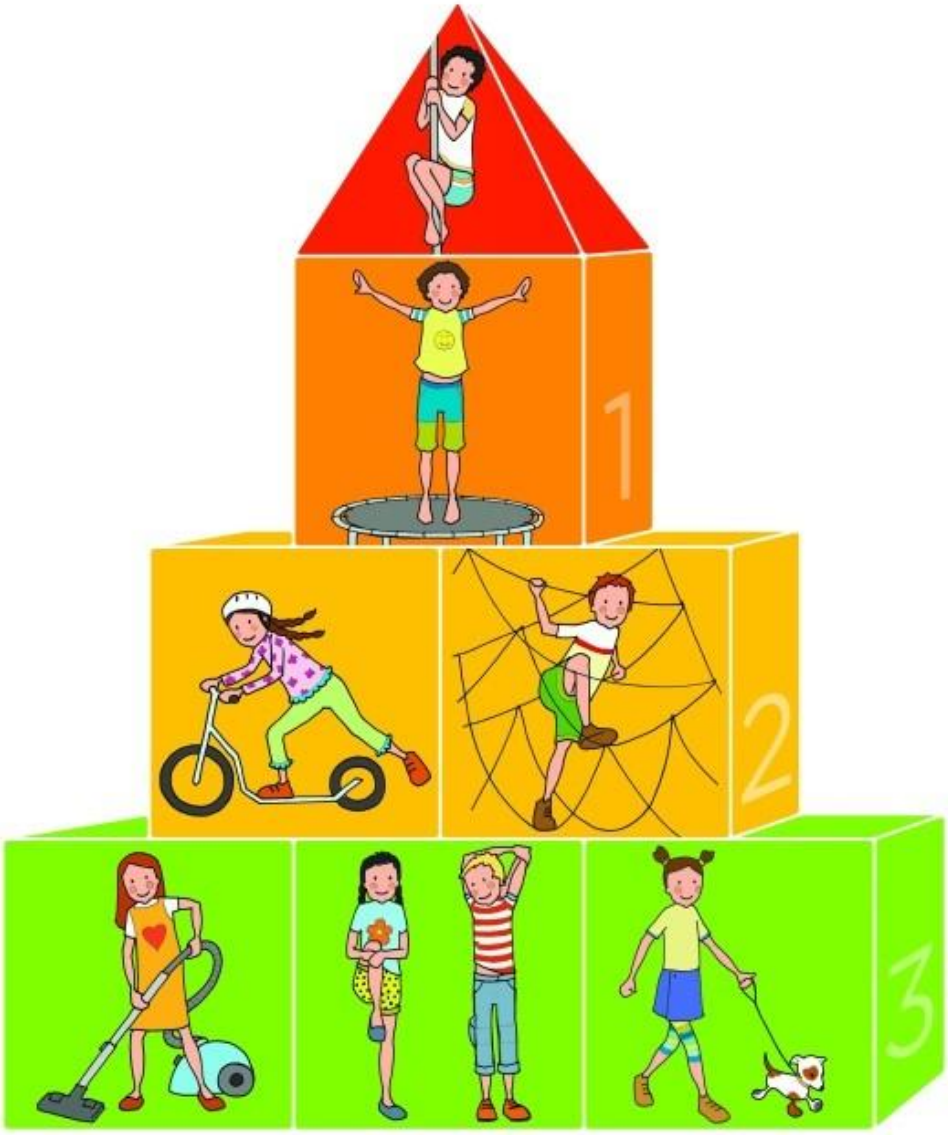


Fig. 1: Pyramid of physical activity for children as presented in the programme *Physical activity and nutrition*

Health-oriented fitness – one of the indicators of physical health

Physical activity and its influence on the human organism is usually connected with the term *fitness*. This terms has not been precisely defined and in everyday life it is ascribed various meanings. Fitness often means efficiency, dexterity or hard work, but can be understood more broadly as physical fitness or resistance to bio-psycho-social demands on the organism.

In the area of physical activity the term fitness usually denotes a physical state of a person; we also speak about physical fitness, which is understood as a necessary prerequisite for the efficient physical functioning of an organism. At present research emphasises more and more frequently the difference between health-oriented fitness related to one's state of health and performance-oriented fitness which is conditioned on physical performance especially in sports specializations.

The concept of *health-oriented fitness* expresses the idea that the level of fitness is individual and each person needs a different level of fitness for a healthy and active way of life. It enables people to cope with their workload and other challenges of everyday life and to engage sufficiently in physical activities within their free time. The level of health-oriented fitness is not given by performance norms, but takes individual differences into account. A sufficient level of fitness of an ordinary person does not have to correspond to the fitness of a top sportsman.

Regarding the influence on human health, we are mainly interested in the significance of the basic *components of health-oriented fitness:*

- muscle fitness and flexibility,
- cardiorespiratory fitness),
- body composition.

Muscle fitness

Muscle power, muscle endurance and flexibility (the range of movement, the range of movement of joints and flexibility) are generally called ***muscle fitness***. Optimal muscle fitness is an important prerequisite for *muscle balance* which is necessary for the correct functioning of the musculoskeletal system. At first sight muscle balance is evident in *the correct body posture* and *ability to move*.

One of the major causes of a slouched or incorrected body posture is a sedentary way of life of children as well as excessive mental strain. To put it in a nutshell, these are the reasons for flabby phasic (kinetic) muscles and for shortened postural (tonic) muscles. As a consequence people suffer from spine weakness and spine disorders, respiratory diseases, etc.

Tab. 1: Muscles according to function

MUSCLES ACCORDING TO FUNCTION	
PREDOMINANTLY POSTURAL MUSCLES (TONIC)	**PREDOMINANTLY PHASIC MUSCLES (KINETIC)**
act to sustain posture	act to enable movement
prone to **tightness/shortness**	prone to **weakness**
NEED STRETCHING	**NEED STRENGTHENING**

Postural (tonic) muscles which predominantly act to sustain static body postures (i.e. standing, sitting, position of the head, etc.) excessively shorten when the phasic muscles weaken. These muscles significantly influence the body posture, especially in the thoracic region, lumbar region, front side of hip joints and thighs (hip flexors) and the back side of thighs and calves (knee flexors). These muscles need **stretching**.

In the postural (tonic) group of muscles we can find a number of muscles and groups of muscles the representation of which is available in many electronic as well as printed resources:

1. scalenes
2. levator scapulae
3. upper trapezius muscle
4. back extensors (especially lumbar and cervical)
5. pectoralis minor muscle
6. teres major muscle
7. thoracolumbar fascia
8. two-headed biceps brachii (biceps)
9. quadratus lumborum muscle
10. iliopsoas
11. piriformis muscle - lateral hip rotator (pear-shaped muscle)
12. tensor fasciae latae muscle
13. hamstrings (semimembranosus, semitendinosus and two-headed biceps femoris)
14. rectus femoris muscle
15. adductor muscles of the hip (adductors)
16. triceps surae muscle

Phasic (kinetic) muscles predominantly act to enable movement. In the case of a lack of movement these muscles weaken and leave their function to postural muscles. These muscles are located mainly in the area of the scapulae, thoracic spine, abdomen and gluteus. These groups of muscles need to be **toned up and strengthened**.

Graphic representation of these muscles can be found in many electronic as well as printed resources.

Among phasic muscles we can rank the following:

1. neck and head flexors
2. spine rotators
3. thoracic spine erector muscles
4. deep neck flexors

5. interscapular muscles (rhomboids and middle and lower trapezius)
6. front serrate muscle
7. upper horizontal fibres of broad back muscle
8. posterior part of the delta muscle
9. lateral rotators of the arm (infraspinatus muscle and teres minor muscle)
10. triceps brachii (three-headed arm muscle)
11. upper fibres of pectoralis major
12. abdominal muscles (rectus abdominis, obliquus abdominis internus, obliquus abdominis internus)
13. gluteal muscles (gluteus maximus, medius and minimus)
14. vastus medialis and vastus lateralis of the four-headed muscle of the femur (quadriceps femoris)
15. tibialis anterior muscle

We consider a body posture as correct when the interplay between the deep stabilising muscle system and the superficial muscles (postural and phasic) takes place. We can define it also as interplay between individual body blocks without an unnecessary waste of energy. Body posture is individual and up to a certain extent it is given by the person's body parameters.

A healthy person's muscles are balanced, body posture is straight and aesthetic (Tab. 2). As a consequence of muscle imbalance the head protrudes, the shoulders round forward, the abdomen tips forward, the curve in the lower back becomes bigger and the pelvis tilts forward. This lowers the capacity of the lungs, causes respiratory diseases, spine weakening and disorders as well as gynaecological problems in girls and women.

Tab. 2: Body posture

Area	**Signs of ideal (optimal) body posture**	**Deviations of poor body posture**	**Motivation for good body posture in children ☺**
whole body	noble posture; spinal curvature is natural, without major rounding	weak posture, spinal curvature forwards and backwards is more prominent or otherwise deformed	we are princesses and princes; puppet on a string
head – neck	axis of the neck is perpendicular to the ground; the chin and neck create a 90°angle	axis of the neck is tilted forward; the chin protrudes, the head is backswept	push the head backwards with a finger; we "close the drawer"
shoulders	shoulders are widely spread pending downwards, both shoulders at the same height	shoulders pulled upwards or pushed forward, at different height	a trickling drop of water
chest, scapulae	chest (upper part) stretched forward; scapulae do not protrude/stand away	flattened chest; thoracic spine rounded backwards; scapulae protrude	a lit light: stick the scapulae to the ribs with a glue

abdomen, pelvis, hips	flat abdomen; the upper part of the pelvis is tilted backwards (slightly tucked in), edges of hip joints at the same height; the hip line is symmetric	weak abdomen; pelvis tilted forward, slanting; the hip line is asymmetric	clench a five-crown coin or a bead in between the buttocks
lower limbs	axis of the ankle, knee and hip lie on one axis; insteps are properly arched	axis of the ankle, knee and hip are not on one axis – most often knock-knees or bow legs, everted ankle joint; flat feet (longi-tudinal, transverse)	there are two beautiful straight trees growing from the ground which have healthy and deep roots (stretch the legs naturally, do not bend backwards, weight on the whole feet)

Fig. 2a: Good body posture

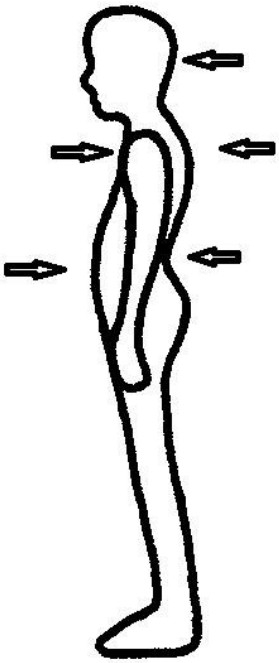


Fig. 2b*:* Poor body posture

One possible way of influencing the formation of the habit of correct body posture and maintaining muscle balance is making *compensation exercises* part of one's daily routine. For children, in the time they spend at school, not only regular P.E. lessons are important, but also short exercise times and recess containing a sufficient amount of physical activity. A bank of exercises and all the necessary detailed theory of compensation exercises can be found in many specialist publications, for example in the book *Exercise time (Tělovýchovné chvilky)* published in 2006 or *Exercises for health and pleasure* (*Cvičím pro zdraví a baví mě to)* published in 2009.

As stated above, fatigue and stress negatively influence one's body posture. They can be of physical or psychological origin. Fatigue is characterised as a lower-level response to stimuli and stress as a reaction of the organism to changed conditions in the form of a defensive reaction. The main

symptoms of fatigue are lowered performance, aversion towards further work, weakness, worsened breathing, shoulders pulled up towards the head, being flushed, etc. The main causes of fatigue in children is a lack of sleep, health problems, incorrect nutrition, psychological problems (usually problems in the family) and also a lack of activities, i.e. a lack of appropriate movement and activities which the child enjoys and is interested in.

Aerobic fitness (cardiorespiratory fitness)

The capacity of the organism to accept, transmit and use oxygen efficiently (especially while engaging in physical activities) can be defined as ***aerobic fitness***. The main effects of this capacity are manifested in the ability of the muscles to perform and endure. A significant side-effect is more efficient cardiovascular activity and, under certain circumstances, also reduction of excessive fat.

If we are to maintain or improve aerobic fitness, it is necessary to engage regularly and for a sufficient time in a physical activity involving big muscle groups (e.g. brisk walking, running, cycling, swimming, cross-country skiing, aerobics, movement activities or sports games). The effort invested in these activities should be reflected in the *heart rate (HR)*, which ranges between 60 – 80% of the maximal heart rate (HRmax). This can be counted using the following formula:

HRmax = 220 pulses/min. minus a person's age

The strain within the range of 60 – 80% HRmax, when we are forced to breathe deeply and quickly, is called a *medium intensity strain* (often also *aerobic strain*). The activity should be at least 10 minutes long, in total the whole-day activity should reach *at least 60 minutes* for children and *at least 30 minutes* for adults.

The above mentioned *medium intensity strain* should be supplemented with an everyday activity of lower intensity (under 60% HRmax), following at least the above stated time limits (60 minutes for children, 30 minutes for adults). Ordinary everyday walking is also very important. The World Health Organisation suggests that adults should take at least 10 thousand steps a day, and children at least 12 thousand steps a day.

During high intensity strain (anaerobic strain) the heart rate achieves values over 80% HRmax (in children usually more than 170 - 180 pulses/min.). Such strain in less adapted individuals can result in quick lactate accumulation in muscles, quick muscle fatigue as well as muscle pain and lack of oxygen (we cannot "catch our breath"). This state usually occurs in less fit people after 15 - 20 seconds of intensive activity (e.g. sprinting, running up the stairs, riding a bike up a steep hill). Because such a strain can even be dangerous for weak individuals we do not advise children or unfit adults to maintain the maximum intensity of strain for longer than the above mentioned 20 seconds. It must be followed by some rest or physical activity of moderate strain. If we follow this principle, high intensity and lower intensity strain can alternate, which is typical for example in movement games (e.g. playing tag), relay competition games, or sports games done as recreation, etc.

The table below (Tab. 3) illustrates approximate values of the heart rate of a person during physical strain:

Tab. 3: Approximate values of the heart rate during physical strain

Age	Max. HR (pulses/min.)	High anaerobic strain (above 80% HRmax)	Recommended aerobic strain (60–80% HRmax)	Low strain (below 60% HRmax)
10	210	170-210	125-170	< 125
20	200	160-200	120-160	< 120
30	190	150-190	115-150	< 115
40	180	140-180	110-140	< 110
50	170	130-170	100-135	< 100
60	160	120-160	95-130	< 95

Any physical activity but also other bodily functions (e.g. maintaining body temperature) require a certain amount of energy which is continuously released into the human body. The organism therefore needs a regular supply of food, i.e. of chemical compounds which are able to release energy during splitting. The conversion of substances and energies in a living organism is called *metabolism*.

The immediate source of energy for muscle contraction comes from *adenosine triphosphate* (ATP), whose chemical energy transforms into mechanical energy. ATP is converted in the process called hydrolysis to *adenosine diphosphate* (ADP) and *adenosine monophosphate* (AMP). This process can be expressed by this equation:

ATP → ADP + AMP + energy

In the process of splitting ATP releases energy necessary for the function of muscle fibres (filaments of actin move into the filaments of myosin). Because the amount of ATP in the muscle is available only for a few seconds (depending on one's adaptive capacity), ATP must be continuously renewed (resynthesized). Energy for the renewal of ATP comes from burning of substances rich in energy, such as glucose, fats and in a smaller amount also proteins.

Unlike other organs, muscles have immediate access to another stock of energy in the form of *creatine phosphate* (CP) which supplies energy immediately after ATP splits for its resynthesis. At the same time ADT enters the reaction:

CP + ADP → ATP + C

This way energy output can be covered for up to 20 seconds of intensive physical activity when a new supply of ATP and *creatine* (C) is being formed.

For the renewal of ATP other energy sources are available. The process during which sugars are burnt (glucose and glycogen) in the chemical reaction without the presence of oxygen is called ***anaerobic glycolysis***:

G + ADP + AMP → ATP + LA

Apart from ATP this reaction also generates *lactate (LA)* whose energy can be used either for direct burning in a muscle cell or, after being transported through the blood circulation system, for the activity of the cardiac muscle, respiratory muscles and other less active muscles. A smaller part of LA (about 40 %) is resynthesised in the liver into glucose and glycogen, which can be reused as a source of energy.

Anaerobic glycolysis starts immediately after the beginning of intensive physical activity. The strength of this reaction gradually grows and culminates between the 20th and 60th second. Anaerobic glycolysis allows for several tens of seconds of intensive physical activity, but during this process in less adapted individuals LA accumulates in the muscles and blood circulatory system, which results in muscle fatigue and pain that is very difficult to overcome. Therefore we do not recommend very intensive physical activities (with high heart rate) for a period longer than 15 - 20 seconds for pre-primary or primary school children.

Unless the maximum physical performance (i.e. anaerobic process) is maintained by a person's will on the edge of endurance (as is the case of athletes in the 400 and 800m run), a spontaneous drop in intensity occurs and the organism gradually changes to the ***aerobic process***. This process makes less intensive and longer-lasting physical activities possible, which is beneficial for the cardiovascular activity. These are chemical processes during which substances split with the presence of oxygen. In the process of burning glucose (G), LA, and fats - which are actually free fatty acids (F), the end products generated with the presence of oxygen are phosphates and some proteins, esp. ATP, water and carbon dioxide. The basic chemical reaction is as follows:

G (nebo T) + AMP + ADP + O_2 → ATP + CO_2 + H_2O

We need to stress that it is not possible to isolate aerobic processes from anaerobic processes in the human body. In fact, the body is a system where aerobic and anaerobic processes simultaneously take part in the process of releasing energy, especially in long-term and more intensive activity. In less intensive activity the aerobic process prevails, whereas in more intensive activity the anaerobic process predominates.

When sugars are burnt during a particular physical activity, it is possible regarding their low stock in the organism to perform the activity (depending on its intensity) for about 30 minutes. As sugars get consumed gradually, fats increasingly become the major source of energy. Compared to glycolysis (oxidative sugar splitting), these are more complex chemical reactions, which is the reason why the intensity of physical activity decreases, but thanks to large supplies of fat in the body the activity can last for several tens of hours. Unless the intensity of the physical activity is too high, the movement is not accompanied by any stronger negative perceptions (muscle fatigue or pain) and is beneficial for human health.

Proteins can also be used as a source of energy, but are primarily assigned the task to build and renew tissues. They can be used as a source of energy on a larger scale only when the supplies of sugars and fats are consumed.

For more detailed information see specialist literature.

Body composition

The third indicator of fitness and limiting factor of physical strain is *body composition*, which is given by the balance between the amount of fat tissue, muscle tissue and the remaining body tissues. An excessive amount of body fat has a negative impact on other components of physical fitness, especially on aerobic fitness (an overweight person has difficulty to move and gets faster into the anaerobic phase).

The contemporary population suffers from excessive weight (being overweight and obesity), which must be regulated. In the aerobic phase we burn sugars first (they usually suffice for 30 minutes of a more intensive physical activity), and later mainly fats. Therefore we can regulate body composition by a continuous strain of moderate intensity longer than 30 minutes (e.g. brisk walking, cycling, doing aerobics), and especially by intake with lower nutrition value than the output. The basic principle is: "Balance the energy in and out!"

Tab. 4: Approximate use of energy per hour

Activity	**kJ/h**	**kcal/h**
sleep, relaxation in bed	200–300	50–70
sitting, mental work while seated	350–450	85–110
standing	400–500	95–120
walking 1.6 km/h, typing, driving	500–630	120–150
walking 3.25 km/h, cycling 8 km/h, playing the piano, cleaning	630–1000	150–240
walking 4 km/h, cycling 10 km/h, volleyball, badminton, cleaning the windows	1000–1250	240–300
walking 5 km/h, cycling 13 km/h, table tennis and tennis, social dancing, painting, decorating	1250–1500	300–360
walking 5.6 km/h, cycling 16 km/h, slow swimming, skating 15 km/h, digging the garden, light shovelling	1500–1750	360–415
walking 8 km/h, cycling 17.5 km/h, chopping wood, folk dancing, moderate shovelling	1750–2000	415–475
jogging 8 km/h, cycling 19 km/h, basketball, digging a ditch	2000–2500	475–595
running 9 km/h, cross-country skiing 6.5 km/h, moderate intensity swimming	2500–2800	595–665
running faster than 10 km/h, cross-country skiing faster than 8 km/h, very intensive swimming, heavy shovelling	nad 2800	Nad 665

Main risks connected to obesity

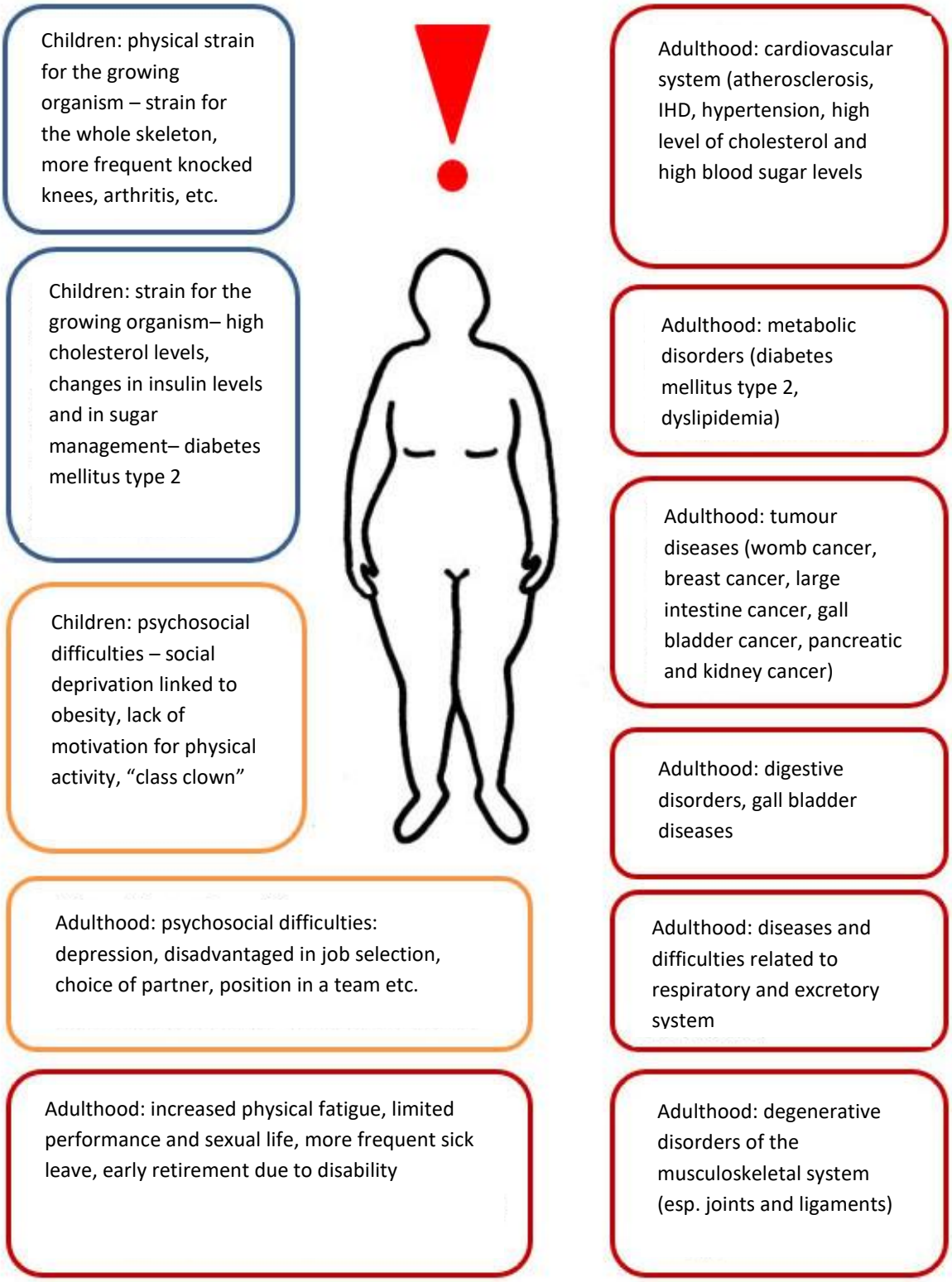


Fig. 3: Main risks connected to obesity

Methods in the evaluation of being overweight and obesity can be divided into two groups. In the first group there are laboratory methods, which provide exact results. The disadvantages of these methods are high demands on material conditions, complexity of execution and expert knowledge. The other group is represented by field methods, which are a lot easier but less precise.

The most frequently used of the field methods is ***Body Mass Index (BMI)*** expressed as a quotient of weight (in kilograms) and the second power of height (in metres).

BMI = weight (kg) / height (m)^2

Even though BMI is currently the most frequently used method, it can sometimes be misleading, because the calculation does not take into consideration other factors (body composition, i.e. skeleton, muscle tissue, fat tissue, etc.). These differences in body composition in two people with the same BMI are shown in the picture (Fig. 4) and the table below (Tab. 5).

Tab. 5: Differences in body composition with the same BMI

	Body composition A	**Body composition B**
Height	178 cm	178 cm
Weight	87 kg	87 kg
BMI	27,5	27,5
Amount of fat	15 %	24 %

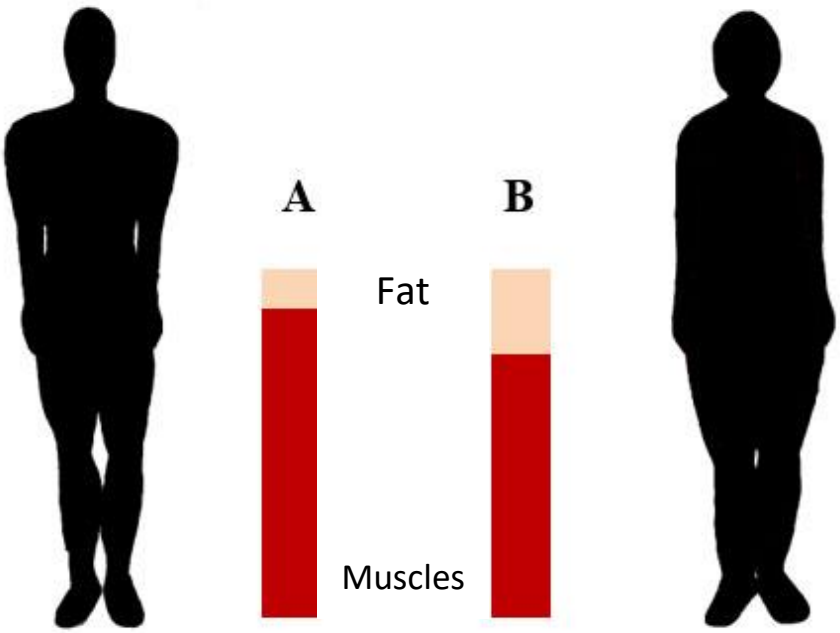


Fig. 4: Differences in body composition with the same BMI

BMI provides only basic information about body composition, but to get a more detailed evaluation it is necessary to determine the proportion of fat in the total weight. This function is currently available through various digital scales and body composition analysers (e.g. Tanita, InBody and others). However, it needs to be operated by a specialist (physicist, anthropologist, etc.)

In the course of life BMI changes its values. The lowest BMI is at the end of the pre-school age and from that moment on it increases up to adulthood. BMI values used for children and adolescents differ from those used for adults (they are often labelled BMI-for-age). In children BMI above the 97th percentile of the norm is evaluated as obesity and BMI between the 90th – 97th percentile is evaluated as being overweight (Fig. 5).

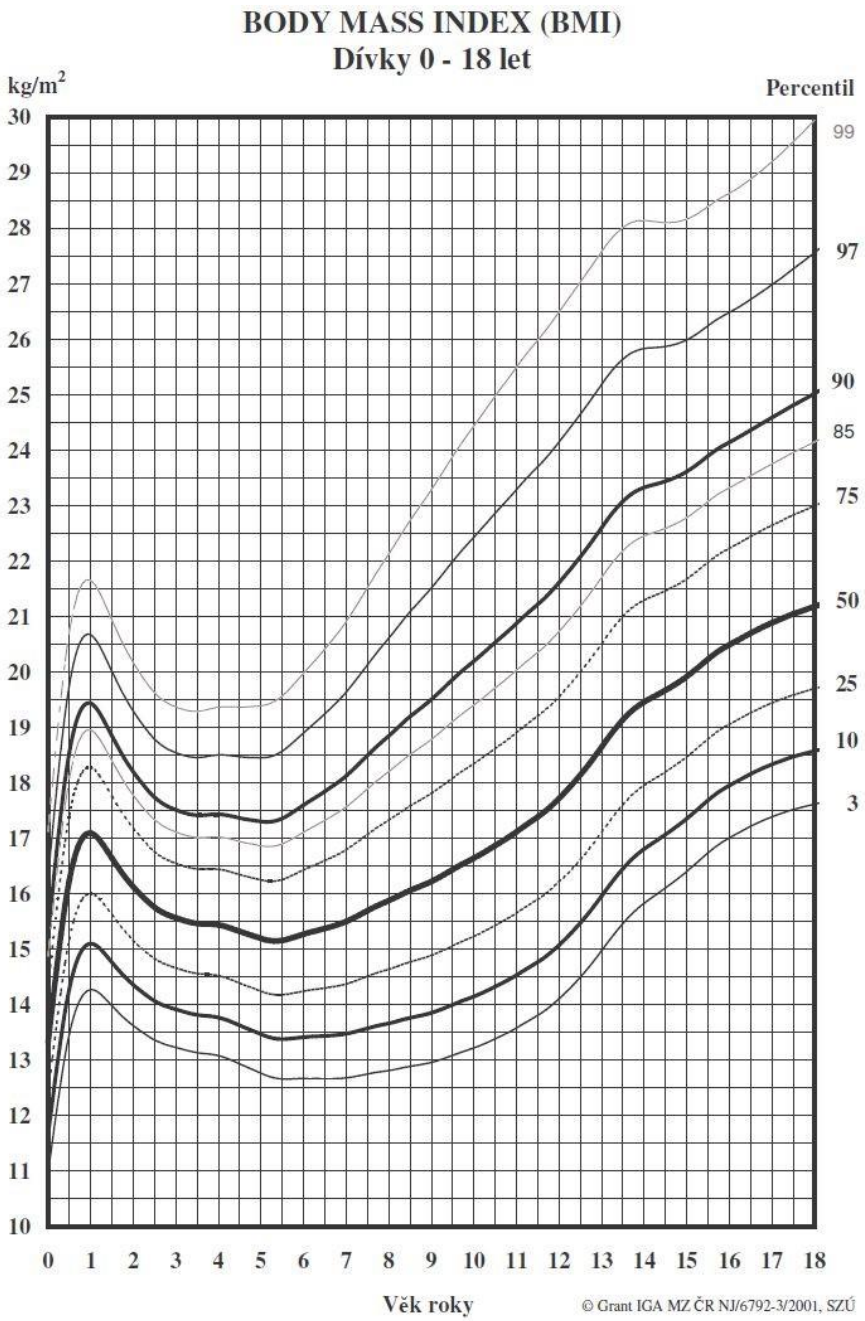


Fig. 5a BMI values for children and youth according to the resources of the National Institute of Public Health (Girls)

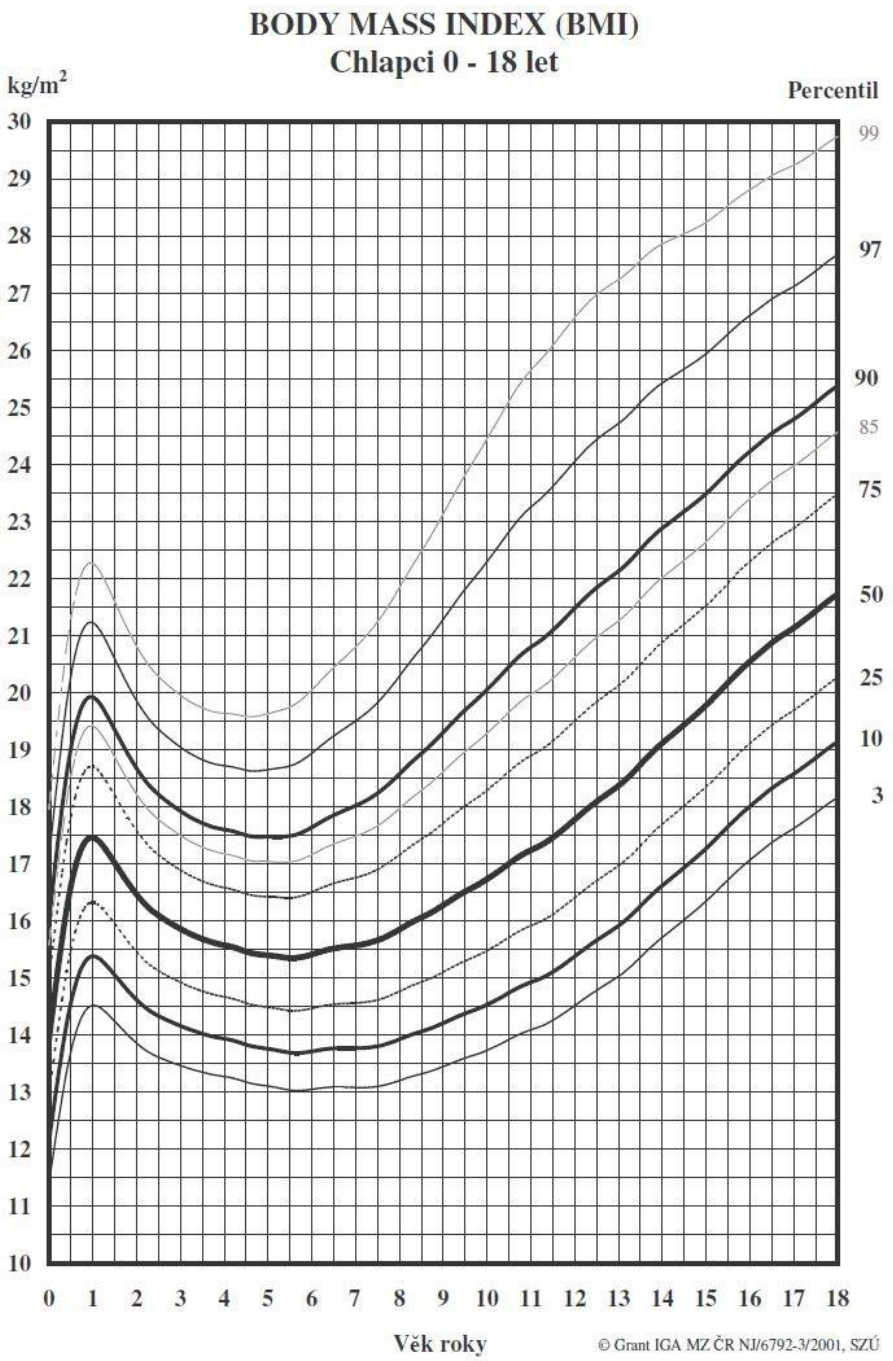


Fig. 5b BMI values for children and youth according to the resources of the National Institute of Public Health (Boys)

Another important aspect is also *fat distribution*. Experts distinguish *android type* (male, also called "apple type") where fats are distributed in the area of the torso. This type is considered more dangerous regarding health than the *gynoid type* (female, also called "pear type") where fat is stored in the area of buttocks and thighs (Fig. 6). Fat distribution shows significant hereditability of up to 60%. To identify the particular body type WHR index (waist – hips ratio) and waist measurement is used.

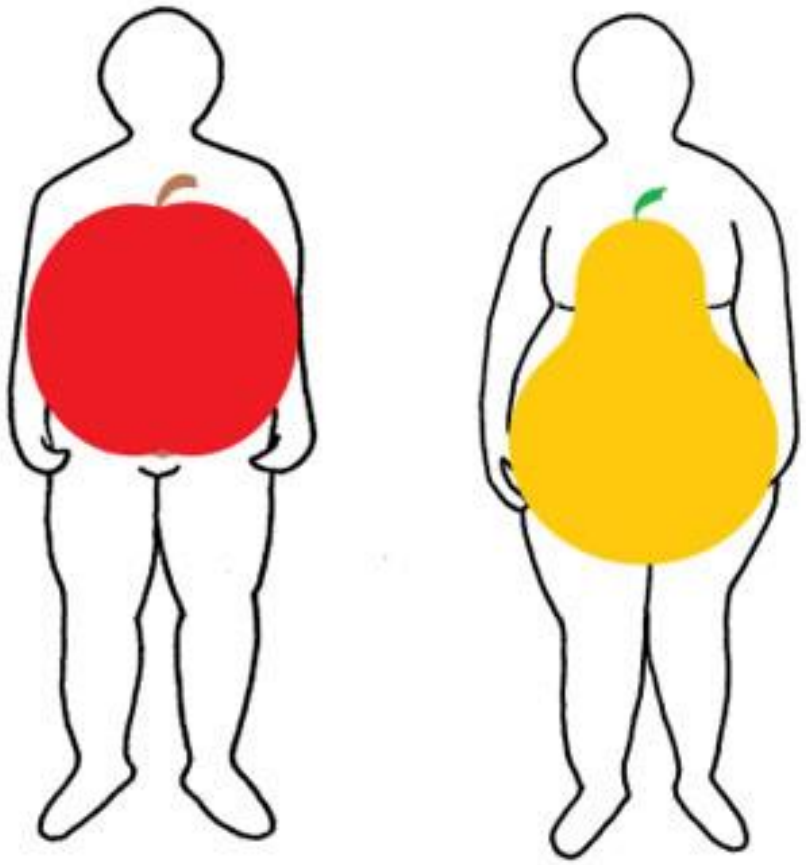


Fig. 6: Types of fat distribution

Somatotype

If two people of the same height stand next to each other, differences in the proportions of individual body segments can be noted. General physical appearance is based on height, weight, skeleton structure, muscles, fat tissue and other space parameters, which are to a great extent influenced by hereditability. A particular shape of human body is called a ***somatotype***.

To identify one's somatotype Sheldon's typology, which is primarily designed for men, is now most frequently used. For the female population the same labelling of body types is used along with the specification of places where under skin fat is distributed. It is difficult to identify the somatotype in children, because they are still growing and their individual body parts and proportions are only being formed. Yet, we can often recognise at an early age in which direction the body is being formed.

Sheldon identified three extreme somatotypes – endomorph, mesomorph and ectomorph, whose characteristics are given in the table below (Tab. 6). Most of the population is a mix of types in which the individual somatotypes appear in various combinations.

Tab. 6: Basic characteristics of the somatotypes

Somatotype – basic characteristics		
Endomorph	Mesomorph	Ectomorph
• narrow shoulders • wide hips • short limbs • small amount of muscle tissue • big amount of fat mass	• wide shoulders • narrow hips • long limbs • big amount of muscle tissue • small amount of fat mass	• narrow shoulders • narrow hips • long limbs • small amount of muscle tissue • small amount of fat mass

Type "A" (Endomorph)

Type "V" (Mesomorph)

Type "I" (Ectomorph)

The exact somatotype can be determined only by a specialist (e.g. physician, anthropologist, specialist in physical education) based on measurements of body proportions. Based on calculations three basic numerical components are determined, which are then used to place the evaluated body in Sheldon's somatotype chart (Fig. 7).

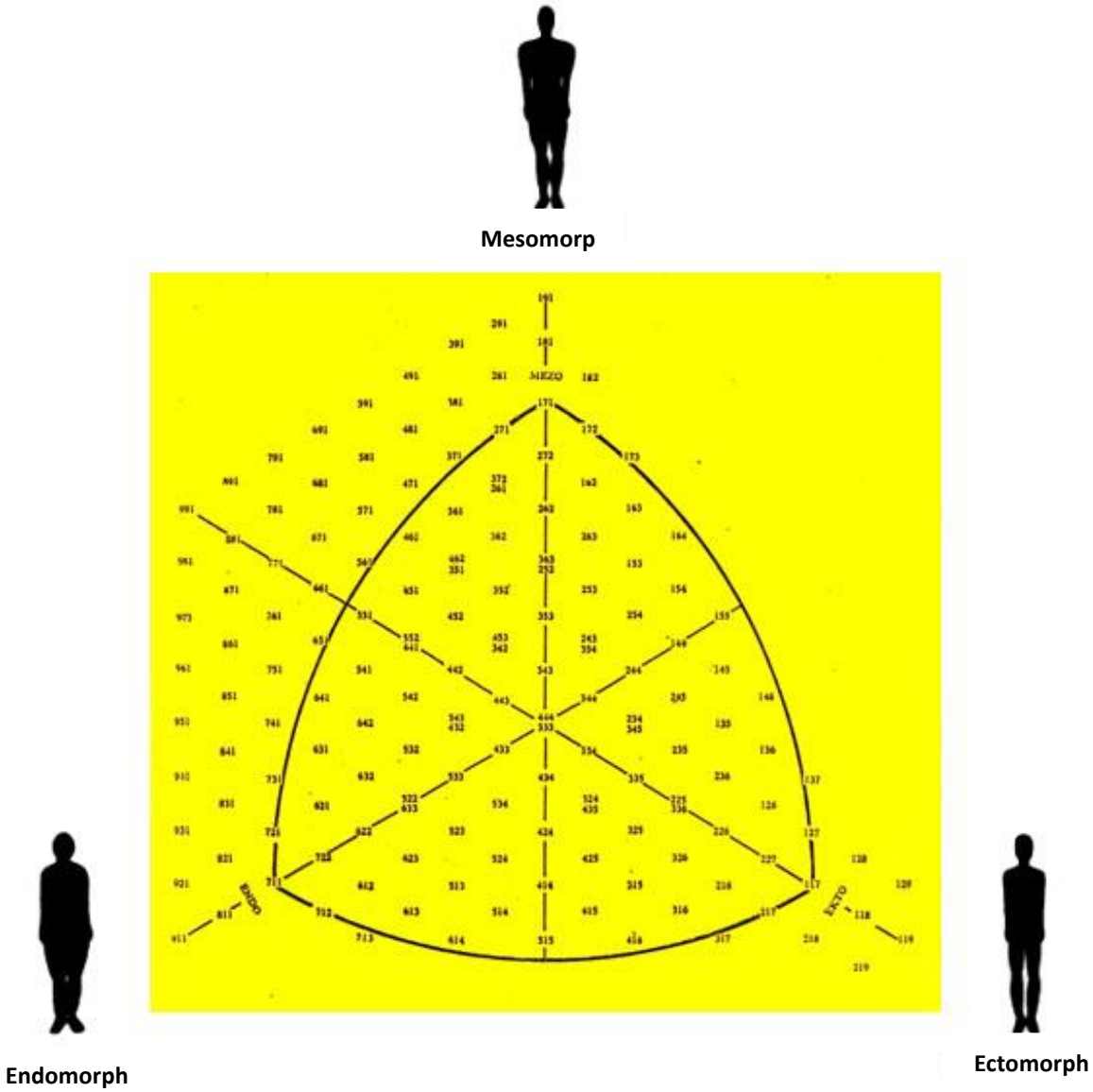


Fig. 7: Sheldon's somatotype chart

Even a simple optical estimation of the somatotype helps distinguish a person's physical dispositions and regulate his physical activity. For the mesomorph type with their dominance of muscle tissue strength or strength and speed focused physical activities are well suited (sports games, gymnastics, etc.), for the ectomorph type endurance sports (long-distance running, cycling, etc.), for the endomorph type activities which do not put excessive strain on joints and do not require excessive strength (swimming, cycling, Nordic walking, etc.). The picture below (Fig. 8) clearly shows that the endomorph and partly also the ectomorph type are rarely suited to racing sports activities.

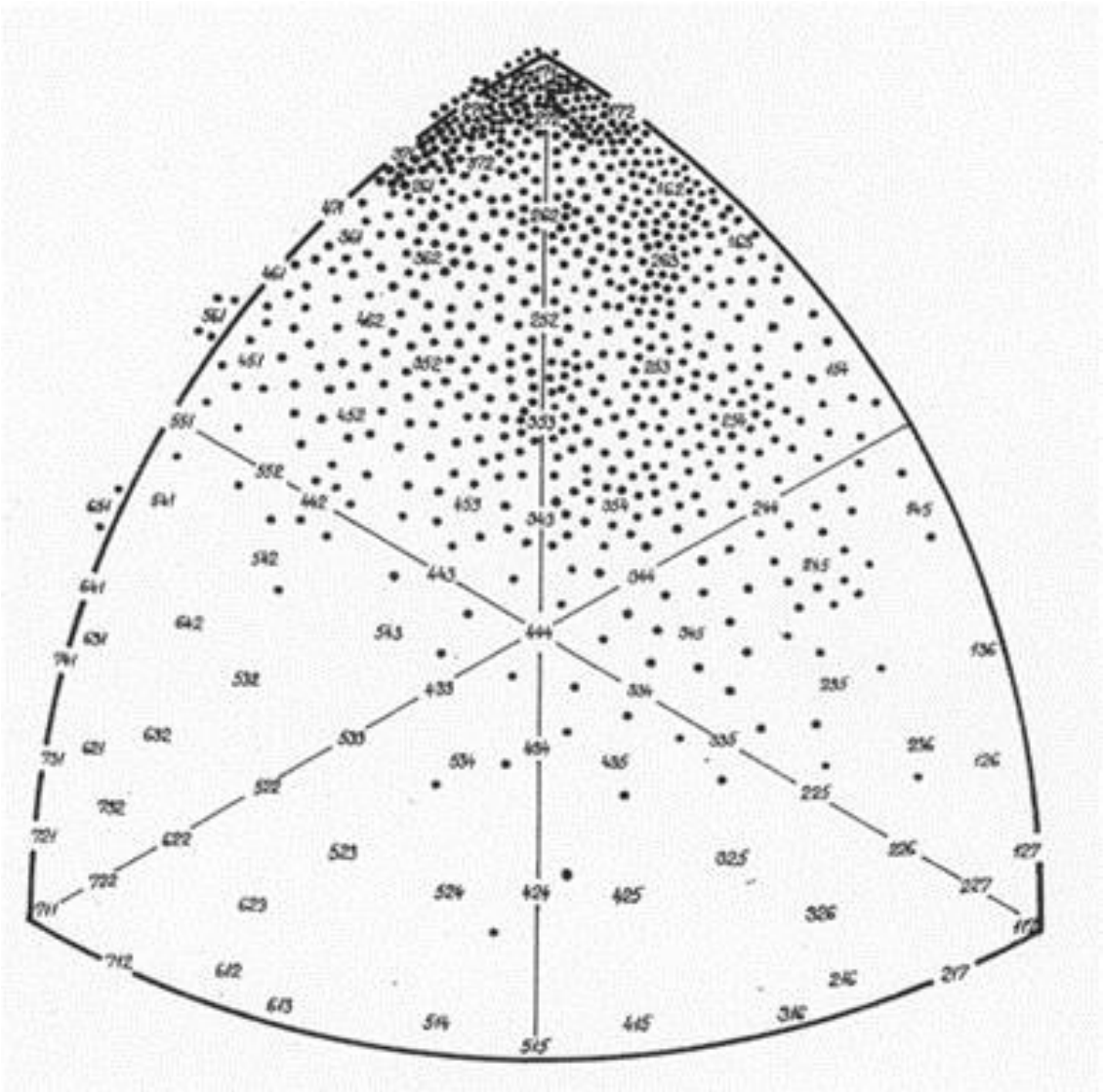


Fig. 8: Somatotypes of top sports people in the CR (based on materials provided by FSS UK)

Testing health-oriented fitness

To monitor and evaluate one's physical fitness motor skills tests are used – standardised examinations of a person's level of physical dispositions. A set of several tests with clearly given rules forms a test battery. An important requirement regarding motor skills tests is their standardisation – the test must be valid, reliable and objective and in the course of the test it is necessary to observe prescribed standard procedures and conditions (e.g. the same aids, instruments, apparatus and equipment, the same environment and precise instructions).

From a number of motor skills tests and test batteries we would like to draw attention to the best known physical fitness test battery:

For a basic assessment of motor skills performance and selected characteristics of body composition the Czech test battery Unifittest (6 - 60) is used. It tests standing long jump, sit-ups, aerobic endurance (alternative: shuttle run, 12 minutes run, 2 km walking) and optional tests depending on pupils' age (shuttle run 4 x 10m, deep seated forward bend, pull-ups - boys, flexed arm hang - girls).

A similar test battery is *Eutofittest*, which tests single leg stands, hand reach, the range of seated forward bend with legs together, standing long jump with feet together, sit-ups, pull-ups, running 10 x 5m or 50 m sprint, endurance shuttle run – Leger test and manual dynamometry.

Compared to other test batteries *Fitnessgram*, designed in the USA, has one unique feature: the person is not assessed for his best possible performance but based on the result is placed in a "target health zone" and provided with an explanation on how well he did in the test and what he can do to maintain or improve his health-oriented fitness. Fitnessgram contains several options of motor skills tests in each tested area (Tab. 7).

Tab. 7: Fitnessgram test battery

FITNESSGRAM		
Aerobic fitness		**choice of one test** endurance shuttle run (preferred test) 1 mile run 1 mile walking
Body composition		**choice of one test** skinfold thickness testing body mass index bioelectrical impedance test or automated caliper
Muscle fitness and flexibility	strength and endurance of abdominal muscles	chest curl-up (lying)
	strength and flexibility of torso extensors	trunk lift (lying on stomach)
	strength and endurance of the upper torso	**choice of one test** 90° press ups (preferred test) inclined pull-ups pull-ups flexed arm hang
	flexibility	**choice of one test** head to knee forward bend (one leg bent) sit and reach test

A more detailed description of test batteries is provided, for example, in the appendix of the material *Movement and Nutrition* (Pohyb a výživa), but test descriptions are available from many other resources. The aim of physical fitness testing is not to assess pupils and students at schools but to evaluate and reflect on one's own health-oriented fitness.

Video: Testing health-oriented fitness - Fitnessgram

Physical activities for prevention and health promotion – summary

Which kind of physical activities can we consider as health promoting? Those which help to optimize one's bio-psycho-social well-being.

From a biological (physiological) point of view activities which positively affect the components of health-oriented fitness should be chosen.

The primary aim of muscle fitness and flexibility is not maximum muscle strength, muscle endurance or above-standard range of movement, but flexibility of joints and optimal firmness of muscles and insertions, which manifest themselves in muscle balance. That is why we should choose appropriate toning and stretching exercises focused on those groups of muscles which have a tendency to weaken and shorten. Activities which evenly engage muscles in the whole body are also suitable as well as particular strengthening and stretching exercises for which we need only 10 to 15 minutes a day.

The main aim of aerobic fitness is an optimal transfer of oxygen into all organs of the human body. It has been proved that the transfer of oxygen and healthy functioning of all the organs which take part in this transfer support aerobic activities, i.e. activities in which big muscle groups participate (brisk walking, running, cycling, cross-country skiing, etc.). It is desirable to keep the heart rate between 60 – 80% HRmax when engaging in a continuous physical activity longer than 10 minutes. In total the aerobic activity should last for at least 30 minutes a day (i.e. three times 10 minutes, twice 15 minutes). For children even 5-minute continuous physical activities are sufficient (e.g. a busy moving game), but in total these activities with higher intensity should last for at least 60 minutes a day. Any activity which makes us breathless and lasts long enough is suitable.

The choice of suitable physical activities is limited by genetically given somatotype and the overall body composition, which can be significantly influenced by a particular lifestyle. The aim of physical activities in this component of fitness is to optimize body composition, especially the muscle-fat ratio to be able to do physical activities which affect muscle and aerobic fitness. On the one hand, an excessive amount of fat (obesity) significantly limits one's physical capacity, but on the other hand, an excessive amount of muscle tissue can put excessive physical strain on the body and can be limiting when doing effective aerobic activities.

Many physical activities are beneficial for one's *mental health* and *social well-being.* Most sportspeople cannot imagine life without sports contests and without the inner satisfaction such a performance brings. Others find contests stressful and seek psychological well-being in non-competitive physical activities, such as intensive walking, Nordic walking (spring-loaded sticks), health running, recreational cycling, swimming, aerobics, psychomotor exercises or dancing. These activities done in a group (with

family, classmates, friends, etc.) can positively influence not only the mental but also social well-being of a person and contribute to his overall bio-psycho-social well-being.

The following practical examples of health-oriented physical activities were chosen to illustrate the theory presented in this chapter and to serve as an activity bank for both teaching practice and personal life.

Practical examples of health-oriented physical activities

Physical activities in the gym and on the sports ground

Physical education and free-time activities

Physical activities for both children and adults should bring, apart from physical strain, also pleasure and a positive experience. In a methodologically well-structured class (P.E. lessons, free-time outdoor and indoor physical activities, etc.) games and activities for the development of one's physical skills and abilities can be employed. At the same time health-oriented fitness should be enhanced (health-oriented games and exercises).

In physical education classes there should be a sequence of exercises and games which complies with the requirements regarding individual stages of a class. These requirements are different for the initial, busy, preparatory part of the class and for the closing part. During free-time physical activities (e.g. in sports clubs, after school clubs) the sequence of the unit can be different, but the basic principles are very similar.

Games and activities in the busy part of the class should serve as a warm-up for muscles and preparation of the organism for activities in the main part of the class.

In the *preparatory part* pupils should use joint-mobilising, stretching, toning and coordination exercises of a static-dynamic character to warm up the main muscle groups and those muscle groups which will be worked on in the main part of the class. Inspiration for warm-ups used with young school children (modified exercises can also be used with other age groups) can be found in the following electronic publications: Ideas for Warm-Ups without Equipment for Young Learners, Ideas for Warm-Ups with Equipment for Young Learners a The Busy and the Preparatory Part of a PE Class at Primary School.

In the *main part* of the class we use games aimed at the development and use of particular physical skills and abilities. In the video recording below the games are presented according to their focus on individual physical skills – speed, strength, dexterity (coordination) and endurance.

Speed ability allows for completion of a physical task in the shortest possible time.

Strength ability requires some external resistence to be overcome.

Dexterity (coordination abilities) allows for exact completion of a physical task in the space and time provided. Among these abilities we can rank movement coordination, flexibility, balance, ability to change position and direction quickly, spatial orientation, rhythm or kinaesthetic differentiation ability.

Endurance ability allows us to perform a physical activity for a long time. Depending on the number of muscles engaged, endurance can be of global or local character. From the point of view of metabolic processes in the organism we distinguish two types of endurance: aerobic (when the muscles are well supplied with oxygen) and anaerobic (when there is a lack of oxygen). Regular aerobic activity is beneficial for the correct functioning of the cardiovascular system, i.e. for aerobic fitness.

At the end of the class we use slower activities which calm the pupil's organism down. Here we can include relaxation, massage, stretching, psychomotor exercises, games focused on sensomotor skills, breathing exercises, etc.

Video: Physical activities in PE classes and in free-time activities

In physical education classes but also in free-time physical activities collective exercises or exercise stations are used, which can focus on varied physical tasks. Individual sports stations can include games, stretching, strengthening, endurance, balance, gymnastic or athletic exercises and other exercises with or without training aids.

At present circuit training is very popular in the area of fitness. It is based around a set of stations, but has its own rules which are aimed at the development of particular physical abilities.

Compensation exercise

Compensation exercise is a set of exercises which help us influence the musculoskeletal system in order to improve its functions (e.g. flexibility, coordination, muscle tone and strength, length of muscles, etc.).

These exercises help us repair muscle weakness (flabby muscles), shortening of muscles, muscle imbalance, poor body posture, incorrect movement patterns, etc. Compensation exercises are also used to prevent the musculoskeletal system from weakening. The basic groups of compensation exercises involve stiffness relieving, stretching and strengthening exercises which are supplemented with breathing, endurance, balance and relaxation exercises as well as exercises for the development of the correct movement and postural patterns (correct body posture). It is necessary to adjust the content of exercises to a particular kind of weakness, state of health, age and sex, physical fitness and experience, functional fitness, interests of the people and the environment. For effective and correct exercise it is necessary to procede from the simplest versions in low positions (lying position, lying position with bent knees, lying on stomach) to more demanding versions in higher positions (sitting position, cross-legged sitting position = tailor seat, sitting position with knees bent, kneeling, press-ups from kneeling position, standing position). Every exercise has to be done with precision and in coordination with breathing.

The aim of *stiffness-relieving exercises* (also *joint-mobilisation execises*) is to enhance flexibility of joints. When exercising regularly, the blood supply in the muscles around the joints increases, muscle tone and muscle imbalance are adjusted and, as a result, the functioning of the joints improves. Movements are done in all directions, slowly, with minimal muscle strain, up to extreme positions,

without swinging movements. Stiffness-relieving exercises include slow circling, swinging a relaxed limb, shaking out, passive movement up to extreme positions, and active movement up to extreme positions. If the movement is active, we speak about automobilization – most frequently related to the muscles around the spine (e.g. spinal exercises).

Stretching exercises are characterised as deliberate stretching using directed, guided and fully controlled movement, especially in muscles prone to shortening (postural muscles) or muscles already shortened. If we are trying to achieve a physiologically correct muscle length, regular exercise is absolutely necessary. After 48 hours the effects of stretching disappear. Stretching muscles can also increase flexibility of joints, which needs to be kept within an appropriate physiological norm – increased flexibility of joints (hypermobility) is for the musculoskeletal system more dangerous and more difficult to adjust than decreased flexibility of joints (in the case of hypermobility static stability worsens).

Stretching exercises always precede strengthening exercises.

The aim of *strengthening exercises* is to increase the functional fitness of muscles, especially phasic muscles (prone to lower tone, and weakness). We prefer dynamic exercises, first of all without a load, and only after correct habits are formed can we start using appropriate equipment (e.g. big balls, soft balls, light dumb-bells, resistance bands, etc.). Before we start strengthening the muscles we always stretch the antagonistic muscles first and do not hold our breath when exercising. When strengthening the abdominal muscles, we lift the torso slowly and keep it in an arched shape. When exercising in the basic press-up position on our knees and its variants, we must not exercise with the lumbar spine curved. It is possible to insert some relaxation exercises between individual strengthening exercises. Strengthening exercises done in the position lying on one's back when the lower limbs are stretched low above the ground are considered ill-suited (e.g. writing numbers). The lying position on our stomach with a simultaneous backward bend of both lower limbs is considered unsuitable too (undesirable increased strain on the back muscles, especially in the lumbar part).

Exercises for a healthy back

It is not unusual to encounter back problems as early as in young children. These fully manifest themselves as painful later in adulthood. It is very often a functional disorder in the area of the back related to the current lifestyle. Incorrect body posture, muscle imbalance, a sedentary way of life and a lack of movement bring along the risk of pain developed in the area of the back.

Making compensation exercises a regular part of one's schedule works as an effective prevention method. Simple exercises can be done with or without training aids in any kind of environment – at work during breaks, at schools, in commercial courses and in the comfort of your home.

Video: Compensation exercises on the carpet

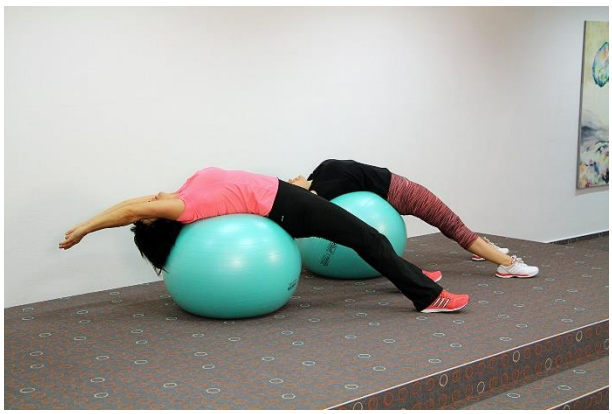
Video: Compensation exercises on chairs

Pilates

Pilates is an exercise method oriented towards the physical and mental formation of an individual.

It aims at the development of strength, flexibility and coordination, lowering stress levels and improving mental well-being. The technique of this exercise starts in the centre (a point a few centimetres above the navel and the adjacent abdominal and back muscles; also called the core or powerhouse) and is aimed first of all at the area of the torso – abdomen, back, hips and gluteus. It uses six basic principles (breath, concentration, core-centration, control, precision, and fluency), which need to be observed in the course of exercises. One of the key principles is the synchronisation of breathing and movement (in the video in Czech „nádech“ = in English “breathe in”, in Czech „výdech” = in English “breathe out”). During the exercise it is necessary to check the body posture (pelvis in the neutral position, torso upright, shoulders and spatulae pushed backwards and downwards, in the standing position the feet form the letter “V” – heels together, tips apart).

Most exercises are done in low positions on a mat; we can exercise with or without training aids (soft balls, resistance bands, big and small balls, rings, etc.). The method is suitable for people of all age categories and is frequently used in physiotherapeutical programmes in post-traumatic states and illnesses. The recommended frequency of the exercise is 2 – 3 times a week.



Video: Compensation exercises - Pilates

Fitness training using aids

Fitness training is a term used for a regular physical activity thanks to which we can (with an appropriate amount of strain) maintain and develop physical abilities and skills. It is a set of exercises aimed at training individual muscles and joints, which can be done at different speeds, intensity and ranges. Individual exercises can be arranged into a series of exercises. Gradually increasing the difficulty of exercises helps us develop the basic components of fitness.

Fitness training can be done with or without aids, indoors or outdoors.

Big balls and soft balls

The big ball (also called *gymball*) was originally used as a therapeutical aid, and later it appeared as a training aid in the commercial sphere. Thanks to its characteristics it gradually started to be used in school and home environments. It is usually used in fitness and health training, or in a sedentary job to sit on and as a relaxation aid.

The correct size is the basic requirement for correct use of the big ball. When sitting on the ball, the angle between the axis of the torso and the thigh and between the axis of the thigh and the shinbone should be bigger than 90°. The size of the ball for young school children depending on their height is somewhere between 42 – 55 cm in diameter, while for adults a size of 65 or 75 cm is usually suitable. The maximum load is usually 300 kg. One of the basic qualities is the elasticity of the material, which must be taken into consideration when choosing the ball (too soft does not provide enough support for correct sitting and exercising).

Correct sitting position on the ball:

- the head is upright, the chin pushed slightly backwards,
- the chest is open (“little light”),
- the spatulae pressed towards the chest (“we do not have any wings”),
- shoulders downwards and wide (“dripping drops of water”),
- the stomach tucked in (“as if somebody wanted to hit us in the stomach”),
- pelvis in the neutral position (hands on the spatulae of the hip bones, check the tilt of the pelvis),
- thighs, knees and feet on one axis, legs slightly apart, shin vertical to the ground, feet loosely placed on the ground

Video: Fitness exercise - Big ball (gymball)

Soft ball (also called *overball, softball, softgym* etc.) was originally used in physiotherapy and later was found useful in commercial sphere and homes. It is made of soft elastic material, is light and easily portable. The maximum load is about 100 -120 kg. The diameter of the original ball is 25 cm, balls of smaller or bigger diameter are also available. It can be bought at a reasonable price.

The use of the soft ball is rather varied. Apart from its most frequent use - stiffness relief, stretching and strengthening of body muscles – it can be used as a toy or a sports aid of different focus than its original one (e.g. as a base, as a regular ball, as a psychomotor aid, etc.), stress-relieving or seating and positioning equipment.

Video: Fitness exercise - Softball (overball)

Resistance bands

Resistance bands are simple training aids with a wide range of use in stretching the whole body. We can use them in stretching, strengthening and other kinds of exercises.

Resistance bands can be of different shapes and tension levels (colour-coded bands of different resistance level are produced – fairer colours mean lower resistance and are designed for beginners or lighter exercise). The bands are easily portable, easy to store and their price is usually low.

At present flat elastic bands made of latex or other rubber material, 1.5 – 5.5 m long, are used most often. They are generally known as Thera-Band (after the producer), aerobic band (based on the most frequent use), or Elastikband, Powerband, etc. Other frequently used resistance bands are RubberBands (popularly called “canning jar rubber seals”) – shorter ring-shaped resistance bands, often tied in the middle so that they form the shape of a figure 8.

Resistance bands can be used in gyms, when doing exercises at schools and at home, in physiotherapy, in group lessons or for individual training.

Video: Fitness exercise - Resistance bands

Balance hemisphere – BOSU

Balance hemispheres are modern training aids suitable for any age category. They were originally used in physiotherapy, but later they made their way into gyms, sports clubs and homes. The most frequently used hemispheres bear the BOSU® brand. Its shape resembles a hemisphere (some producers make also elliptical domes) and both the inflated part as well as the flat base are used for exercise. Exercises on balance hemispheres focus not only on superficial muscles but also on the muscles of the deep stabilization system. It also has a positive impact on the coordination of movement, physical fitness, musculoskeletal system, cardiovascular system and human psyche.

Video: Fitness exercise - BOSU

Balance pads

Balance pads (also called *balance air pads*) are another kind of balance training aids used in physiotherapy, sports, schools, workplaces and homes. They are suitable for toning muscles of the whole body, and are used in strengthening and coordination exercises, balance exercises and in the development of spatial perception. They are also used as a massage aid (e.g. feet massage), chair mat (health-promoting effects, helps fight backache) or as a piece of games equipment for individual and collective games. When exercising with or sitting on a balance pad the deep stabilization system, which participates in the correct body posture and body coordination, is activated.

Balance pads are often made of soft elastic material of different colours. One side of the pad is smooth, and on the other there are massage nubs.

Video: Fitness exercise - Balance pads

Skipping rope

The first historical mention of the use of skipping ropes dates back to Ancient Egypt. For centuries skipping ropes were made of natural materials, most often by weaving stems of herbs. Nowadays, skipping ropes are made of all sorts of materials. There are ropes made of hemp, synthetic ropes, bead ropes, leather and cabel ropes, or skipping ropes made of cords and ropes of a different kind, diameter and type. The end of the rope can be equipped with wooden or plastic handles or there can be a nod tied at the end.

The right length of the skipping rope is set in the following way: when standing in the middle of the rope, the ends reach one's armpits (or between the chest and the armpit). A too long or too short skipping rope does not allow for the correct execution of jumps.

In fitness training we usually use the skipping rope for jumping, but it can also be used as an aid for compensation exercises (most often stretching and strengthening). When jumping with our feet together, on one foot or alternating both feet over the rope swinging forward, we have to bear in mind the correct technique of the execution. In the basic position the body is upright, shoulders are wide and pushed downwards, arms bent – elbows next to the body, forearms straight and slightly forward, and the end of the rope is in the palms. The legs are slightly apart (the width of the pelvis) and slightly bent at the knees. The rope is behind the body. The first arch "starts in the arms" (slightly bent arms make a big arch forward, the movement starts in a crouching position with the arms sideways, not crouching with the arms raised – a frequent mistake) which gives the rope enough energy to move forward. The arms return to the previous position (i.e. elbows next to the body) and the following swing is generated by swinging the wrists and small circular movements of the forearms (not by swinging the whole arms – a frequent mistake). During the jump the legs are straight (legs bent forward or backwards is a frequent mistake), the torso is firm, and the lumber spine is not bent. The jump is light and elastic (stiff, elasticity-lacking landing on the whole foot is a frequent mistake, which causes a shock to the spine and quick fatigue to the lower limb muscles). The rope during the jump moves just above the ground.

Video: Fitness exercise - Skipping rope

Physical activities in water environments

A water environment brings along new conditions for physical activities. Thanks to the unique physical properties of water the musculoskeletal system is relieved, the speed lowers and exercises and movement change because of the water resistance. Therefore these physical activities are suitable also for disabled people. Aquatic activities are beneficial for the whole organism: regarding health-oriented fitness, musculoskeletal system, cardiovascular system, respiratory system, thermoregulation as well as movement coordination, endurance, spatial orientation, flexibility, psyche, etc. Right above the water surface the air is saturated with water vapour and contains only a few dust particles, which is beneficial for the upper air passages and therefore suitable for people with some respiratory disorders.

A water environment is used for sports, recreational, physiotherapeutical or relaxation purposes.

Swimming and games for babies and toddlers

The views of experts and laymen regarding swimming for babies and toddlers differ. Among the frequently cited positive aspects of swimming at this age we can mention improvements to psychomotor development, to the fine and gross motor skills, appropriate strain on the cardiovascular and respiratory systems and their enhanced function, strengthening of all components of the musculoskeletal system without a strain being put on joints, development of strength, endurance and coordination, improved body defences and resistance to cold, lowered fear of water and, last but not least, positive effects on social development (tight bond with parents, movement in a group).

Children who attend swimming courses sleep better and eat better. Among the negatives we can name potential development of allergies or asthma as a reaction to chemical substances dissolved in the water, skin and digestion problems caused by the polluted water, inflammation of the air passages as a consequence of poor drying after swimming or the cold water in the pool (should be 28°C).

Swimming with babies is usually done in bathtubs and pools (best without chlorinated water), whereas toddler classes take place in pools. The duration of a lesson is 30 minutes at most.

Video: Swimming for babies and toddlers

Swimming and games for pre-school and school children

For pre-school and school children physical activities in water environments are associated with games. Games are usually connected to motivation (fairy-tales – e.g. *Moving water tales (not only) for pre-schoolers*, poems and imagination) and are aimed at training and development of basic swimming skills and strokes. Depending on the age and skills achieved, children are placed into ability groups. A lesson is 30 – 60 minutes long.

Examples of games and activities:

- Games to get acquainted with water - games aimed at getting rid of the fear of water and submerging the head (e.g. playing tag – individual children, pairs, threes, groups; diving games; splashing games; games using equipment, etc.)
- Games for getting around in water – games for the development of spatial orientation above and under water (e.g. hunting for objects; identifying numbers underwater; swimming under something; jumps and falls, etc.)
- Games for breathing – games aimed at forming basic habits of directed breathing for swimmers
- Games for floating – the target skill is to put and maintain the body in the horizontal position on the water surface (e.g. a little star with a swimming board under the body; a little star; a mushroom; sending "little boats", etc.)
- Elements of swimming and coordination – separate practice of lower and upper limb movements and subsequent coordinated practice of a particular stroke

Video: Prepration for swimmers and beginners before learning how to swim

Swimming and aquafitness in adulthood and old age

In adulthood physical activities focused on *fitness or health-oriented swimming* and *aquafitness* are preferred.

Fitness-oriented swimming counts as a cyclic aerobic activity which can be done by anybody regardless of sex, age or fitness. It is also suitable for physically challenged people (e.g. for people with problems of the musculoskeletal system, obesity, etc.). The basic position is lying on the stomach or on the back (depending on the chosen stroke), which puts a balanced strain on the whole organism, in a position favourable for the cardiovascular and respiratory system. Thanks to the properties of the water environment aquatic activities lack hitting and shocks and there is little

strain put on the lower limb joints. It is said that when swimming a person uses twice to five times more energy and strength than on land and burns 1 800 – 2 000 kJ / hour.

Back stroke is considered the healthiest stroke. The swimmer is in a horizontal position on his back, the head in line with the torso. Considering the fact that the face is directed upwards and there is no problem regarding breathing, it is often the first stroke taught to children. However, in fitness swimming it is not widely used.

The opposite is true. The most frequently used stroke is the breast stroke. It is the slowest stroke. The swimmer lies on his stomach. Demanding coordination of the movement of the limbs and breathing out under water makes this stroke difficult for many swimmers. In swimming complexes we can usually see people doing breast stroke without submerging their heads and breathing into the water, which in the long run negatively affects the neck and shoulders (head bent back, fatigue, pain).

Crawl is the fastest stroke done in a floating position on the stomach. The head is in line with the torso, and the limbs move fluently. The biggest problem is breathing into the water, which must be practised. Crawl is the second most frequently used stroke in fitness swimming.

The second fastest is the butterfly stroke. The basic swimming position is on stomach, and the wavy movement engages the whole body. It is a demanding swimming stroke in terms of coordination and physical fitness, which is why it is not frequently used in ordinary fitness swimming.

Aquafitness encompasses different forms of movement in the water. One of the many kinds of group exercises done in water and accompanied by music is *aqua aerobics.* It is a fitness activity focused on the cardiovascular, respiratory and musculoskeletal system. People exercise in different depths (shallow water – reaching the chest, transition – reaching the shoulders, deep – no contact with the bottom, using floating equipment), with or without training equipment (e.g. dumb-bells, pool noodles, gloves, aqua belts, aqua steps, etc.). The body is often in the upright position, and modified steps, running, jumping and variations are used.

Video: Aqua aerobics, fitness swimming

Physical activities in natural environments

Movement in fresh air undoubtedly brings along many health benefits. One's physical activity increases, which puts more strain on the musculoskeletal and other body systems. When exercising in the woods or other kind of greenery, stress levels and mental fatigue decrease. Children who spend more time outside in the countryside are less frequently ill. In the course of school attendance, movement in fresh air is considerably reduced by the morning (but also afternoon) spent in the school building. *Integrated field education* is considered an effective form of teaching when the content of different school subjects is integrated with outdoor physical activity (i.e. outside the school building).

Hiking, cycling and water sports

In this country, these three are some of the most popular outdoor activities. They represent a set of skills and knowledge related to active movement outdoors including cultural and educational activities. The most widely spread is hiking, which uses the most natural kind of movement - walking - in the form of walks, trips, hikes, long-distance hikes, hiking in stages, etc. It is suitable for any age category if the health, abilities and skills of the participants are taken into consideration. A more demanding form is *hiking in high mountains*, which requires good physical fitness, specific knowledge and skills.

Cyclotourism, which combines physical activities with cycling, is becoming more and more popular. The bicycle makes travelling longer distances at a higher speeed possible, but still allows us to take note of the environment intensively. The cyclist must be able to ride a bicycle in different terrains, be able to fix defects on the bicycle and maintain it in a good technical condition. A bicycle helmet should be an integral part of the cyclist's equipment.

In summer *water tourism* (river rafting, windsurfing, paddleboarding, etc.) and in winter tourism connected to *skiing and skating* are getting more and more popular.

In spring, summer and autumn *in-line skating* has become a popular parallel to skating on frozen water in winter. It is a complex physical activity in which all body muscles take part and which in terms of difficulty is compared to cycling or running. It is beneficial for body forming purposes and for burning fats. Skaters must be equipped with protective pads and helmets.

Video: In-line skating, cycling, water sports

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