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Volgograd State Medical University
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Department of General Hygiene and Ecology

MANUAL

IN HYGIENE

for General Medicine students, specialty 31.05.01, English medium

Part 2

(Hygiene of medical establishments, workplace hygiene,
hygiene of children and adolescents)

Volgograd
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The present manual in hygiene for General Medicine students, specialty 31.05.01, English medium, Part II, includes the following sections: "Hygiene at medical establishments", "Workplace hygiene", "Hygiene of children and adolescents".

PRACTICAL SKILLS

1. Estimating the parameters of aeration, microclimate, illumination of patient health care institutions and other buildings.
2. Estimating working conditions and giving recommendations for the prevention of occupational diseases.
3. Evaluating physical development of children.
4. Determining the health status group of children.
5. Giving recommendations for developing a healthy lifestyle with consideration to age, sex and occupation.

CONTENTS

Chapter 1 Hygiene of medical establishments

THEME 1

HYGIENIC EVALUATION OF THE LAYOUT AND SETTINGS OF PATIENTS' STAY IN HEALTH ESTABLISHMENTS

M*otivational statement of theme*

Sanitary-hygienic and sanitary-antiepidemic regulations and norms developed for different types of therapeutic and preventive establishments are aimed at providing optimum hospital settings for patients and creating a favorable working environment for the medical staff. These requirements should be considered when planning, building and using hospitals. The awareness and understanding of hygienic aspects of therapeutic and preventive, sanitary and antiepidemic work plays a major part in the work of the doctor of any specialty. The regulations and standards are aimed at providing optimum conditions for the patients staying at therapeutic establishments and providing favorable working conditions for the personnel.

Objective: studying hygienic requirements imposed on the layout, organization, equipment, maintenance, anti-epidemic regimen at medical organizations.

Students' classroom activities:

1. Case problems of three types. Reference material, tables and recommended literature may be used. The case problems should be reported in writing.

1.1. Making a hygienic evaluation of the inner environment in a hospital ward; working out a complex of preventive measures.

1.2 Making hygienic evaluation of the general layout of the hospital grounds and layout of the hospital.

1.3. Making a hygienic evaluation of disinfection on the premises in therapeutic and preventive establishments by means of ultraviolet treatment.

2. Discussion report prepared by students as assigned by the teacher.

Students' independent activities

1. Types of hospital construction, their hygienic evaluation and comparative description.
2. Hygienic requirements imposed on the selection of land for the construction of hospital.
3. Hygienic requirements imposed on planning and construction of a hospital area.
4. Hygienic requirements imposed on hospital wards and the arrangement of the inner environment on hospital premises (aeration, microclimate, lighting, interior design).
5. Hospital infection: notion of hospital infection, its sources, prevention.
6. The use of ultraviolet bactericidal radiation for the sanation of air in

therapeutic and preventive establishments as well as against infectious diseases.

Plan of students' independent activities

"__ "_____20__ .

1. Case problem (type 1) No _____

_____
_____
_____
_____
_____

2. Case problem (type 2) No _____

Read the case problem carefully and answer the following questions:

2.1. Type of hospital construction _____

2.2. Location of the hospital (in relation to residential areas, industrial buildings, roads)_____
_____
_____
_____

2.3. Layout of hospital grounds (shape of the area, fencing, the number of entrances and exits, zoning of the hospital area):

_____
_____
_____
_____
_____

2.4. Area of the grounds in accordance with requirements:

_____
_____
_____
_____

2.5. Inner layout of ward departments in accordance with requirements:

- Assortment of specially designed rooms

  _____
  _____
  _____
  _____

  Area of rooms

  _____
  _____

_____
_____

2.6. Hygienic evaluation of the inner environment of hospital buildings

_____
_____
_____
_____

3. Case problem (type 3) No_____

3.1. State the rules of locating UV-radiation in a room:

_____
_____
_____
_____

3.2. State the necessary mode and duration of irradiation (depending on the type of room and its purpose):

_____
_____
_____
_____

3.3. Calculate the number of bactericidal lamps necessary for sanation of air in a room in therapeutic and preventive establishments:

_____
_____
_____

Done by: _____
Supervisor: _____

Reference information

Term definition

HOSPITAL INFECTION is an infection developed by patients in hospital or other health care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in hospital but manifesting after discharge, as wells occupational infections among staff of the facility (World Health Organization).

WARD UNIT is an isolated complex of rooms designated for patients in the same condition. It consists of wards, the corridor, sanitary conveniences, utility rooms, treatment rooms.

The hospital ward units should be located at a distance of not less than 30 m from the main road; the area of the grounds should be 200 m^2 per one bed. The distance from the surgical unit to other hospital units should be not less than 25-30 m, the parking place for the visitors should be not less than 100 m from the hospital ward unit. A sanitary-protective zone between the hospital and the sources of air pollution and noise should be 1 - 2 km wide. The distance from the main building to the dietary department should be not less than 30 m. The density of construction should be not less than 12-15 %. The vegetation in should be not less than 60 %.

Types of hospital construction:

1. Decentralized
2. Centralized
3. Mixed
4. Moduled

Main divisions of a hospital:

- Admission and discharge facilities;
- Ward departments;
- Therapeutic and diagnostic departments;
- Laboratories;
- Central sterilizing unit;
- Pharmacy;
- Food catering facilities;
- Morbid anatomy department;
- Administration;

Prevention of hospital infection

1. Specific measures for the prevention of nosocomial infection (vaccination)

1.1. Planned vaccination*:*

- Active vaccination
- Passive vaccination

1.2. Urgent vaccination.

2. Non-specific measures for the prevention of hospital infection.

2.1. Constructing and planning measures: isolation of hospital units, hospital wards, operating theatre units; strict division into clean and septic patients; zoning of the hospital area; rational layout of hospital departments on floors.

2.2. Sanitary and technical measures: ventilation; air supply; sanitary devices; air conditioning.

2.3. Sanitary and antiepidemic measures: control over the sanitary conditions in hospital; sanitary and educational work among the medical staff and patients; early detection of carriers among medical staff and patients (through bacteriological and daily examinations); control over bacterial

dissemination in hospital.

2.4. Disinfecting and sterilizing measures: physical means (mechanical processing, thermal treatment, UV-radiation, ɣ-radiation).

Use of ultraviolet bactericidal radiation against infection

The use of ultraviolet (UV) bactericidal radiation in different types of therapeutic and preventive establishments is aimed at solving one of the most important problems of preventive medicine, that is considerable reduction of infectious disease incidence, including hospital infection, as well as providing sanitary and epidemiological well-being of patients.

To improve the quality of prophylaxis against infectious diseases the new guidelines "The use of ultraviolet bactericidal radiation for disinfection of the air and surfaces in hospital wards and departments" were introduced by the Ministry of Health of the Russian Federation.

Ultraviolet bactericidal radiation is part of the spectrum of electromagnetic waves of a wavelength between 205 nm and 315 nm. The exposure of microorganisms to ultra-violet can cause destructively modifying photochemical damage in the cellular DNA nucleus which results in their death in the first or next generation. As it is well known ultra-violet bactericidal radiation is extremely harmful for living microorganisms which are responsible for the spread of airborne and droplet infections such as tuberculosis, diphtheria, measles, flu, smallpox, etc. At the same time ultra-violet bactericidal radiation is often used in combination with some other disinfecting agents (for example, physical and chemical) which ensures adequate disinfection of hospital premises.

The range of bactericidal lamps is nowadays much wider; there are lamps with low mercury content, and non-ozone lamps. When applied, these lamps do not produce ozone which is extremely dangerous for the health of people, especially for patients with lung diseases and children.

Besides, new bactericidal irradiators have been elaborated and their design is being gradually improved. Moreover, mass production of closed bactericidal recycling irradiators has been launched. The recycling irradiators enable the medical staff to disinfect the premises in the presence of people as air is exposed to irradiation in a closed irradiation chamber, through which it is blown by a fan, and the release of ultra-violet into the room is prevented.

Moreover, bactericidal ultra-violet lamps BUV-15, BUV-30 and BUV-30 p, low pressure gas-discharge mercury lamps are also used for the sanation of air and surfaces in hospital wards in therapeutic and preventive establishments. These lamps have a poerful disinfecting effect. The greatest bactericidal effect is achieved with bactericidal irradiators with production capacity of 3 W per m^3 working for 2 hours. However, when they are on, excessive amounts of ozone and nitric oxide can accumulate in the rooms. When using ultra-violet in

hospitals, the person should follow accident prevention regulations. For disinfection of the air and surfaces special mobile and stationary bactericidal irradiators are used. Both wall and ceiling bactericidal irradiators belong to stationary bactericidal irradiators.

Sanation of air on hospital premises in the absence of people with bactericidal lamps made of uviol glass

Sanation of air on hospital premises in the absence of people is usually carried out in bacteriological laboratories, operating theatres, dressing-rooms, in laboratories, at the chemist's after cleaning. In this case open lamps BUV-15, BUV-30 are usually used. The lamps are placed at a height of about 2.5 m above the floor or evenly all about the room, or above the workplaces, or in the doorways where a "screen" of bactericidal rays is created.

The number of lamps used for the sanation of air and the duration of sanation depend on the size of the room. The minimum number of lamps used for the sanation of air should be enough to cover 1 m^3 of the area with 1.5 W of the consumed power. The duration of sanation of air should be as long as possible; the minimum duration should be 15-20 minutes.

Sanation of air in the presence of people

Sanation of air in the presence of people is the most effective way of sanation, because people seem to be the main source of bactericidal contamination of air on hospital premises. The sanation of air in the presence of people may be carried out with the use of shielded bactericidal lamps made of uviol glass with production capacity of no more than 1 W per l m^3; therefore, only the upper portion of the premises is irradiated. Shielded lamps are usually placed evenly all about the room at a height of no less than 2 m above the floor in the places with the most intensive convection currents of air (for example, above heating devices, doorways and window frames).

To calculate the production capacity of a bactericidal device, it is necessary to provide 0.75 — 1 W of the consumed power per 1 m^3 of area.

The total duration of air irradiation indoors should not exceed 8 hours per day. The optimum mode of irradiation should include 3.4 irradiations alternating with breaks to air the room.

Exemplary calculation of the number of lamps necessary for sanation of air on hospital premises in the presence of people

Problem: For sanation of the corridor with an area of 270 m^3 BUV-30 lamps should be used. The sanation of air will be undertaken in the presence of people. Calculate the number of BUV-30 lamps necessary for the sanation of air and state where and how they should be placed.

Solution:

1. Overall power of the device:
а) minimum - 0,75 W/m^3 x 270 m^3 = 197,5 W;
б) maximum – 1.0 W/m^3 x 270 m^3 = 270 W.
2. Number of lamps:
а) 197.5 W: 30 W = 6.583, that is 7 lamps are necessary for irradiation of the room.
б) 270 W: 30 W = 9 lamps.

Answer: 7-9 BUV-30 lamps are necessary for the sanation of air in the room.

Table 1

Area of the land for constructing hospitals

Number of beds in hospital	Area of land per 1 bed (for adults), m^2	Area of land per 1 bed (for children), m^2
150	150	150
300-400	125	200
500-600	100	135
800-1000	80	-

Table 2

Area of room in medical establishments

Hospital premises	Area (m^2)
Hospital wards for adult patients: - hospital wards with only one bed - hospital wards with two or more beds	10 7
Nurse's station	6
Treatment rooms	12
Doctor's consulting room	12
Canteen	15
Lavatories for patients: one for men and another for women with a wash-basin (1 lavatory pan per 15 men and 1 lavatory per for 10 women)	1.76 for each cabin
Bathroom for 1 bath with showers	12

Shower cubicle for women	5
Clean linen stores	4 per one operating theatre (no less than 10)
Matron's office	10
Office of Head of department	16
Medical staff room	12
Dressing-room (bandaging room)	18
Small operating theatre with preoperating room	24+8
Operating theatre	36
Room for anesthesia	12
Preoperating room (for 1 operating theatre)	10
Preoperating room (for 2 operating theatres)	12
Sterilizing room	10
Procedure room	12

Table 3

Parameters of microclimate in medical establishments

Hospital premises	Temperature of air, C°	Relative air humidity, %	Air velocity, m/s
Hospital wards for adults; wards for women in children´s department	20 - 26	no more than 60	0.1– 0.2
Doctor´s consulting room	20 - 27	no more than 60	0.1– 0.2
Operating room, postoperative wards, intensive care unit (ICU), delivery rooms	21 - 24	no more than 60	0.1– 0.2
Laboratory, dressing-room (bandaging room)	22 - 26	no more than 60	0.1– 0.2
Physical therapy room	18 - 28	no more than 60	0.1– 0.2

Table 4

Standard of artificial lighting on hospital premises

Type of room	Minimum permissible lighting
Wards for adults	100
Wards for children, postoperative wards, intensive care unit (ICU)	200
Operating room; delivery room	500
Post nurses	300
Doctor´s consulting room	300 (500)

Chapter 2 Workplace hygiene

THEME 2.1

FACTORS OF WORKING ENVIRONMENT; THEIR EFFECTS ON HUMAN HEALTH; PREVENTIVE MEASURES AGAINST OCCUPATIONAL DISEASE

Motivational statement of theme

At work a person is exposed to the effects of physical, chemical and biological factors of working environment as well as psychological and physiological factors of the organization of the workplace and lay-out of the equipment at workplace. If the basic parameters of working environment do not correspond to hygienic standards, they are considered as harmful (can result in temporary or permanent reduction of work capability, occupational diseases, higher incidence of somatic and infectious diseases, may lead to health problems in the offspring), or dangerous resulting in the onset of acute disease or progressive deterioration of human health. In some cases it may be even fatal.

Any health specialist should be able to reveal the cause of disease and establish the relationships between the person's occupation and his health problems, as well as predict the effects of working environment on the course of the disease, pregnancy and postoperative period. A health specialist should be also able to apply this knowledge to performing primary and periodical medical examinations, in providing professional consultations to teenagers and in organizing the work of health workers.

Objective: learning how to evaluate a negative effect of working conditions on a person's health and work capability; familiarizing the students with hygienic standards of working environment and preventive measures aimed at providing safe working conditions.

Students' classroom activities:

1. Presenting of students' reports and their discussion.

2. Case problems. The solution of the situational problems should be reported in writing.
3. Evaluating the working environment in a classroom at the Hygiene and Ecology Department.
3.1 Taking the necessary measurements and filling in Table 1.
3.2 Drawing a conclusion about the working environment in the classroom.
3.3 Developing measures for improving the working environment in the classroom.

Students' independent activities

1. Harmful and dangerous production factors.
2. Harmful production factors, their classification.
3. Evaluation of working environment according to the indices of harmful and dangerous factors. Types of working conditions. Hygienic criteria of evaluation.

4. Common occupational diseases. Occupational diseases caused by heating microclimate, noise, excessive vibration, ionizing radiation, toxic substances, occupational dust.
5. Preventive measures against occupational diseases.

Plan of students' independent activities

" __ " _____20__ .

1. Case problem № _____

1.1. Workplace factors. Evaluation of their basic parameters:

_____
_____
_____

1.2. Type of working conditions:

_____
_____
_____

1.3. Health problems associated with by the effects of harmful working conditions:_____
_____
_____
_____
_____

4. Preventive measures:

_____
_____
_____
_____

2. Evaluation of working conditions in a classroom at the Hygiene and Ecology Department.

Table 1

Working conditions in the classroom

Parameter	Instrument	Result	Sanitary norm
Space per person	Measuring tape		2.2-3 m
Distance from the	Measuring		No more than 2 m

blackboard to the first desk	tape		
Distance between the desk and the last desk	Measuring tape		No more than 20 m
Distance between the desk and the outside wall	Measuring tape		No less than 90 m
Sizes of the desk: its width, height and length	Measuring tape		50 cm 75 cm 60 cm
Ventilation capacity at workplace	Anemometer, measuring tape		30 m^3
Air temperature	Thermometer		20-23 °C
Relative air humidity	Psychrometer		40-60%
Coefficient of natural lighting	Luxmeter		No less than 1.5%
Artificial lighting	Watt's method		300 Lx

1. Conclusion about the type of working conditions: optimum, maximum permissible, harmful, dangerous (underline).
2. Measures for improving working conditions:

_____
_____
_____

Done by: _____
Supervisor: _____

Reference information

Term definition

OCCUPATIONAL HYGIENE is referred to as preventive medicine which studies the conditions and nature of the working environment and their effects on a person's health and functional state; it also develops scientific fundamentals and practical measures aimed at prevention of harmful and dangerous effects of the factors of working environment.

WORKING CONDITIONS are referred to as a number of factors of working environment in which a person works.

HARMFUL WORKPLACE FACTORS are basic factors of working environment which in certain conditions (e.g. intensity, duration of work, etc.) can result in an occupational disease, temporary or permanent reduction in work

capability, higher incidence of somatic and infectious diseases, health problems in the offspring (Fig. 1).

DANGEROUS WORKPLACE FACTORS are factors of working environment which can cause an acute disease or sudden deterioration of health. In some cases their effects may be even fatal. Depending on the quantitative characteristics and duration of work, some harmful workplace factors can be classified as dangerous.

HYGENIC STABDARDS FOR WORKING CONDITIONS (MAXIMUM PERMISSIBLE CONCENTRATION (MPC) & MAXIMUM PERMISSIBLE LEVEL (MPL) are referred to as the extent of maximum permissible harmful production factors which must not cause any disease or health problems revealed in the course of work or much later in life in the present generation or its offspring. These factors are relevant in daily work (except weekends) which usually amounts to no more than 40 hours a week. Hypersensitive people, however, may develop health problems even if the working conditions are adequate.

EXPOSURE is a quantitative characteristic of intensity and duration of the action of harmful production factors on a person.

TIME PROTECTION is reduction of the effects of harmful production factors on a person by reducing the duration of work, introduction of scheduled breaks between shifts, reduced working days, increased holidays, limitation of working time in the above mentioned working conditions.

SAFE WORKING CONDITIONS are working conditions in which have no harmful or dangerous effects on a person or they do not exceed the permissible hygienic norm.

COMBINED ACTION OF POISONS is simultaneous or sequential long-term effects of a number of poisons entering the body in the same way.

MIXED ACTION is simultaneous or sequential long-term effects of factors of a various nature (e.g. chemical, biological, physical) on the human body.

CLASSIFICATION OF HARMFUL WORKPLACE FACTORS

1. Physical factors:

- Air temperature, air humidity, air velocity, thermal radiation;
- Non-ionizing electromagnetic fields and radiation: electric fields, constant magnetic fields (including geomagnetic fields), electrical and magnetic fields of industrial frequency (50 Hz), electromagnetic radiation of radio-frequency range, electromagnetic radiation of the optical band (including laser and UV-radiation);
- Ionizing radiation;
- Industrial noise, ultrasound, infrasound (i.e. infrasonic sound);
- Vibration (local and general);
- Aerosols (occupational dust) of fibrogenic action;

- Lighting: natural (absent or insufficient), artificial (insufficient lighting, direct and indirect bright lighting, lighting fluctuations);
- Electrically charged particles of air, aeroions.

2. Chemical factors include some substances of biological nature (e.g. antibiotics, vitamins, hormones, enzymes, protein preparations) synthesized chemically and/or for whose control methods of chemical analysis are used.

3. Biological factors:

Pathogenic microorganisms
Microorganisms-producers
Living cells and spores found in some preparations

4. Workplace factors characterizing the extent of strain of work:
Physical dynamic load

Net mass of weight lifted and/or moved
Monotonous work movements
Static load
Position at work
Inclination of the human body
Movements in space

5. Factors of production process characterizing the intensity of work:

Intellectual, sensory, emotional load
Monotonous load
Working regimen

HYGIENIC CRITERIA OF EVALUATION AND CLASSIFICATION OF WORKING CONDITIONS ACCORDING TO OCCUPATIONAL HAZARDS OF WORKING ENVIRONMENT, EXTENT OF STRAIN & INTENSITY OF WORK

Hygienic criteria are indices which enable us to evaluate the extent of the deviating parameters. This is related to the parameters of working environment and production process.

Classification of working conditions is performed according to the differentiation of the above mentioned deviating parameters. Working with causative agents of infectious diseases as well as substances which should not be inhaled or found on the skin (e.g. antitumor medicines, estrogenic hormones, narcotic analgesics) enables us to assign some working conditions to a certain class of occupational hazards.

If hygienic standards are neglected, it is necessary to use personal protective gear and reduce the duration of exposure to harmful workplace factors (i.e. time protection) (Fig. 2).

Working in dangerous working conditions (class 4) is not allowed except in case of eliminating the consequences of an accident or prevention of an accident.

According to hygienic criteria, working conditions are divided into 4 types: optimum, maximum permissible, harmful and dangerous.

Optimum working conditions (type 1) are working conditions in which the employees' health is protected and conditions for maintenance of high work capability are created.

Optimum working conditions were defined for microclimatic parameters and workplace factors. As for other factors, conventionally optimum working conditions are considered to be conditions in which harmful workplace factors are absent or they do not exceed the permissible level.

Maximum permissible working conditions (type 2) are characterized by harmful production factors which do not exceed the permissible hygienic standards. Any functional changes occurring in the human body are restored at rest or by the beginning of the next work shift. These working conditions do not cause any health problems in the present generation or in the offspring.

The first and second types are referred to as safe working conditions.

Harmful working conditions (type 3) are characterized by the presence of harmful workplace factors which exceed permissible hygienic standards and may cause health problems in the employee and his offspring.

According to the extent of exposure to harmful working conditions, four degrees of occupational hazards are distinguished:

1st degree of type 3 (3.1) are working conditions in which harmful production factors may result in functional changes of the human body which can be restored at rest over a prolonged period of time. Working in these conditions can increase the risk of health problems

2nd degree of type 3 (3.2) are working conditions in which harmful workplace factors can cause persistent functional changes in the human body. Working in these conditions may lead to increased rate of occupational diseases which are characterized by a permanent loss of work capability or by involvement of the most vulnerable organs and systems, development of initial signs or early (associated with a loss of work capability) stages of occupational diseases caused by a prolonged exposure to harmful factors. These usually occur in 15 years or more.

3rd degree of type 3 (3.3) are working conditions in which harmful workplace factors can result in the development of occupational diseases at an early or advanced stage (associated with a loss of work capability) in the course of work as well as in increased number of chronic occupational diseases, and their increased incidence associated with a permanent loss of work capability.

4th degree of type 3 (3.4) are working conditions that are characterized by an advanced stage of occupational diseases associated with total loss of work capability as well as increased incidence of chronic diseases.

Dangerous working conditions (type 4) are characterized by workplace factors whose effects on a person at work pose a threat to his life and increase the risk of development of acute occupational diseases.

Table 2

Types of working conditions

Factor	2	3.1	3.2	3.3	3.4	4
Maximum permissible concentration & maximum permissible level						
Harmful substances of the 1st & 2nd type of danger except for those mentioned below	<MPC	1.1-3	3.1-6	6.1-10	10.1-20	>20
Substances with an acute mechanism of action. Substances with an irritant action	<MPC	1.1-2 1.1-2	2.1-4 2.1-4	4.1-6 5.1-10	6.1-10 10.1-50	>10 >50
Allergens	<MPC	1.1-3	3.1-10	>10	_	_
Carcinogens;	<MPC	1.1-2	2.1-4	4.1-10	>10	_
Aerosols of fibrogenic action	<MPC	1.1-2	2.1-4	4.1-10	>10	_
Antitumor medicines, estrogenic hormones	_	_	_	_	+	_
Narcotic analgesics						
Pathogenic microorganisms: extremely dangerous infections, causative agents of some other infectious diseases	_	_	_	_	_	+
Producer microorganisms; preparations which contain living cells and spores of some microorganisms	<MPC	1,1-10,0	10,1-100,0	>100	_	_
Noise (equivalent level of sound, db)	<MPL	Up to 5	15	25	35	>35

Vibration (equivalent level of vibrospeed, db) Local General	<MPL <MPL	Up to 3 Up to 6	6 12	9 18	12 24	>12 >24

Note:

1. The extent of occupational hazards is determined according to maximum concentrations of harmful substances in the air compared with hygienic standards.

2. If there are some harmful substances with the same effect in the air of the area, the indices of their effect should be added up. We take the sum of the ratios of their actual concentration to the maximum permissible concentration (MPC) which should not exceed one, and then we calculate the extent of permissible concentration of harmful substances in the air.

3. If there are two or more harmful substances of different action in the air of the area, the type of occupational hazards should be determined in the following way:

- according to the substance whose concentration corresponds to the highest type and extent of occupational hazards;
- according to the presence of several harmful substances whose concentrations correspond to type 3.1.; it does not have any effect on the extent of occupational hazards;
-according to the presence of three and more harmful substances whose concentrations correspond to type 3.2., making them even more harmful (type 3.3.).
-according to the presence of two and more harmful substances whose concentrations correspond to type 3.3., making them more harmful (type 3.4., type 4).

4. If the substance has some specific effects (e.g. carcinogens, allergens, etc.), the evaluation of working conditions is usually carried out according to the highest extent of occupational hazards.

THEME 2.2
EXTENT OF STRAIN & INTENSITY OF WORK THEIR EFFECT ON EMPLOYEES' PHYSICAL FUNCTION

Motivational statement of theme

A person usually works in certain working conditions (e.g. microclimate, dust content, air pollution, industrial noise, vibration, lighting, etc.) which, on the one hand, should provide for work, but, on the other hand, may have a negative effect on the person's work capability.

Besides working conditions, there are some other workplace factors that also have an effect on the functional state and work capability of people. These factors include those characterizing the extent of strain of work (e.g. physical dynamic load, net mass of weight lifted and/or moved, total amount of stereotyped work movements, static load, position at work, inclination of the human body at work, movements in space, etc.) and factors characterizing the extent of intensity of work (e.g. intellectual, sensory, emotional load, monotony of load, work regimen).

If working conditions do not correspond to the hygienic norms (e.g. forced position at work, emotional stress, excessive duration and intensity of work, etc.), the person may develop overexertion of a number of functions and systems of the body as well as rapid fatigability, and some occupational diseases.

Knowledge of these issues will enable the doctor to reveal the relationship between the cause of the disease and the patient's work as well as to optimize working conditions in therapeutic establishments.

Objective: learning how to evaluate the type of work (the extent of strain and intensity of work) according to the functional state and work capability of people; familiarizing the students with some physiological methods of studying work capability and fatigability of people as well as measures aimed at improving working conditions.

Students' classroom activities

1. Case problems. The solution of situational problems should be reported in writing.

2. Research of the person's ability to brainwork at a forced rate “Number/letter combinations”.

3. Studying the effects of physical activity (work model) on the person’s functional state. Evaluating the extent of strain of work according to a hygienic classification.

Experiment technique.

3.1. A person should perform a preset amount of work. It consists in lifting and lowering a 5-kilo dumb-bell at the height of 1 m for 3 minutes.

3.2. It is necessary to calculate the number of physical movements performed by the student during this time.

3.3. The students should examine the physical state of the person in two stages. First they should record the indices of the initial state before starting the work and immediately after finishing it. At each stage they should record the parameters considered in Table 1.

3.4. Recording the results of the experiment in Table 3 of the plan and drawing a conclusion about shifts of functional parameters of the human body. The information given in Table 2 should be considered.

3.5. Calculating physical dynamic load (given in units of external work) using the following equation:

$$A = /(P \times H + \frac{P \times H1}{2} + \frac{P \times L}{9{,}8}) \times 6/ \times n,$$

where,

A - Volume of work, kgm;

P - Net mass of weight lifted, kg (5 kg);

H - Height at which the weight is lifted, m (lm);

HI - distance at which the weight is lowered, m (1 m);

L - Distance of horizontal movement of the weight, m (O m);

n - Amount of times lifting and lowering the weight.

3.6. Estimating the extent of strain of work according to a hygienic classification and revealing a possible negative effect on health. Developing methods of optimization of working conditions.

4. presenting and discussing reports assigned by the teacher.

Students' independent activities

1. The extent of strain & intensity of work, their definition.
2. Parameters of the extent of strain and intensity of work.
3. Fatigue & overfatigue: their definition, subjective & objective signs.

Plan of students' independent activities

"__ "_____20__ .

1. Case problem № ____ _____

_____

_____

_____

_____

_____

_____

2. Studying the effects of physical work on the functional state of a person and evaluating the extent of strain of work.

Net mass of weight lifted_____ kg; height at which the weight is lifted and lowered _____ m; amount of times lifting and lowering the weight_____.

Table 1

Effects of physical work on human functional state

Parameters	Methods	Results	
		1	2
Maximum arbitrary force of hand muscles,	Dynamometry		
Tremor of hand: Amplitude (range) Frequency (rate)	Skin thermometry: number of contacts with irregularly shaped edges; number of contacts: total time (sec)		
Heart rate (HR)	It is determined on palpation or according to pulse tachometer scale		
Arterial blood pressure: Systolic (SP) Diastolic (DP)	Manometer		
Pulse pressure (PP)	PP=SP – DP		
Stroke volume (SV)	SV=101+0.5 SP-l.09 DP-0.6 • age (years)		
Minute stroke volume (MSV)	MSV=SV • HR		

Make a conclusion about basic functional shifts occurring in the human body:
_____
_____
_____

Physical dynamic load is calculated using the equation _____ _____kg/m.

Type of working conditions according to the given parameter of the extent of strain of work:
1. Optimum (mild physical load).
2. Maximum permissible (average physical load).
3. Harmful (hard physical load) /3.1; 3.2/ - underline.

Prognosis of the effects of unfavorable factors on work capability of people:

_____
_____
_____
_____

Measures to improve working conditions:

_____
_____
_____
_____

Done by: _____
Supervisor: _____

Reference information

EXTENT OF WORK STRAIN is a characteristic of the job which reflects the physical load on the musculoskeletal system and functional systems of the human body, for example, cardiovascular, respiratory system, promoting its activity.

EXTENT OF WORK INTENSITY is a characteristic of the job which reflects mainly the load on the central nervous system, sense organs and emotional state of the person.

WORK EFFICIENCY is a condition of the person in which a number of physical, intellectual and emotional abilities enable the worker to perform a certain amount of work of a given quality.

WORK CAPABILITY is a condition of the person determined by the opportunities of physiological and mental functions of the human body which characterizes the ability of the human body to perform a certain amount of work of a given quality and over a certain period of time.

The extent of work capability depends on working conditions, age, state of health, the person's skills, motivation, moral and material stimuli. Three phases of work capability are distinguished: adaptation phase, phase of high and relatively stable work capability and a phase of reduced work capability (tiredness).

FUNCTIONAL STATE OF THE HUMAN BODY is a number of physiological functions and qualities of a person providing for effective performance of work considering a certain amount of energy consumption.

FATIGUE is a temporary, reversible reduction of functional abilities of a person (or work capability) caused by performing work in certain working conditions. OVERFATIGUE is a long or irreversible reduction of work capability (pathological state) resulting from fatigue accumulating in the human body under the influence of poor working conditions.

OPTIMUM WORK LOAD is a load that does not lead to rapid fatigue of the person at the end of their work shift. It also provides for vital activity of the human body throughout their life.

MAXIMUM PERMISSIBLE WORK LOAD is the load which does not lead to overfatigue of the person at the end of their shift. It does not cause health problems in people nor has a negative effect on work capability of people throughout their life.

MAXIMUM PERMISSIBLE INTENSITY RATE (no more than 5-10 minutes per shift) can be determined according to the heart rate; it amounts to 160 beats/min. in men, and 150 beats/min. in women. These values should be reduced by 10 per 1 min. for people over 30, and by 20 per 1 min. for people over 40.

If the actual physiological parameters do not correspond to the recommended values, measures aimed at reducing work load should be undertaken. They may include mechanization and automatization of work operations, improvement of the medical and sanitary situation, optimization of working and resting conditions.

Extent of strain at work (appendix, table 2)

- Physical dynamic load (given in units of external work per shift, kg/m);
- Net mass of weight lifted and/or moved (kg);
- Stereotyped work movements (amount of movements per shift);
- Static load;
- Posture at work;
- Inclination of the human body;
- Movements in space (km).

Types of working conditions according to the extent of work strain "Physical dynamic load". They are given in units of external mechanic work per shift/kg/m in regional load and moving a weight at a distance of 1 m):

1st type: men - up to 2500; women - up to 1500;
2nd type: men - up to 5000; women - up to 3000;
3rd type: 3.1: men - up to 7000; women - up to 4000;
3.2: men - less than 7000; women - less than 4000.

Criteria for assessing the extent of work intensity
(appendix, table 1)

- intellectual load (content of work, perception of signals (i.e. information) and their evaluation, distribution of functions according to the extent of work strain, nature of work);

- sensory load (duration of observation, number of signals and messages per hour, number of objects which should be observed at the same time, size of the object to be observed, working with optical devices, working at a display, load on the auditory analyzer and vocal apparatus);

- emotional load (extent of responsibility for the outcomes of work, significance of a slight mistake; extent of personal risk, extent of responsibility for safety of other people's lives);

- monotonous load (number of work operations necessary for performing a simple task or performed repeatedly; duration (sec.) of performing simple or repeated operational tasks; the percentage of time of active work in relation to the duration of the shift; monotonic load);

- work regimen (actual duration of a working day, work shifts)

Table 2

Physiological standards of physical stress at work

Criteria	Maximum permissible values				Optimum
	1-2	3-4	5-6	7-8	8-8
Heart rate (HR) per 1 min at -general load	130	120		100	85-95
- regional load	120		100	100	75-85
- local load	100	95	90	85	75-82
-with prevalence of static load	105	100	95	90	80-8

Note:

Total work is the work which involves various groups of muscles (e.g. muscles of lower extremities and of the trunk). Regional work is the work which involves the muscles of the shoulder girdle and the girdle of upper extremities. Local work is the work which involves the muscles of the forearm and the hand.

When work capability of people reduces and the person develops fatigue, dynamometric indices are usually decreased, and tremor (constant, involuntary slight shaking) of the hands increases.

Hemodynamic indices provide information about the supply of the organs with oxygen, nutrients, hormones and other regulating substances. The character and significance of their changes show the extent of strain and intensity of work. In a moderate muscle load the most rational and effective response is an increase of stroke volume (SV) which is not associated with acceleration or is associated with slight acceleration of the heart rate (HR). Minute stroke volume of blood circulation is increased and thus, the working muscles are well supplied with blood.

Greater muscle load, especially in unfavorable working conditions, may lead to a negative response. In this case an increase of minute stroke volume is not only achieved by an increase in the heart muscle strength and stroke volume. It is

achieved through an increase of the heart rate. It has a negative effect on systemic circulation

The greatest muscle load in unsatisfactory working conditions may lead to a less adequate reaction on the part of the circulatory system. The workers show decreased stroke volume (SV) which is not compensated for by a corresponding acceleration of pulse rate. Sometimes it may be associated with a relative slowdown of pulse rate compared with the period of stable work capability of the person or average pulse rate during their work shift. As a result, minute stroke volume does not increase; on the contrary, it reduces. In most cases the above mentioned pathologic reactions are permanent. Some workers may develop functional changes resulting in cardiovascular disease.

Table 3

Classification of types of working conditions based on the extent of work intensity

Parameters of the extent of work strain	Optimum	Maximum permissible	Harmful (hard work)	
	Mild physical activity	Average physical activity	1st degree	2nd degree
	1	2	3.1	3.2
1. Intellectual load				
1.1. Content of work	No decision-making involved	Dealing with problems according to the given algorithm	Dealing with difficult problems according to the given algorithm	Creative activity which is associated with decision-making and dealing with difficult problems
1.2. Perception of signals (i.e. information) and their evaluation	Perception of signals without their correction	Perception of signals with their subsequent correction	Perception of signals with evaluation of actual values of the parameters of work	Perception of signals with comprehensive evaluation of the parameters of work
1.3. Extent of work strain of	Processing information and solving a problem	Processing information, dealing with a problem and checking the results	Processing information, checking the results and controlling work	Controlling work and distribution of functions according to the extent of strain of work
1.4. Character of work	The work is performed according to an individual plan	The work is performed according to a plan which can be corrected in the course of work	The work is performed in conditions of shortage of time	The work is performed in conditions of shortage of time and the worker takes responsibility for the end results
2. Sensory load				

2.1. Duration of observation (given in percent per shift)	up to 25%	26-50%	51-75%	more than 75%
2.2. Number of signals and messages per hour	up to 75	76-175	176-300	more than 300
2.3. Number of objects which to be observed at the same time	up to 5	6-10	11-25	more than 25
2.4. Load on the visual analyzer, - size of the object to be observed (the distance from the eyes to the object should not be more than 0.5 m) - working with optical devices (given in percent per shift) - working at a display (hours)	more than 5 mm up to 25% up to 2	5 — 1.1 mm 25 - 60% 2-3	1 – 0.3 mm 51-75% 3-4	less than 0.3 mm more than 75% more than 4
2.5. Load on the auditory analyzer:	100-90%	90 - 70%	70 - 50%	less than 50%
3. Emotional load				
3.1. Extent of responsibility for the results of work, implications of a slight mistake	The person takes responsibility for fulfilling certain work. It involves additional efforts of the worker	The person takes responsibility for a high quality of auxiliary work. It involves additional efforts of the management	The person takes responsibility for a high quality of auxiliary work. It involves additional efforts of the staff	The person takes responsibility for a high quality of the end product. It involves damage to equipment, stopping of work and personal risk
3.2. The extent of personal risk	No risk	-		Possible

3.3. The extent of risking the safety of other people's lives	No risk	-		Possible
4. Monotonous load				
4.1. The number of work operations necessary for performing a simple task or performed repeatedly	more than 10	9-6	5-3	less than 3
4.2. Duration (sec.) of performing simple or repeated operational tasks	more than 100	100-25	24-10	less than 10
5. Work regimen				
5.1. Actual duration of a working day	6-7	8-9	10-12	more than 12
5.2. Work shifts	One shift work (without night shifts)	Two shift work (without night shifts)	Three shift work (night shifts)	Irregular shift work alternating with night shifts

Table 4

Classification of types of working conditions based on the extent of work strain

Parameters of the extent of work intensity	Optimum (mild physical activity	Maximum permissible (average physical activity	Harmful (hard work)		
			1st degree	2nd degree	3rd degree
1	2	3	4	5	6
1. Physical dynamic load (given in units of external work per shift, kg/m)					
1.1. Regional load (a work involving the muscles of the shoulder girdle and the girdle of upper extremities). It is used when moving an object at a distance of 1 m					
- males	up to 2500	up to 5000	up to 7000	up to 9000	More than 9000
- females	up to 1500	up to 3000	up to 4000	up to 5500	More than 5500
1.2. Total work is the work which involves various groups of muscles (muscles of lower and upper extremities, muscles of the trunk). It is used when moving an object at a distance of 1 - 5 m					
- men	up to 12500	up to 25000	up to 35000	up to 45000	More than 45000
- women	up to 7500	up to 15000	up to 25000	up to 27000	More than 27000
1.3 Total work is used when moving an object at a distance of less than 5 m					
- males	up to 24000	up to 46000	up to 70000	up to 90000	More than 90000
- females	up to 14000	up to 28000	up to 40000	up to 55000	More than 55000

2. Net mass of weight lifted and/or moved (kg)					
2.1. Lifting and moving weight alternating with some other work (2 times per hour) - men - women	up to 15 up to 5	up to 30 up to 10	less than 30 less than 10		
2.2. Lifting and moving weight repeatedly (during work shift) - males - females	up to 5 up to 3	up to 15 up to 7	up to 30 less than 7	More than 30	
2.3. Total weight which is moved per hour • from work surface: - males - females • from the floor - males - females	-	up to 870 up to 350 up to 435 up to 175	less than 870 less than 350 less than 435 less than 175		
3. Stereotyped work movements (amount of movements per shift)					
3.1. Stereotyped work movements in local load (work involving the muscles of the hands and fingers)	up to 20000	up to 40000	up to 60000	More than 60000	
3.2. Stereotyped work movements in regional load (work involving the muscles of the shoulder girdle and the girdle of upper extremities)	up to 10000	up to 20000	up to 30000	More than 30000	
4. Static load (values per shift)					

Moving weight - with one hand - with both hands - involving the muscles of the trunk For women these values are reduced by 40%	up to 18000 up to 36000 up to 43000	up to 36000 up to 70000 up to 100000	up to 70000 up to 140000 up to 200000	More than70000 More than 140000 less than 200000	
5. Position at work					
	Free, comfortable (the person may change position at work, e.g. "standing-sitting")	The person has to stay in an uncomfortable fixed position at work (up to 25%)	The person has to stay in an uncomfortable fixed position at work (up to 50%)	The person has to stay in an uncomfortable fixed position at work (over 50%)	
6. Inclination of the human body (amount of body inclinations per shift)					
The amount of body inclinations per shift	up to 50	Body inclinations at an angle of 30° 51-100	Body inclinations at an angle of 30° 101-300	Body inclinations at an angle of 30° more than 300	
Movements in space (per shift, km)	up to 4 km	up to 10 km	up to 15 km	More than 15 km	

THEME 2.3
PROVIDING RADIATION SAFETY OF MEDICAL PERSONNEL

Motivational statement of theme

Radioactive substances, sources of ionizing radiation are now widely used in clinical practice for diagnostic and therapeutic purposes. If radiation safety is neglected, this could have a direct and/or remote impact on the patients' and personnel's health. That is why knowing the rules of radiation safety when handling radioactive substances and ionizing radiation sources is so important in clinical practice.

Objective: familiarizing the students with the main parameters of radioactive safety so as to create safe working conditions for handling ionizing radiation sources**.**

Students' classroom activities

1. Solving case problems determining the main parameters of protection against external radiation: quantity, time, buffer distance, and barrier shielding.
2. Viewing a classroom video, holding a discussion on the viewed material.
3. Listening to students' reports**.**

Students' independent activities

1. Occupational hazard upon exposure to ionizing radiation.
2. Basic protective measures when handling bare and sealed sources of ionizing radiation.
3. Sanitary and epidemiologic control when handling sources of ionizing radiation.

Plan of students' independent activities

"_____"_____20__.

1. Case problem No_____

Computational formula for maximum permissible activity of a radiation source that allows working without a shield for a given period of time at a given distance:

Obtained result:

Maximum admissible activity of a radiation source _____Bq.

2. Case problem No ____

Formula determining the period of handling a radioactive substance on a regular basis during a week when safe working conditions are retained (without exceeding the maximum permissible dose):

Obtained result:

Period of work_____hours a week.

3. Case problem (buffer distance) No_____
Computational formula for the buffer distance from an active radiation source which permits safe work (for a given period of time, with a given source of radiation):

Obtained result:
distance_____meters.

4. Case problem (barrier shielding) No_____
Computational formula for coefficient of attenuation:

Obtained result:
Coefficient of attenuation: _____times.
Computing the thickness of a barrier shield of lead (in mm) depending on the coefficient of attenuation and gamma-radiation energy using tabular information (Table 2).
Obtained result:
Thickness of barrier shield of lead: _____millimeters.

Done by_____
Supervisor_____

Reference information

Term definitions

BECQUEREL (Bq) is a SI-derived unit of radioactivity. One Bq is defined as the activity of a quantity of radioactive material in which one nucleus decays per second.

EXTERNAL IRRADIATION is exposure of a human body to ionizing radiation from an external source.

INTERNAL IRRADIATION is exposure of a body, its parts or tissues to ionizing radiation emitted by radio nuclides contained in the tissues.

DOSIMETRIC CONTROL is a means of checking whether the radioprotection measures for personnel handling ionizing radiation sources are sufficient; it includes:
- determining the individual irradiation dose for each person using a personal dosage meter;
- systematic control over the radiation intensity on the workplace and in adjoining premises;
- utilizing devices signaling that the permissible dose is exceeded.

IONIZING RADIATION is any radiation with enough energy so that during an interaction with an atom, it can remove tightly bound electrons from the orbit of the atom, causing the atom to become charged or ionized (visible light or ultraviolet rays are not included into the notion of ionizing radiation).

IONISING RADIAITON SOURCE is a substance or device emitting or capable of emitting ionizing radiation.

SEALED RADIOACTIVE SOURCE is a source of ionizing radiation constructed so that radioactive substances cannot escape into the environment; external irradiation of the personnel is possible at that.

BARE RADIOACTIVE SOURCE is a source of ionizing radiation whose handling can result in radioactive substances escaping into the environment; internal and external irradiation of the personnel is possible in this case.

PROTECTION AGAINST EXTERNAL IRRADIATION:

QUANTITY PROTECTION means handling a minimum quantity of radioactive substances; the underlying principle is attenuation of radiation intensity;

TIME PROTECTION means reducing the time period of handling the source of ionizing radiation;

DISTANCE PROTECTION means putting a safe distance between the personnel and the ionizing radiation source;

BARRIER SHIELDING means utilizing the barrier properties of materials that absorb radiation.

SIEVERT (Sv) is a SI derived unit of equivalent radiation dose and effective dose; it means the amount of energy absorbed by one kilo of biological tissue.

IRRADIATION CATEGORIES are defined conventionally based on the impact of ionizing radiation on the body or a cohort of irradiated individuals.

CRITICAL ORGAN (upon irradiation) is an organ or tissue, a body part or the whole body whose irradiation under the circumstances produces the greatest damage to the individual or his posterity. Critical organs are classified according to their radiosensitivity.

MeV (megaelectronvolt) is a unit of energy commonly used in nuclear and particle physics, equal to the energy acquired by an electron in falling through a potential of 1,000,000 volts.

PERSONAL COMPUTER (PC) is a small, relatively inexpensive computer designed for an individual user for word processing, accounting, desktop publishing, and for running spreadsheet and database management applications.

PERSONNEL means individuals who handle ionizing radiation sources on a regular or temporary basis.

MAXIMUM PERMISSIBLE DOSE means the annual effective dose or equivalent annual dose of ionizing radiation that a person may receive over 50 years without appreciable bodily injury

RADIOACTIVITY is a process by which the nuclei of unstable atoms of an element emit radiation (particles of matter and rays of energy), and in so doing become atoms of other elements.

RADIONUCLIDE is an unstable or radioactive type of atom characterized by a certain constitution of its nucleus and capable of existing for a measurable time. The nuclear constitution is specified by the atomic number, mass number, and atomic mass.

RADIOSENSITIVITY is relative susceptibility of cells, tissues, organs or organisms to the harmful effect of ionizing radiation.

RADIATION SAFETY is protection of human health against the harmful effect of ionizing radiation without unreasonable restriction of the useful activity when handling radioactive substances and ionizing radiation sources in industry, sciences and clinical practice.

EQUIVALENT DOSE is a computed average measure of radiation absorbed by a fixed mass of biological tissue that attempts to account for the different biological damage potential of different types of ionizing radiation.

EFFECTIVE DOSE is a measure of cancer risk to a whole organism due to ionizing radiation delivered non-uniformly to part(s) of its body. It takes into account both the type of radiation and the nature of each irradiated organ. The unit for effective dose is the sievert.

Radiation safety

Categories of irradiated individuals:

Category A personnel means individuals handling technogenic sources of ionizing radiation.

Category B personnel means individuals who do not handle ionizing radiation sources directly but can be exposed to ionizing radiation on their workplace.

Population means all people including the personnel outside their workplace with ionizing radiation sources.

Table 1

Basic dose limits

Standardized value	Dose limit		
	Category A personnel	Category B personnel	Population
Effective dose	20 MeV per year on average for any consecutive 5 years, but under 50 MeV per year	5 MeV per year on average for any consecutive 5 years, but under 12.5 MeV per year	1 MeV per year on average for any consecutive 5 years, but under 5 MeV per year

Equivalent dose per year: -in the lens -skin -hands and feet	 150 MeV 500 MeV 500 MeV	 37.5 MeV 125 MeV 125 MeV	 15 MeV 50 MeV 50 MeV

External radiation dose received when handling a source depends on the following*:*

- Intensity of the source,
- Exposure time,
- Distance from the radiation source,
- Density of the medium through which radiation travels.

Thus the methods of protection from external radiation are based on quantity, time period, distance, and barrier shield. The limit effective dose for category A personnel is the criterion for computing the parameters of protection from external radiation.

A simplified formula for computing the main parameters of protection is as follows:

$$\frac{m \times t}{R^2} = 1{,}8 \times 10^8$$

,

Where m is γ-activity of radiation source in Becquerel (Bq);
t is irradiation time for a working week, in hours;
R is the distance from the radiation source, in meters;
1.8 x 10^8 is evaluation coefficient.

Quantity protection means finding the maximum permissible activity of the source which can be handled without barrier shielding for a given period of time at a given distance. Computational formula:

$$m = \frac{1{,}8 \times 10^8 \times R^2}{t}$$

Time protection means defining the period of handling a radioactive substance for a week under safe circumstances (without exceeding the limit dose upon constant work) computational formula:

$$t = \frac{1{,}8 \times 10^8 \times R^2}{m}$$

Distance protection means defining the distance from the person to the radiation source which permits safe work for a given time, with a given source.
Computational formula:

$$R = \sqrt{\frac{5{,}8\times10^{6} \times 36}{1{,}8\times10^{8}}}$$

Barrier shielding method is based on the capability of materials to absorb ionizing radiation.

External irradiation with α-particles requires no barrier shielding as the path of α-particles in the air is short; they are easily stopped by materials like paper.

An aluminum sheet 0.5 cm thick, glass or plastic can shield from β-rays.
Protection from γ-rays is rendered by barrier shield of lead, cast iron, concrete. The intensity of γ-rays absorption is directly proportional to the specific weight of materials, and inversely proportional to the radiation energy.

The thickness of a barrier shield that can attenuate the intensity of γ-rays to the maximum permissible dose is computed according to the table (with consideration to radiation energy).

The value of coefficient of attenuation is defined according to the formula:

$$K = \frac{P}{P_0},$$

Where K is attenuation coefficient;
P is the received dose;
P_0 is maximum permissible dose (0.4 MeV per week).

Table 9 shows the thickness of a barrier shield, at the crossing of lines for the coefficient of attenuation and radiation energy.

Table 2

Thickness of barrier shield of lead (mm) depending on coefficient of attenuation and γ-radiation energy (angle beam)

Coefficient of attenuation, *K*	γ-radiation energy, MeV									
	0.1	*0.2*	*0.3*	*0.4*	*0.5*	*0.6*	*0.7*	*0.8*	*0.9*	*1.0*
1.5	0.5	1.0	1.5	2	2.5	3	4	6	7	8
2	1	2	3	4	5	7	8	10	11.5	13
5	2	4	6	9	11	15	19	22	25	28
8	2	5	8	11	15	19.5	23.5	28	32	35
10	3	5.5	9	13	16	21	26	30.5	35.5	38

A compulsory preliminary medical examination is performed before a person is employed to determine whether this person's condition is fit for the job he is assigned to as well as to early spot and prevent diseases.

Compulsory routine health screening is performed:

1) to provide continuous supervision over health condition of employees, to timely detect signs of diseases, early stages of occupational diseases, early signs of effects of harmful and/or dangerous workplace factors on employees' health condition;
2) to spot diseases and conditions which contraindicate further work involving exposure to harmful and/or dangerous workplace factors;
3) to timely take prevention and rehabilitation measures aiming at health maintenance and rehabilitation of employees;
4) to timely reveal and prevent the onset and spread of infectious and parasitic diseases;
5) to prevent accidents on the workplace.

To perform either preliminary or routine health screening a medical institution sets up a *permanent medical commission*.

A *medical commission* includes an occupational therapist as well as medical specialists who have had advanced training in the field of occupational therapy in due order or have a valid certificate to practice in the field of occupational therapy.

The frequency of medical routine health screenings is conditioned by the character of harmful and/or dangerous workplace factors that the employee is exposed to as well as activities they are involved in.

Employees under the age of 21 undergo routine health screenings on an annual basis.

THEME 2.4

HYGIENIC ASPECTS OF PC OPERATOR WORK MEDICAL AND SANITARY PROVISION FOR INDUSTRIAL WORKERS

Motivational statement of theme

Recent decades are characterized by mass introduction of computer technology in various industries, including medicine. This has led to an increase in the number of permanent working places equipped of computers. A variety of hygienic significant factors of the environment and workplace affected the PC operator. Understanding and ensuring compliance of existing regulations governing working conditions with the PC, is the key to workplace safety.

Objective: learning how to evaluate a negative effect of working conditions on a person's health and work capability; familiarizing the students with hygienic standards of working environment and preventive measures aimed at providing safe working conditions; teaching rational organization of PC work.

Students' classroom activities

1. Case problems. Solution of the situational problems should be reported in writing.

Students' independent activities

1. Complex production factors acting on PC users. Risk factors for the users' health. Possible consequences of its effects on the body.
2. Hygienic requirements for PC work.
3. Rational organization of work with PC.

Plan of students' independent activities

"__ "_____20__ .

1. Case problem (type 1) No _____

_____
_____
_____
_____
_____

Done by_____
Supervisor_____

Reference information

Production factors affecting PC users

1. Physical factors

Electrostatic field, the electromagnetic field of industrial frequency 50 Hz, ultraviolet and infrared radiation, noise. In current models of computers the electromagnetic, ultraviolet, infrared and electrostatic field are low-intensive and usually at a distance of 30 - 50 cm from the screen not exceeding MPLP. The electrostatic field has the ability to "charge" microparticulate dust particles hampering their sedimentation which creates additional risks of allergic diseases of the skin, eyes and upper respiratory tract.

The microclimatic conditions (e.g. air temperature, relative humidity of the air) in the working room tend to change. The extent of noise is steadily increasing.

2. Chemical factors.

VDT work contributes to the appearance of ozone in the air. Its concentration is usually less than the MRL for workplace (0.1 mg/m^3), but in poorly ventilated areas ozone concentrations can reach and even exceed the MPC.

3. Workplace factors characterizing the extent of work strain

The work with PC causes a greater strain of visual analyzer, interfaced with a significant intellectual, emotional stress.

Adverse health effects associated with prolonged work at the computer

Typical presentation in PC operators are dry, gritty eyes, headache, sore muscles pulling the neck, arms and back, poor concentration. Long-term continuous use of the computer, especially on a poorly organized workplace can cause occupational diseases of the nerves, muscles and tendons of the hand.

Hygienic requirements for the premises to work with PC

1. Premises for work with a PC must have natural and artificial lighting. Natural lighting must be provided by windows facing north and northeast. Desktops should be placed so that natural light falls mainly on the left side on the work surface.
2. Premises for work with a PC must have artificial lighting: fluorescent lamps.
3. Illumination on the work place surface should be 300 - 500 lux. Lighting should not create glare on the screen surface. Illumination of the screen surface should not be more than 300 lux.
4. Application fixtures without lenses and screening grids are not allowed.
5. Area per workplace for PC users based on cathode ray tube (CRT) must be at least 6 m². When using PVEM CRT (without auxiliary devices - printer, scanner, etc.) that meets international standards for computer security; with duration of work of less than 4 hours per day, a minimum area of 4.5 m² per workplace is allowed.
6. Soundproofing premises must meet hygiene requirements and provide the extent of noise at a work place no more than 50 dB.
7. Premises to work with the PC should have optimal microclimate parameters (according with the sanitary-epidemiological standards for microclimate of industrial premises).

Table 1

Optimal microclimate parameters for rooms with PC

Season	Job category	Temperature, C^0	relative humidity,%	Air velocity, m / s
Cold	light - 1a,b	21-24	40-60	0,1
Warm	light - 1a,b	22-25	40-60	0,1

Note: category 1a includes works produced by sitting position and not requiring physical exertion; category 1b includes works produced by sitting, standing or associated with walking and accompanied by some physical exertion.

8. Premises for PC operating systems must be equipped with heating, air conditioning or effective forced ventilation.
9. Equiment should be protected from exposure to direct sun light. The premises for the operation of the PC should be wet cleaned daily.

Requirements for the organization and arrangement of workplace equipped with a PC

1. Workplaces must be positioned so that the natural light shines from the side, mostly on the left.
2. Distance between desktops with video monitors (from the back side of the first monitor to the screen of the second one) shall not be less than 2.0 m, and the distance between the lateral surfaces of video monitors - not less than 1.2 m
3. Desktop design should provide optimal placement of equipment on the work surface, taking into account the amount and character of work.
4. The table working surface height should be adjusted within 680 - 800 mm; Modular dimensions of the working surface of the table should be considered: a width of 800, 1000, 1200 and 1400 mm, depth of 800 and 1000 mm at its irregular height of 725 mm.
5. Chairs of PC users should ensure
- width and depth of the seat surface is not less than 400 mm;
- height adjustment of the seat surface between 400 - 550 mm and forward angles up to 15 °, and back up to 5 °;
- height of the supporting surface of the backrest 300 ± 20 mm, width - not less than 380 mm;
- armrests;
- adjust the armrests height above the seat within 230 ± 30 mm;
6. Workplace for PC users should be equipped with a footrest. Keyboard should be arranged at a distance of 100 - 300 mm from the edge facing the user.
7. Eye level with the vertically placed screen will be on the center or 2/3 of the screen height.

THEME 2.5
HEALTH CARE PROVISION FOR EMPLOYEES AT INDUSTRIAL ENTERPRISES

Motivational statement of theme

In the prevention of general and occupational diseases, constant medical monitoring of the health status of persons exposed to harmful and dangerous industrial factors is of great importance. For employees engaged in hard work and work in harmful and dangerous working conditions, the order of the Ministry of Health and Social Development of the Russian Federation No. 29n of January 28, 2021 provides for mandatory preliminary and periodic medical examinations, which are provided by doctors of various specialties.

Objective: to familiarize students with the work of the medical and sanitary unit; with the order of the Ministry of Health and Social Development of the Russian

Federation No 29n of January 28, 2021 On approval of the lists of harmful and (or) dangerous production factors and works, during which preliminary and periodic medical examinations are carried out, and the procedure of mandatory preliminary and periodic medical examinations of employees engaged in hard work and work in harmful and (or) dangerous working conditions.

Students' classroom activities

1. Solution of case problems on mandatory preliminary and periodic medical examinations, registration of the decision in the protocol. When doing the task, use Order No 29n.

2. Watching a training video, participating in a regulated discussion on the viewed material.

Students' independent activities

1. Health care unit: its concept, structure, objectives and principles of work.

2. Duties of physicians at the Health care unit.

3. The content of order No 29n.

4. Medical examinations of employees: the concept of mandatory preliminary and periodic medical examination, its purpose and objectives.

5. Occupational diseases: the notion of occupational disease, examples, ways of prevention.

Plan of students' independent activities

"_____"_____20__.

1. Case problem (type 1) No_____

Conclusion on the possibility of admission _____ to work for the company_____by profession_____:

Conclusion:_____
_____
_____
_____+____
_____

2. Situational problem (type 2) №_____

Write a plan for the examination of an employee engaged in production _____, following Order No 29n:

- The name of harmful and (or) dangerous production factors

_____

- Frequency of exams _____

- Participation of medical specialists (a list of specialists involved in medical examinations)

_____
_____
_____

- Laboratory tests and functional studies

_____
_____
_____

- Medical contraindications

_____
_____
_____
_____

Done by_____
Supervisor_____

Reference information

Term definition

Health Care Unit (HCU) is a complex hospital and outpatient institution that provides highly qualified specialized medical care to workers and employees. The HCU includes an outpatient department, inpatient departments of various profiles, as well as medical and paramedic health centers located at the workshops of enterprises, dispensaries, inhalatories, flotariums, etc. The main organizational and structural unit of the HCU is the medical section in the workshop of an industrial enterprise.

The main task of the HCU, which serves industrial workers and employees, is to identify early signs of occupational disease, develop and conduct therapeutic and preventive and sanitary-hygienic measures aimed at improving working and living conditions, preventing and reducing general and occupational morbidity and injuries, providing highly qualified care and dispensary supervision.

The duties of HCU physicians include:

1) providing qualified medical care to workers and employees;

2) preventive monitoring of the health status of employees;

3) supervision of compliance with preventive measures and safety regulations at the enterprise;

4) sanitary and educational work.

OCCUPATIONAL MORBIDITY is an indicator of the number of newly identified patients with occupational diseases and poisoning during the year, calculated for 100, 1000, 10000, 100000 employees exposed to harmful factors of the production environment and the job process.

OCCUPATIONAL DISEASES are diseases in the occurrence of which the decisive role belongs to the influence of unfavorable factors of the working environment and the job process. For example: inhalation of dust (aerosol) containing silicon dioxide causes silicosis; exposure to general vibration can lead to the development of vibration disease.

Acute occupational disease (intoxication) is a sudden, acute deterioration in the state of health (to the extent of fatal outcome) that occurs after a single (for no more than one shift) exposure to relatively high concentrations of chemicals contained in the air of the work area, as well as levels and doses of other adverse factors. The diagnosis of an acute occupational disease can be established by a doctor of any medical and preventive institution after mandatory consultation with a specialist in occupational pathology and a doctor in occupational health.

Chronic occupational disease (intoxication) is a disease that occurs as a result of prolonged exposure to harmful occupational factors. The first diagnosis of a chronic occupational disease can be only established by specialized medical and preventive institutions like Centers for occupational pathology (clinics and departments of occupational diseases of research institutes, departments of occupational diseases of medical institutes, etc.).

The main causes of occupational diseases can be intense short-term or long-term exposure to harmful factors as a result of an accident, violation of the normal technological regimen, improper organization of the production process, etc.

Classification of occupational diseases according to the etiological principle (by the nature of the production factor)

1) Caused by exposure to chemical factors. These are acute and chronic intoxications, as well as their consequences, occurring with isolated or combined damage to various organs and systems. Example: toxic anemia, hepatitis, osteoporosis, etc;

2) Caused by exposure to industrial aerosols. These include: pneumoconiosis-silicosis, silicatoses, metalloconiosis, pneumoconiosis of electric welders and gas cutters, grinders, emery machines, etc;

3) Caused by exposure to physical factors: such as vibration (for example, vibration sickness), contact ultrasound (autonomic polyneuritis), intense noise (hearing loss like cochlear neuritis, noise sickness), electromagnetic and scattered laser radiation

(skin burns, retinal lesions), intense ionizing radiation (radiation sickness), a significant and relatively rapid change in atmospheric pressure (decompression sickness, acute hypoxia (lack of oxygen), unfavorable meteorological (microclimatic) conditions (overheating, convulsive illness, obliterating endarteritis, vegetative-sensitive polyneuritis);

4) Related to physical activity:

- diseases of peripheral nerves and muscles - neuritis, radiculopolyneuritis, vegetative-sensitive polyneuritis, cervico-brachial plexitis, myofascitis;
- diseases of the musculoskeletal system - chronic tendovaginitis, bursitis, epicondylitis of the shoulder, arthritis deformans; coordinating neuroses - writing spasm, other forms of functional dyskinesia;
- diseases of the vocal apparatus – phonasthenia, and of the organ of vision - asthenopia and myopia;

5) caused by the action of biological factors: infectious and parasitic diseases: tuberculosis, brucellosis, glanders, anthrax, dysbiosis, candidiasis of the skin and mucous membranes, visceral candidiasis and other diseases.

Outside of this etiological systematics are occupational diseases of group 6 and 7:

6) Allergic diseases - conjunctivitis, rhinitis, eczema.

7) neoplasms - cancer, tumors (of skin, bladder, liver, etc.), leukemia.

WORK-RELATED DISEASES: the incidence of general diseases of various origin (mainly polyethiological), which tends to increase with increasing work experience in unfavorable working conditions and exceeding that in professional groups that are not in contact with harmful factors.

Meanwhile, not every illness of an employee, which in one way or another was affected by the conditions of his work as a whole, can be an occupational disease. In order for the disease to be recognized as a professional one, it must be diagnosed.

For the correct diagnosis of an occupational disease, the complaints of the victim and the symptoms of his disease are not enough: it is necessary to carefully study the sanitary and hygienic working conditions, the history of the patient's professional experience, his "professional path", including all types of work performed by him since the beginning of his employment. Therefore, in practice, the reliability of the diagnosis is ensured by careful differentiating the observed disease from diseases of non-professional etiology with similar clinical presentations. Of great importance for confirming the diagnosis is the detection in biological media of the chemical that caused the disease. In some cases, only following up the patient for a long time makes it possible to finally resolve the issue of the connection between the disease and the profession.

CONTENT

Order of the Ministry of Health and Social Development of the Russian Federation No 29n of January 28, 2021 "On approval of lists of harmful and (or) dangerous production factors and works, during which preliminary and periodic medical examinations (examinations) are carried out, and the procedure for conducting mandatory preliminary and periodic medical examinations (examinations) of workers engaged in hard work and work in harmful and (or) dangerous working conditions".

1. List of harmful and (or) dangerous production factors, in the presence of which mandatory preliminary and periodic medical examinations are carried out.

1.1. Names of harmful and (or) dangerous production factors.

1.2. Frequency of inspections.

1.3. Participation of medical specialists.

1.4. Laboratory tests and functional studies.

1.5. Medical contraindications.

2. List of works in the performance of which mandatory preliminary and periodic medical examinations (examinations) of employees are carried out.

3. Procedure for conducting mandatory preliminary (upon admission to work) and periodic medical examinations (examinations) of employees engaged in hard work and work in harmful and (or) dangerous working conditions.

3.1. General provisions.

3.2. Procedure for conducting preliminary examinations.

3.3. Procedure for conducting periodic inspections.

3.4. Medical contraindications for admission to work.

According to "Procedure for conducting mandatory preliminary (upon admission to work) and periodic medical examinations of employees engaged in hard work and in harmful and (or) dangerous working conditions.

Mandatory preliminary medical examinations when applying for a job are carried out in order to determine whether the health status of the person entering the job corresponds to the work assigned to him, as well as for the purpose of early detection and prevention of diseases.

Mandatory periodic medical examinations are carried out in order to ensure:

1) dynamic monitoring of the health status of employees, timely detection of diseases, initial forms of occupational diseases, early signs of the impact of harmful and (or) dangerous industrial factors on the health of employees, the formation of risk groups for the development of occupational diseases;

2) identification of diseases, conditions that are medical contraindications for continuing work related to exposure to harmful and (or) hazardous production factors, as well as work that requires preliminary and periodic medical examinations of employees in order to protect public health, prevent the occurrence and spread of diseases;

3) timely implementation of preventive and rehabilitative measures aimed at preserving and restoring the working capacity of employees;

4) timely detection and prevention of the occurrence and spread of infectious and parasitic diseases;

5) prevention of accidents at work.

Preliminary and periodic examinations are carried out by medical organizations of any form of ownership that have the right to conduct preliminary and periodic examinations, as well as to assess professional suitability in accordance with the current regulatory legal acts (hereinafter referred to as medical organizations).

To conduct a preliminary or periodic examination by a medical organization, a permanent medical commission is formed.

Preliminary examinations are carried out when applying for a job on the basis of a referral for a medical examination issued by the employer to the person applying for the job.

For a person undergoing a preliminary examination, the following documents are issued by the medical organization:

- medical card of an outpatient patient , which includes the conclusions of specialist doctors, the results of laboratory tests and instrumental studies, the conclusion based on the results of a preliminary or periodic medical examination.

- employee health passport.

By the time the person entering the job completes the preliminary examination the medical organization issues a conclusion based on the results of the preliminary medical examination.

The Conclusion indicates the result of the medical examination (medical contraindications identified, not identified).

The frequency of **periodic examinations** is determined by the type of harmful and (or) hazardous production factors affecting the employee, or the type of work performed.

Periodic examinations are carried out at least within the terms specified in the List of factors and the List of works.

Periodic medical examinations are provided for employees working in harmful and (or) dangerous working conditions (including underground work), as well as work related to the movement of transport; organizations of the food industry, public catering and trade, water supply facilities, medical organizations and children's institutions, as well as some other employees performing the work provided for in the appendix to the Order.

Employees under the age of 21 undergo periodic inspections every year.

By the conclusion of the employee's periodic examination by the medical organization, a medical report is issued.

Based on the results of the periodic examination, the employee is given recommendations for the prevention of diseases, including occupational diseases, and, if there are medical indications, for further observation, care and medical rehabilitation, which are issued in the medical record in the medical organization where the medical examination was conducted. The results of the medical examination can be used by the employer to determine whether the employee belongs to a risk group for the development of an occupational disease.

If an employee is suspected of having an occupational disease during a periodic examination, the medical organization issues the employee a referral to the center of occupational pathology or a specialized medical organization that has the right to conduct an examination of the connection of the disease with the profession, and also draws up and sends a notification about establishing a preliminary diagnosis of an occupational disease.

Chapter 3 Hygiene of children and adolescents

THEME 3.1

PHYSICAL DEVELOPMENT OF CHILDREN AND ADOLESCENTS

Motivational statement of theme

Physical development is a major indicator of health. The indicators of physical development help to diagnose some diseases.

Impaired physical development of individuals, such as gigantism, acromegalia, hypophyseal nanism, is associated with some diseases of the endocrine system.

Low stature, deficient body weight may be associated with chronic diseases. Rickets, chronic tuberculous intoxication can cause growth inhibition in children.

Deficient body weight, diminished muscle tone as well as dysfunction of some organs often occur in sick children.

Growth and development disturbances occur if the child's lifestyle does not suit his age. Malnutrition, inadequate physical activity and sleep can cause developmental lag in children.

The indicators of physical development often help in choosing a profession. For example, platypodia is a contraindication against a profession which is associated with "standing position".

The indicators of physical development can show if the child is ready for studying at school. Poor growth rate is often associated with developmental lag of the functions necessary for schooling.

Objective: mastering techniques for evaluating physical development.

Students' classroom activities

1. Determining the posture of a person. Making a conclusion concerning the person's carriage (posture).
2. Foot assessment by using plantography. Making a conclusion concerning the person's foot.
3. Case problems. The solution of the situational problems should be reported in writing.

Students' independent activities

1. The notion of physical development. Dynamics of physical development of children and adolescents.
2. Correlation between poor physical development and health problems.

3. Techniques for studying physical development: somatoscopy, somatometry, physiometry.
4. The notion of biological age. Indicators of biological age. Estimating chronological age of a child
5. Evaluation of physical development according to regression scales. Indicators of physical development. Methods of evaluation.

Plan of students' independent activities

"_____"_____20__.

1. Evaluation of posture.

Concluion:_____
_____
_____
_____
_____

2. Evaluation of plantogram

Diagram of footprint

Conclusion:

3. Case problem No____
_____
_____
_____
_____
_____

Done by_____
Supervisor_____

Reference information

PHYSICAL DEVELOPMENT is a number of morphological and functional characters of the human body. The term "physical development" implies:

- growth (quantitative increase in the amount of tissues and organs as well as formation of new compounds due to substances entering the body);
- development (these are qualitative changes which occur in the human

body, differentiation of organs and tissues, improvement of their functions as well as development of new ones).

BIOLOGICAL AGE is the extent of the development of morphological structures and functions achieved by the individual; the extent of morphofunctional maturity of the human body.

CHRONOLOGICAL AGE is the age determined according to the date of birth.

ACCELERATION (derived from the Latin word *acceleratio* "gaining speed") is a process of acceleration of growth and differentiation (i.e. maturation) of various structures and functions of the human body.

RETARDATION is the process of slowing down the growth of the human body and differentiation (i.e. maturation) of various structures and functions of the human body.

Posture evaluation technique

The doctor examines a child in an upright position at a distance of 1 m. The examination of a child is performed in three positions **(**appendix, table 1).

When examining the child anteriorly in an upright position, the doctor is to evaluate:

- position of head (proper position of the head, lateral or forward flexion of neck);
- contours and line of shoulders (symmetrical, forward inclination of shoulders);
- asymmetry of cervical and brachial lines;
- shape of the chest (rickety, cylindrical, flat, barrel-shaped);
- shape of the abdomen (tympanitic (swollen), protruding as compared with the level of the chest, scaphoid (boat-shaped);
- shape of the legs (straight, baker's legs (genu valgum), bandy legs (genu varum);

When examining the child in an upright position from the side, the doctor is to evaluate:

- position of head;
- position of shoulders;
- shape of the abdomen;
- shape of the back (correct, round-shouldered, flat, sway, sway-concave, flat-concave);
- effaced lumbar lordosis in children with a sway-concave back;

When examining the child in an upright position from his back, the doctor is to evaluate:

- position of head;
- position of shoulder girdle;
- position of scapula (ptosis of the shoulder and a scapula, asymmetry of the inferior angle of scapula, winged scapula, deviation of the spine in the frontal plane to the right or left in one or several parts of the spine);

- asymmetry of the waist triangle;
- shape of the lower extremities.

Platypodia evaluation technique

It is recommended to examine children for platypodia from 2 years of age. It should be performed once a year using the plantograph.
When examining the child with platypodia, the child's foot should be placed on the plantograph. We get a footprint on a sheet of paper.

Evaluation of a plantogram. Two lines should be drawn on the given footprint (appendix, fig. 3). Line AB connects the middle of the heel with the middle of the base of the great toe.

Line AC connects the middle of the heel with the second web (interdigital) space. If the internal curve of the footprint crosses line AC, the foot is normal; if the internal curve of the footprint is between line AB and AC, flattening of the foot of the I^{s1} degree is present; if the internal curve of the footprint does not cross line AB, platypodia of the 2^{nd} and even 3^{rd} degree is revealed.

Biological age evaluation technique

Biological age is the extent of morphofunctional maturity of the human body.

Each child is characterized by his own growth rate; therefore, his biological age may differ from the chronological one.

Biological age of a child is determined by the doctor before going to school and before the 5^{th} form.

To determine the biological age of a child the following indicators should be considered:

- Height (cm).
- Increase of the body height (annual growth gain) (cm).
- Number of permanent teeth.
- Secondary sexual characteristics.
- Skeletal maturity (i.e. bone age) (It is determined according to the extent of calcification of the bones of the upper limb).

1. Body height is determined according to the extent of physical development. In this relation five groups are singled out:

- Low stature (from M-2σ and even less);
- Less than medium (from M-l σ to M-2 σ);
- Medium (from M-1 σ to M+1σ);
- More than medium (from M +l σ to M+2 σ);
- High stature (from M+2 σ and even higher).

2. The information on annual growth gain is obtained from the medical history of a child's individual development. Then it should be compared with

the standard indicators of annual growth gain (see appendix table 3).

3. Number of permanent teeth. This information is usually obtained by the pediatrician from the dentist.

4. The extent of the development of secondary sexual characteristics (i.e. the extent of puberty) is determined according to the extent of the development of secondary sexual characteristics in children over 10.

The extent of puberty is determined in boys according to the extent of sexual development (that is appearance of pubic hair (P) and axillary hair (Ax). In girls it is determined according to the extent of sexual development, that is breasts (Ma) and menstrual function (Me).

The extent of the development of secondary sexual characteristics is determined according to the following pattern:

For boys

1. Adult male pattern of pubic hair growth – P

P0 - absence of hair growth;

P1 - single hairs on the pubis;

P2 - sparse hair in the central part of the pubis;

P3 - thick, straight hair (uneven hair growth on the pubis, without distinct borders);

P4 - thick, curly hair (even hair growth on the pubis with a distinct horizontal border);

P5 - thick, curly hair extending to the internal surface of the thigh and towards the umbilicus (adult male pattern of hair growth).

2. Adult male axillary hair growth – Ax

Ax0 - absence of hair growth;

Axl - single hairs (in a small central part of the armpit);

Ax2 - thick, straight hair (all over the armpit);

Ax3 - thick, curly hair.

For girls

1. Adult female pattern of pubic hair growth – P

P0 - absence of hair growth;

P1 - single hairs;

P2 - thicker, long hair (in the central part of the pubis);

P3 - thick, long, curly hair (on the pubis).

2. Adult female pattern of axillary hair growth – Ax

Ax0 - absence of hair growth;

Axl - single hairs;

Ax2 - sparse hair (in the central part of the armpit);

Ax3 - thick, curly, long hair in the armpits.

3. Development of breasts in girls – Ma

Ma0 - breasts are not prominent;

Ma1 - breasts are slightly prominent, the areola forms a cone with the nipple;

Ma2 - breasts are greatly prominent, together with the nipple and areola forms a cone;

Ma3 - breasts are greatly prominent, the nipple rises over the areola; the breasts are round in shape.

4. Presence of the menstrual function – Me

Me0 - absence of menstruations;

Mel - menarche on examination;

Me2 - unstable menstrual cycle;

Me3 - regular menstrual cycle throughout a year.

5. Skeletal maturity is determined according to the X-ray of hand and wrist bones. Using the X-ray the time of formation and development of the foci of ossification can be revealed. The X-ray of hand and wrist bones should be compared with the standard one. The process of ossification of hand and wrist bones in children is the most reliable indicator of somatic maturity. However, the indicator is considered less commonly. The X-ray of hand bones is taken in case when some other signs indicate a high extent of developmental lag.

There are more informative indicators of biological development of children of any age.

In pre-school and primary school children (5.5-10) the main indicator of biological maturity is the number of permanent teeth. In secondary and higher school teenagers (11 - 16) the main indicator of biological maturity is the extent of the development of secondary sexual characteristics.

The evaluation of the indicators of biological age in children is carried out by means of comparing the indicators with the standard ones (appendix, fig. 5).

There are some possible conclusions concerning the evaluation of biological age:

- Biological age of the child corresponds to the chronological one;
- Biological age of the child falls behind the chronological one;
- Biological age of the child outstrips the chronological one;

Developmental lag or accelerated development should be diagnosed in children if the difference between the biological age and chronological one is 2 or more years.

Physical development evaluation technique

1. Measuring height, body weight, chest circumference.

- Examining the patient (carriage, shape of the chest, shape of the legs); determining the extent of the development of secondary sexual characteristics.
- Determining chronological age of the child and assigning him to a certain

age group.

- Evaluating growth rate and body weight according to the height. The evaluation should be carried out by means of comparing the actual indicators with the standard ones.

Evaluation of physical development according to regression scales

Physical development of a child is evaluated with the help of this method by summarizing the main indicators, such as height, body weight and chest circumference. For screening evaluation only two indicators, such as height and body weight, are used. The third indicator, that is chest circumference, is not used since it is related to body weight.

For evaluation of physical development of children "Standard indicators of physical development of children of the Volgograd Region" are used. The evaluating scales include the mean arithmetical value and any possible deviations measured by the sigma value. These tables do not include the average value of body weight for certain values of height; however, they show the range of possible fluctuations.

The range of deficient body weight as well as the range of excessive body weight for a certain value of height has been determined.

The evaluation of physical development of children is carried out by comparing anthropometric indicators obtained on examining a child with the "Tables of standard indicators of physical development".

In the Table of “Standard indicators of physical development” corresponding to the child’s age and sex, the range of weight and height should be determined.

The evaluation of physical development is carried out according to these indicators.

Children and adolescents with body height below medium, medium, over medium, high stature and with body weight within M-1σR - M+2σR (for children under 3 within M-1σR - M+1σR) show normal physical development (Table 1).

Physical development abnormalities are determined as follows:

1. Deficient body weight (i.e. body weight is less than the minimum standard body weight in relation to height).
   - 1st degree (M-1σR - M-2σR)
   - 2nd degree (less than M-2σR)
2. Excessive body weight (i.e. body weight is more than the maximum standard body weight in relation to height).
   - 1st degree (M+2σR - M+3σR)
   - 2nd degree (more than M+3σR)
3. Low stature (i.e. body height which is less than the standard body height) (less than M-2σ).

- The child’s height determined as "less than medium" and "high stature" do not affect the evaluation of physical development. Therefore, a medical report does not have to indicate body height. If the child has deficient or excessive body weight, the indicator which is not normal should be reported.
- If a child has a low stature (less than M-2σ), his body height should be indicated.

Table 1

Physical development evaluation technique

Evaluation of physical development	Height	Weight
I. Normal	Medium Over medium Below medium High stature	M-1 σR - M+2 σR
II. Deficient body weight 1st degree 2nd degree	Any height	 M-l σR - M-2 σR Less than M-2 σR
III. Excessive body weight 1st degree 2nd degree	Any height	 M+2 σR - M+3 σR More than M+3 σR
IV. Low stature	Less than M-2 σ	Any weight

Management: children with excessive body weight (2nd degree) should be referred to an endocrinologist.

Children with a low stature should also be referred to an endocrinologist for establishing the cause of low stature.

Children with deficient body weight should see a pediatrician for establishing the cause of deficient body weight.

Excessive body weight does not always mean overweight. Excessive body weight and obesity (body fatness) are not the same.

A person is considered overweight if his body weight exceeds the standard weight by 10 -20% in relation to body height.

If a person's weight exceeds the standard weight by 20-29% in relation to body height, he is considered to be obese (1st degree).

If a person's weight exceeds the standard weight by 30 - 40% in relation to body height, he is considered to have obesity of the 2nd degree.

If a person's weight exceeds the standard weight by 50 — 100% in relation to body height, he is considered to have obesity of the 3rd degree.

And, finally, a person is considered to havr obesity of the 4lh degree if his body weight exceeds the standard weight by 100 % in relation to body height.

Excessive body weight can be revealed in some athletes who are overweight because their muscles are well developed or bony skeleton is rather heavy.

Apart from this, a child's weight may be normal due to a well pronounced development of adipose tissue; however, his musculoskeletal system may be poorly developed.

To avoid any mistakes in evaluating physical development, it is recommended to measure skin fold thickness in children. Skin fold thickness should be measured in children whose body weight exceeds the normal value (more than 2 σR). The measurements of skin fold thickness can be performed in the following areas:

- at the level of umbilicus, 5 cm to the left;
- under the left shoulder blade;
- at the thigh (in a "sitting " position, with the knees bent in the knee joint at an angle of 90°; skin fold thickness is measured parallel to the inguinal fold).

The measurements of skin fold thickness with the caliper or anthropometric sliding caliper are considered to be most accurate.

The measurements of skin fold thickness are compared with the standard ones (Table 2). If a child is overweight with increased thickness of at least one skin folds, he is likely to be obese.

Table 2

Skin fold thickness in children (mm) (M±m)

Sex	Age	Skin fold thickness under the shoulder	Skin fold thickness in the area of the stomach	Skin fold thickness at the thigh	Skin fold thickness, total
Boys	6	4.5±0.9	6.3±1.3	10.7±0.6	21.5±l.0
	7	5.1±l.2	6.8±2.1	13.6±1.1	27.4±1.5
	8	5.7±l.0	6.1±2.2	ll.4±l.0	23.7±1.3
	9	6.3±1.3	6.6±2.4	12.2±1.4	25.5±1.7
Girls	6	5.6±1.7	7.6±2.6	12.2±1.3	25.6±1.9
	7	6.8±1.8	6.5±2.2	14.7±1.3	27.8±1.9
	8	7.7±1.4	9.6±2.1	13.5±1.3	28.6±1.6
	9	7.0±l.3	9.3±1.9	13.7±1.1	30.1±1.5

THEME 3.2
COMPREHENSIVE EVALUATION OF CHILDREN'S HEALTH

Motivational statement of theme

All constituents of a child's lifestyle, such as mental and physical activities, nutrition, etc., should be organized considering the child's health condition. The latter should be considered in carrying out preventive medical examinations, professional orientation, and individual preventive and sanitary measures. According to comprehensive evaluation of children's health condition which is based on a number of criteria, the child can be assigned to a certain health status group which gives the necessary information about the children's health. This work is usually performed by district pediatricians, adolescents' therapeutics, family doctors, doctors specializing in certain fields of medicine. Therefore, this topic should be discussed by the students of all departments.

Objective: learning how to determine the health status group of a child and adolescent; mastering the algorithm of recommendations for the correction of disorders in the development and state of health of children and adolescent.

Students' classroom activities

1. Taking a family history of your child (or of your own). Calculating and evaluating the inherited burden index.
2. Case problems. The solution of the situational problems should be reported in writing.

Students' independent activities

1. Negative trends observed in the state of health of modern children.
2. Criteria of children's health. Ways of its evaluation and determination.
3. Indications for assigning children to health status group 1.
4. Indications for assigning children to the risk group.
5. Which groups do children with chronic diseases belong to?
6. Differential medical management of children in different health status groups. (appendix fig. 5).

Plan of students' independent activities

1. Taking a family history of a child (See appendix, fig. 6).

FAMILY HISTORY OF A CHILD

Last name/ First name_____

Age_____

Calculating and evaluating the inherited burden index _____
Concluion:_____
_____
_____
_____

2. Case problem No_____
2.1. Health status group of the child_____
2.2. Criteria used for determining the health status group
_____
_____
_____
_____
_____

Done by_____
Supervisor_____

Reference information

Diagnostics of a child's health condition

1. The first criterion includes peculiarities of ontogenesis (i.e. genealogical, biological, social history).

Genealogical method is the method of taking the family history of a person, i.e. tracing some signs or symptoms of a disease within the family or kin as well as stating the type of kinship ties between family members (not less than two generations should be considered).

Family history compiling technique

Clinical diagnosis of the proband.

1. Last name/ First name of the proband. Date of birth. Place of birth. Nationality.

2. Are the parents of the proband relatives (close or distant)?

3. Information on the siblings of the proband; their age (one should consider the sequence of gestations as well as pregnancy outcomes); state of health of the

siblings.

4. Information on the mother of the proband: date of birth, place of birth, nationality, occupation; one should consider the diseases she has or had if she is dead; one should consider the cause of death and the age at which she died; if she was married more than once, the information on children by her previous marriage should be also considered.

5. Information on the siblings of the mother, her parents and children (the information should be obtained according to the same scheme).

6. Information on the father of the proband (the information should be obtained according to the same scheme): his siblings, parents, siblings of his parents and their children.

7. If information is available, one should consider great-grandmothers and great grandfathers. The generations should be indicated with Roman figures beginning with the upper one. All members of the generation are indicated with Arabic figures from left to right.

The following rules should be observed while taking the family history of a child:

- The distance between generations should be similar.
- Each member of the family should be placed in his (her) generation.
- Points of intersection should be clearly marked.

If you use various signs or symbols for indicating certain types and peculiarities of generations, description of these indications (i.e. a legend) should be supplied.

For screening assessment of the child's family history the inherited burden index should be used. It can be calculated using the following equation:

$$\mathbf{i} = \frac{\text{total number of diseases in relatives (excluding the proband)}}{\text{total number of relatives (excluding the proband)}}$$

If the inherited index is more than 0.7, one can conclude that it is burdened and the proband is quite susceptible to diseases. For example, i= 13:10=1.3.

Biological method includes information on the course of pregnancy, delivery (e.g. early pregnancy toxemia, duration of delivery, Apgar score, birth trauma), development of the baby during the 1st year (Rh-factor, weight at birth, diseases of the child).

Table 1

Indices of social family history
Major characteristics of social family history

Indices	Favorable family history	Unfavorable family history

1. Characteristics of the family.	Family with two parents, i.e. the child has a father or close relatives of his mother (two or even more adults)	Single-parent family, i.e. the child is brought up by his mother
2. Education of family members	Higher education or professional education	No professional education
3. Psychological atmosphere in the family. 3.1 Relationships between family members 3.2 Attitude to the child 3.3 Bad habits.	The relationships in the family are friendly; the members of the family have no bad habits such as alcoholism, etc.	The relationships in the family are complicated; the members of the family have some bad habits
4. Living conditions and standard of living	A detached comfortable flat; living space per person is 7 m^2.	Living in a flat without any conveniences. The amount of money per person is less than the substinence rate

If the family history of the child is considered to be favorable, the conclusion is the following: "Social history is favorable". If the family history of the child is unfavorable, it is necessary to indicate the unfavorable indices of the history.

2.The second criterion is information on physical development of the child.

We have already discussed the methods of studying and evaluating the physical development during childhood and adolescence.

3.The third criterion is information on mental development of the child.

The extent of the child's development is characterized by the development of certain mental functions reflecting the extent of maturity of the central nervous system. It is necessary to study and evaluate the following parameters: mentality, speech, motor activity, attention, memory (special tasks should be set to the child to evaluate these parameters), social contacts (by means of observation, survey). Evaluation of mental functions of the child is subject to great variation: “child’s mental activity corresponds to the age”, “child's mental activity lags behind the age”, “child's mental activity outstrips the age”.

Besides the extent of the child's development, mental health and behavior of the child are determined according to the following indices:

1.Emotional status. Mood.

Cheerful (the child is on good terms with people surrounding him; he (she) is interested in playing and takes an active part in games; he (she) is friendly with other children; the body's responses are rather emotional; he (she) often smiles, laughs, comes into contact with people surrounding

him; the child has no fears.
Quiet (the child is friendly with people surrounding him; he (she) is quiet and active; his body's responses are less emotional; he (she) does not willingly come into contact with people surrounding him).
Irritable, agitated (the child often cries, is often irritated; he (she) can come into contact with people surrounding him; sudden outbursts of anger and crying can be observed).
Depressed (the child is passive, reserved, and sad; he (she) can cry easily and for a long time).
Unstable (the child's mood can change easily; he (she) can come into contact with people surrounding him quite easily but at the next moment he can be quite reserved).
Fears (the child is afraid of darkness, animals, unawareness, etc.).

2.Vegetative status.

Sleep:

- the child falls asleep slowly, quickly;
- the sleep of the child is quiet, unquiet;
- duration of sleep (shortened, long-lasting, corresponding to the age of the child).

Appetite: good, poor, increased, selective diet, rejecting food at pre-school establishments.
Lifestyle: active, passive.
Pains which are not associated with certain diseases: pains in the heart, abdomen, etc.
Hyperhidrosis (excessive): general sweating or sweating of the hands and feet; constant hyperhidrosis or only when the child is nervous/worried.

3. Psychomotor stability

Enuresis, encopresis (Yes/No).

4. Personal characteristics

Relationships with peers, adults (good, poor, absence of relationships, initiative, responsible): communicative, friendly, aggressive, rude, cruel to other children or animals; unemotional, importunate, curious, interested in what is going on, showing initiative, ambitious, easily trained; incurious, without initiative, unstable.

Motor activity, emotions: lively, steady, of great endurance, unsteady, inert, fatigable and easily excitable; motor disinhibition (the child can jump without any purpose; if the child is nervous, he (she) sits like on tenterhooks; the child makes a lot of useless movements); noisy, talkative, excited; slow, retarded; it takes him (her) a lot of time to put on his (her) clothes, to keep the room in order, etc.

Bad habits: swaying from side to side, fumbling with their clothes or hair,

licking the lips, biting their nails, sucking their thumb, knitting their brows or nose, nervous breakdowns, blinking, masturbating, etc.

Evaluation:

- If all the parameters of the child's behavior are positive, it is qualified as "behavior without any deviations".
- If there are some somatovegetative, emotional, psychomotor, social or behavioral deviations, it is qualified as "deviant behavior".

4. The forth criterion is the extent of the child's resistance.

The extent of the child's resistance is determined according to the amount of acute diseases of the child over the year.

The following age criteria used for determination of high risk groups, are recommended:

1st year - 4 and more acute diseases per year
2-3 - 6
4-6 - 5
over 6 - 3

5. The fifth criterion is the extent of the child's functional development.

Various indices of the child's functional state are studied and evaluated. They are the following: blood pressure, pulse rate, respiratory rate, blood type, hemoglobin level, etc.

6. The sixth criterion involves presence or absence of chronic diseases or congenital defects of development.

The general state of the child's health is evaluated at a scheduled medical examination by the pediatrician, and if necessary by physicians specializing in particular fields, at certain periods determined by current recommendations on medical examination of children.

Having considered all the criteria of the child's health condition, the doctor decides to which health status group the child should be assigned.

Group 1: healthy children with normal above-stated criteria, having no chronic diseases; they have normal indices of functional, mental, and physical development; these children rarely fall ill; the family history of these children is favorable.

Group 2: children who have a higher risk of developing a disease; these children are characterized by some abnormalities of functional, mental, and physical development, however, they do not develop any symptoms of chronic disease; they have decreased resistance.

Group 3: children with chronic diseases and congenital defects of development at the stage of compensation. The stage of compensation is

determined by rare (one or two times a year) acute attacks of chronic diseases as well as normal functioning of the body.

Group 4: children with chronic diseases and congenital defects of development at the stage of subcompensation (the general state of their health is quite normal). These children may attend pre-school establishments.

Group 5: children with chronic diseases and congenital defects of development at the stage of decompensation. These children are usually at hospital or have to keep to bed at home at the moment of medical examination.

If the child has several diseases, his state of health is evaluated according to the major and the most complicated disease.

The combination of at least two unfavorable forms of the child's family history is enough for assigning the child to health status group 2.

It is necessary to indicate the health status group of the child and some peculiarities of his health, such as acute respiratory diseases, deficient weight of the 1st degree (health status group 2); dental caries, decompensated form, etc (health status group 3).

Depending on the changes in the state of the child's health, the pediatrician can change the health status group of the child.

MEDICAL MANAGEMENT OF CHILDREN IN DIFFERENT HEALTH STATUS GROUPS

The children of group 1 must be supervised at regular periods established by current recommendations on medical examination of healthy children (yearly medical examinations). Preventive, educational, sanitary measures are usually carried out.

The children of health status group 2 who run the risk of developing a disease should be supervised by the pediatrician more carefully. Preventive, medical and sanitary measures taken in due time are the only effective way of preventing chronic diseases. The terms of supervision of these children are determined by the pediatrician individually for each child. Preventive, educational, sanitary, and special medical measures are recommended for the children of this group.

The children of group 3, 4, 5 should be under dispensary observation by a pediatrician and specialists. They should receive the required care considering the disease they have.

TEME 3.3
COMPLEX ESTIMATION OF STUDYING CONDITIONS IN EDUCATIONAL ESTABLISHMENTS. EVALUATION OF FUNCTIONAL READINESS OF CHILDREN FOR SCHOOLING. HYGIENIC EVALUATIONAL OF SCHOOL FURNITURE.

3.3.1. SCHOOL READINESS. EVALUATION OF FUNCTIONAL READINESS OF CHILDREN FOR SCHOOLING

Motivational statement of theme

Successful schooling as well as fulfilling the related responsibilities is possible when a child attains a certain level of physical and mental development, that is "school readiness". The extent of readiness for schooling is determined by the extent of functional development of some organs and systems as well as by the readiness of the child to meet schooling requirements. It is associated mainly with the development of mental and motor activity of the child, with his/her ability to concentrate, inhibit their motor activity for some time, keep a posture necessary for work (without getting tired). To write and to draw properly, a certain extent of the development of the small muscles of the hand as well as coordination and correlation of finger movements is essential. School immaturity of a child may be due to a number of biological and social factors.

The number of six-year-old children who are not ready for starting school varies between 5% and 90%. The number of such seven-year-old children is between 10% and 20%. As a rule, 93% of schoolchildren do well at school; however, 27% of children are considered "of medium readiness"(moderately mature). As a rule, even if children who are "immature for schooling" do well at school, this results in functional disturbances or impaired health condition.

Therefore it is necessary to identify the children who are not ready for schooling and to take special medical and educational measures aimed at improving their condition.

Objective: mastering the technique of determining the functional readiness of a child for schooling.

Students' independent activities

1. Why should the functional readiness of the child for schooling be determined?
2. External criteria of school readiness.
3. Medical psychological and physiological criteria used for determining school readiness.
4. Evaluation of the results of the medical examination of the child. Medical & educational management.

Students' classroom activities

1. The purpose of determining the functional readiness of the child for schooling.
2. External criteria of school readiness.
3. Functions necessary for schooling.
4. Major risk factors associated with non-readiness of the child for schooling.
5. Medical, psychological and physiological criteria for determining school readiness.
6. Evaluation of the examination results (medical, psychological and physiological criteria for a time delay from entering school) and further medical and pedagogical tactics.

Plan of students' independent activities

" _____ " _____ 20__

1. Case problem No____
   Kern & Irasek test score:_____:
   Conclusion:_____
   _____
   _____
   _____

2. Case problem No_____
   Conclusion:_____
   Recommendations:_____
   _____
   _____

Done by_____ _____
Supervisor ___ _____

Reference information

SCHOOL READINESS is a certain extent of physical, psychological and social development of a child which makes it possible for the child to study at school. FUNCTIONAL READINESS OF A CHILD FOR SCHOOLING is the extent of development of analytical and synthetical functions of the cerebral cortex, motor activity and speech of a child (the functions which are necessary for schooling).

FUNCTIONS NECESSARY FOR SCHOOLING

1. A certain extent of the development of the closing function of the cerebral cortex (formation of conditioned reflexes, differential inhibition).

2. The development of the second signaling system (i.e. the development of speech).
3. The state of the motor function which enables the child to coordinate the

movements of the small muscles of the hand and posture muscles of the trunk. Static tolerance.
4. The development of psychomotor functions and flexibility of nerve processes.

MAJOR RISK FACTORS ASSOCIATED WITH NON-READINESS OF CHILDREN FOR SCHOOLING

1. Biological development lags behind the chronological one.
2. Functional disturbances (e.g. neurotic reactions, logoneurosis, hypertrophy of tonsils, refracture anomaly up to +3.0, pathologic posture, vegetovascular dystonia, anemia, decreased resistance of the human body).
3. Chronic diseases.

EXTERNAL CRITERIA OF SCHOOL READINESS

1. A certain extent of psychological and emotional development which enables the child to respond to the events which take place at school (e.g. a good/bad mark, teacher's remarks, etc.).
2. The ability of the child to adjust his/her behavior to meet the requirements of the teacher.
3. The ability of the child to concentrate on certain things and focus attention.
4. Showing an interest in school, subjects and events associated with school.

MEICAL CRITERIA USED IN DETERMINING FUNCTIONAL READINESS FOR SCHOOLING

1. Extent of biological development.
2. State of health on examination.
3. Acute sickness rate in the past year.

PSYCHOLOGICAL & PHYSIOLOGICAL CRITERIA USED IN DETERMINING FUNCTIONAL READINESS FOR SCHOOLING:

1. Kern and Irasek test score.
2. The quality of pronouncing sounds (presence of any defects).
3. Motormetry test results (i.e. "cutting a circle").

GUIDE TO PSYCHOLOGICAL & PHYSIOLOGICAL STUDY

A. Kern & Irasek Test

(Orientation test used for determining school readiness)

The test consists of three main tasks:

1) Drawing a human figure.
2) Copying a short phrase which consists of three words (i.e. He ate soup.).
3) Copying a number of dots.

Total number of scores

A 5-point system is used. The highest score is 1 and the lowest score is 5 on a 5-point scale. Approximate criteria are used for calculating points for each task on a 5-point scale.

Task l (Drawing a human figure) (See appendix, fig. 8)

1 point — the figure must have the head, trunk and limbs. The head should be connected with the trunk by the neck, which is less than the trunk itself. There must be hair on the head (there may be a hat, cap, etc.), ears; the face should have the eyes, nose, and mouth. The upper extremities must have the hands with five fingers on each hand. The human figure must have man's clothes on.

2 points - the human figure must have the head, trunk and limbs. The head should be connected with the trunk by the neck, which is less than the trunk itself. There must be hair on the head (it may be a hat, cap, etc.), ears; the face must have the eyes, nose, and mouth. The upper extremities must have the hands with five fingers on each hand. The figure must have man's clothes. One of the three parts of the human body, such as the neck, hair or finger, can be missing. The face, however, must have all the necessary parts.

3 points - a general image of a human figure with the head and limbs. A line is usually drawn instead of the limbs (either lower or upper).

4 points — the human figure has neither trunk nor limbs.

Task 2 Copying a text (See appendix, fig. 7)

1 point — the text (phrase) which was copied may be easily read. The letters should be no more than twice as large as in the example. The letters must be organized in three separate words. The letters may be inclined at an angle of 30°.

2 points — the text (phrase) which was copied may be easily read. The letters must be the same size as in the example. They may be slightly inclined.

3 points — the letters must be organized in two separate words. Four out of seven letters must be readable.

4 points - at least two letters must be the same as in the example. The whole text (phrase) should look like writing.

5 points - unclear writing.

Task 3. Copying a number of dots (See appendix, fig. 9)

1 point - an accurate copy. There must be dots rather than circles. The symmetry of the figure must be retained. The figure may be a little bit shorter, but no more than twice as short.

2 points — inaccurate symmetry is allowed. One dot may be outside the bounds

of the column or the line of the figure. There may be circles instead of dots.

3 points — the number of dots resembles the shape in the pattern. The drawing may be nonsymmetrical. The pentagon may have with its base facing upwards or downwards. The number of dots may vary compared with the pattern (e.g. no less than 7 dots and no more than 20 dots).

4 points - the dots are crowded and resemble a geometric figure. The number of dots and their sizes are not essential. No other figures are allowed (e.g. lines).

5 points - an unclear copy.

B. Studying the quality of pronouncing sounds (presence or absence of any defects in pronouncing sounds)

To determine the quality of pronouncing sounds, the child is asked to say which objects he/she can see in the picture. He/she must do it consistently in a loud voice.

C. Motormetry test ("cutting a circle")

The child gets a sheet of thin cardboard or thick paper with a figure on it. The child gets a pair of sharp, not tight scissors. He/she must cut the circle along to the medial thick line. The child must do it with his right hand. As soon as the child reaches the thick line, the process is timed (you may use a stopwatch or a watch with a special hand for this purpose). The child must cut the circle within a minute. During this time he must cut eight ninths of the circle. The child may deviate from the thick line at least 2 times (if he cuts one of the thin lines) and 1 time (if the child cuts two of the thin lines).

Total score

The child is considered to be ready for schooling, if he scores 3 to 9 points in Kern & Irasek test and has positive results (+) at least in one of the two tests.

Temporary delay of schooling may be advised in the following cases:

A) Medical criteria:

1. Developmental lag (e.g. the height is less than 1 sigma by local standards, annual height gain is 4 cm, absence of permanent teeth, etc.).
2. Children who had the following diseases over the past year: viral hepatitis type A, pyelonephritis, diffuse glomerulonephritis, non-rheumatic myocarditis, epidemic cerebrospinal meningitis, meningoencephalitis, tuberculosis, acute rheumatism, blood diseases (hemopathies), acute respiratory diseases which occurred more than 4 times a year.
3. Children with the following chronic diseases at the stage of subcompensation and decompensation:

- vegetovascular dystonia of hypotonic type (ABP is 80 Hg) or hypertonic (ABP is 115 Hg) type; congenital malformation or rheumatic heart disease.
- chronic bronchitis, bronchial asthma, chronic pneumonia (in exacerbation or absence of remission within a year).

- gastric or duodenal ulcer, chronic gastritis, chronic gastroduodenitis (in exacerbation, combined with frequent recurrence or incomplete remission).

- anemia (if blood hemoglobin is 10.7 – 8.0 g%), tonsillar hypertrophy of the 3rd degree, adenoid vegetations of the 3rd degree, toxic or allergic chronic tonsillitis, endocrinopathy (goiter, diabetes mellitus, etc.).

- neurosis (neurasthenia, hysteria, logoneurosis, etc.), mental retardation, cerebral spastic infantile paralysis, craniocerebral injury, epilepsy, epileptiform syndrome, enuresis.

- eczema, neurodermatitis (with extensive lesions of the skin).

- progressive myopia (more than 2.0).

B) Psychological and physiological criteria:

- according to the results of repeated psychological and physiological examinations children are considered to be not ready for schooling if they score 9 and more points in Kern & Irasek test and if they have defects in pronouncing some sounds.

3.3.2. EVALUATION OF LEARNING CONDITIONS AT EDUCATIONAL ESTABLISHMENTS
RISK FACTORS
MEASURES AIMED AT OPTIMIZATION OF LEARNING CONDITIONS

An indispensable condition for promoting and improving the health of a child is providing optimum learning conditions (microclimate, lighting, air quality). The necessary hygienic requirements for the learning conditions at educational establishments should be met to ensure primary preventive measures against diseases in school.

Objective: Evaluation of learning conditions at educational establishments and methods of its optimization.

Students' classroom activities

" _____ " _____ 20__

1. Case problem No ___ _____

Conclusion:

_____

_____

_____

Recommendations:_____

_____

_____

Done by_____ _____
Supervisor ____ _____

Reference information

Table 1

Duration of cross ventilation at educational establishments depending on air temperature

Air temperature (°C)	Duration of ventilation (min)	
	During short breaks	During long breaks and between shifts
From+10 to+6	4-10	25-35
From +5 to 0	3-7	20-30
From 0 to - 5	2-5	15-25
From -5 to -10	1-3	10-15
Below-10	1-1.5	5-10

Table 2

Air temperature at educational establishments (°C)

Class-room, laboratory room	18-20
Assembly hall, lecture-room	18-20
Computer class	19-24 (optimum) 18-22 (permissible)
Recreation room	16-18

Table 3

Area of class-rooms at educational establishments

Class-room	Area (m^2 per person)
Area of the classroom	2.5
Sanitary unit (lavatory)	0.1
Area of classroom and lecture room	2.2
Dining-room	0.7
Laboratories	4.0
Computer class	4.0

Table 4

Standards of artificial lighting at educational establishments

Rooms, surfaces	Lighting, lx
Classroom	300/200
Blackboard	500
Computer class	400/300
Drawing class	200/150
Recreation rooms	150/100

Note: the second figure indicates electric lamps.

Table 5

Recommended colors for decoration of educational establishments

Surface	Color
Walls	Light yellow, beige, pink, green, blue
School furniture	Natural color or light green
Blackboard	Dark green
Doors	Brown
Windows	White

3.3.3. HYGIENIC EVALUATION OF SCHOOL FURNITURE

Motivational statement of theme

The relatively immobile position of the body during classes is associated with the development of static tension in children. Prolonged static tension inevitably leads to rapid fatigability of children. If it persists for a long time, work capability of children decreases and attention diminishes. A proper position at work can contribute to the reduction of static tension during classes. School furniture chosen to suit the height of the child prompts a proper position at work. If school furniture does not suit the height of the child, disproportionate writing desks and chairs will cause additional work load on the body resulting in muscle fatigability. If it persists, children develop muscle asymmetry which is a most common cause of impaired carriage. Besides, an improper position at work is one of the most common factors causing myopia (i.e. shortsightedness). The main cause of shortsightedness is inadequate distance between the eyes of the child and the writing desk.

The school pediatrician should control the way seats are taken by children in a classroom.

Objective: learning how to evaluate the layout of school furniture in a classroom as well as controlling the way seats are taken by children (the height and state of health of children should be considered).

Students' classroom activities

1. Measuring the size of the writing desk and marking it. For this purpose one should have a ruler. Reference material for hygienic evaluation of school furniture can be taken at the laboratory assistant office. Making a conclusion concerning the size of the writing desk.
2. Case problems. The solution of case problems should be reported in writing.

Students' independent activities

1. Hygienic requirements imposed on school furniture. Proper position of the child at work.
2. Standards to be considered when selecting school furniture. School furniture marking.
3. Hygienic requirements imposed on the layout of school furniture in a classroom.
4. Hygienic requirements imposed on seat-taking. State of health of children should be considered.

Plan of independent work

" _____ " _____ 20__

1. Measuring the size of the writing desk:
   Height of the seat (its front edge) _____
   Height of the back edge of the writing desk cover over the floor
   Marking the writing desk _____
2. Case problem No__

   Evaluating the layout of school furniture in a classroom:
   Evaluating the way seats are taken by children in a classroom (the height and state of health of children should be considered):

   Recommendations:_____
   _____
   _____
   _____
   _____
   _____

Done by_____
Supervisor____ _____

Table 1

Sizes of School Furniture

№	Height of the child (mm)	Basic parameters of school furniture	Color of marking

		Height of the edge of the desk which is the closest to the child over the floor (mm)	The height of the seat over the floor (mm)	
1	1000-1150	460	260	Orange
2	1150-1300	520	300	Violet
3	1300-1450	580	340	Yellow
4	1450-1600	640	380	Red
5	1600-1750	700	420	Green
6	More than 1750	760	460	Blue

Reference information

Selection of school furniture

One of the basic parameters considered in selecting school furniture is the height of the child. These parameters are regulated by a special document.

School furniture should be marked. It should be painted on the lower surface of the writing desk cover and the seat of the chair. The number of the desk and chair is the numerator and the height of the child is the denominator in the following fraction:

$$\frac{3}{130\text{-}145}$$

Besides, some additional marking should be made on both outer sides of the writing desk in the form of a circle of 15-20 mm in diameter or in the form of a rectangle.

Sitting at the desk leaning slightly forwards is considered to be a **proper position at work.** A book or an exercise-book should be at a distance of 25-30 cm from the eyes. The distance between the writing desk and the chest of the child equals a hand. The child can lean against the chair back at the level of the lower part of the back. The legs should be bent in the knee and hip joints at a right or obtuse angle. The feet should lean against a foot piece or the floor. The arms should be placed on the desk, the shoulders are at the same level and parallel to the edge of the desk.

If the position at work is proper, the child does not have a sensation of oppression or tightness in the chest or abdominal cavity. The child can breathe in and out easily. In this case the load on the child's musculoskeletal system is minimal and the visual analyzer is not strained.

Proper position at work can be easily achieved if school furniture suits the child's height and weight. The height of the seat must suit the length of the leg and

foot of the child (+/- 1.5 - 2 cm for heeled shoes). The depth of the seat must equal ¾ of the thigh in length. If the depth of the seat is less than ¾ of the thigh, the bearing area is reduced and the position of the child at work is less stable and the child gets tired rapidly. If the depth of the seat is greater, the edge of the seat can cause compression of the vascular-nervous fascicles in the popliteal space of the child.

Proper position at work is calculated using the ratio of the height of the writing desk to the height of the seat as well as the distance between them.

Distance to the chair back is a horizontal distance from the edge of the desk facing the child to the chair back. This value must be 3 - 5 cm more than the front & back edge of the body. If the distance is more, the angle of inclination of the child increases. If this distance is less, the movements of the chest are difficult.

Distance to the seat is the distance from the front edge of the seat to the vertical line drawn from the edge of the writing desk facing the child.

This distance can be negative, positive or zero. If the distance is negative, the edge of the writing desk protrudes over the edge of the chair by 3 - 5 cm. If the distance is zero, the edge of the writing desk and the chair are placed on the same vertical line. If the distance is positive, the vertical line goes in front of the edge of the chair. When writing, the distance should be negative.

REQUIREMENTS IMPOSED ON SCHOOL FURNITURE

Each person must be provided with a comfortable work place at the writing desk which suits the person's height and state of visual and acoustic analyzers. Marking is advisable to make school furniture suit the person's height. Writing desks should be placed in the classroom according to their numbers: smaller writing desks - near the blackboard, larger ones - far from the blackboard. Writing desks for children with visual and hearing impairments should be placed near the blackboard. Besides, children with visual impairment should take seats near the windows.

Children who often fall ill with acute respiratory diseases, quinsy, common colds should take their seats far from the outside wall.

To prevent children sitting at the writing desks in the first and third rows from carriage impairment and development of strabismus, it is recommended to make them change their seats twice a year.

When laying out school furniture in the classroom, the following standard values of the distance between writing desks should be considered:

- between two-seat writing desks - no less than 60 cm;
- between writing desks and the outside dividing wall - no less than 50 - 70 cm;
- between writing desks and the inside dividing wall or the bookcases at the wall - no less than 50 - 70 cm;
- from the last writing desk to the wall - no less than 70 cm;
- from the first writing desk to the blackboard - 240 - 270 cm;

• the largest possible distance from the last writing desk to the blackboard - 860 cm;
• height of the lower edge of the blackboard over the floor - 80 - 90 cm.

TEME 3.4 HYGIENIC ISSUES OF PHYSICAL EDUCATION AND HARDENING AGAINST DISEASE

Motivational characteristics of theme

Physical education is one of the most important elements of a person's healthy lifestyle as well as one of health-improving strategies of the population, including children and adolescents. The health-improving role of physical education consists in increasing non-specific resistance of the human body to the effects of pathogenic microorganisms and unfavorable environmental factors. Physical education also contributes to stimulation of growth and development of children, improvement of thermoregulation reactions, development of major physical abilities (strength, rapidity, dexterity, tolerance, equilibrium and coordination of movements), correction of congenital and acquired defects of physical development. The health-improving role of physical education also helps to boost the tone of the central nervous system, induce positive emotions and promote mental health.

Physical education is an important part of training at educational and health-improving establishments. Doctors working at educational establishments usually control the physical education classes.
The doctor is responsible for advising the optimum exercise regimen. He should select a group of physical exercises and the type of exercises for the child. The doctor is also responsible for advising exercise therapy to a child who had a disease or trauma. The doctor should give recommendations about certain kinds of sports and competitions. The doctor should control the child's physical load. The doctor should provide consultations to children and their parents.

Objective: giving an idea of physical education as an important element of a person's healthy lifestyle; learning to assign a health status group to individuals with different levels of health; providing hygienic evaluation of the PE class.

Students' classroom activities

1. Case problems. The solution of case problems should be reported in writing.
2. Hygienic evaluation of the physical education class at school. Special features of PE must be reported in writing.

Students' independent activities

1. Health-improving role of physical education.
2. Hygienic principles of organization of physical education for children and adolescents.
3. System of physical education of schoolchildren.
4. Motor activity, hygienic norms.
5. Health status groups of schoolchildren in physical education.
6. Hygienic requirements imposed on the organization of PE classes.
7. Hygienic requirements imposed on the gym.

Plan of students' independent activities

" _____ " _____ 20__

1. Case problem No ____

Health status group:

_____

Indications:

_____
_____
_____

Obligatory exercises:

_____
_____
_____

Additional recommendations:

_____
_____
_____

2. Case problem No _____

Acute diseases:

_____
_____

Rehabilitation period:

_____
_____
_____

Additional recommendations:

_____
_____
_____

3. Case problem No ____
Age___, sex ___.
Sports:_____
Recommendations:
_____
_____
_____

Done by_____
Supervisor_____ _____

Reference information

PHYSICAL EDUCATION is the effects of nature, physical exercise and hygienic measures acting on the human body aimed at supplying the body with a certain degree of physical development, formation and improvement of motor activity abilities, practical skills.

MOTOR ACTIVITY is the total amount of movements per certain period of time (an hour, day, etc.).

HYGIENIC STANDARD OF MOTOR ACTIVITY is a quantitative value of motor activity (its duration given in hours, number of movements) which meets biological needs of the human body for movement and improves the person's health.

KINESOPHILIA is referred to as biological needs of the human body for movement.

HYPOKINESIA is referred to as deficient motor activity (for example, in case of physical overloads, chronic diseases, defects of development in children and adolescents, unfavorable climatic factors, etc.)

HYPERKINESIA is referred to as excessive motor activity (for example, in case of training for sports competitions).

MOTOR DENSITY OF PHYSICAL EDUCATION CLASS is the ratio of the time spent by the child on execution of a certain movement to the duration of the class. Its percentage is usually calculated from time-keeping per minute. The recommended value is 60 - 80%.

PHYSIOLOGICAL LOAD CURVE is graphic representation of pulse rate during the physical education class (structural parts of the class are put on the horizontal axis, while pulse rate is put on the vertical axis). The recommended increase of pulse rate after the introductory part of the class is 25 - 30%, after the main part - 80 — 100% and it tends to return to the normal (i.e. pulse rate in a quiet state before the class) at the end of the class or at the 3rd or 4th minute of the recovery period.

Hygienic principles of physical education of children and adolescents

1. Providing the optimum motor activity regimen considering the needs of the child's body for movement and functional abilities of children.
2. Differential use of forms and means of physical education depending on sex, age, health and the extent of physical fitness of the child.
3. Systematic approach to physical education.
4. Stepped increase of physical load.
5. Complex use of various forms and means of physical education.
6. Creating favorable environmental conditions in the PE class.

System of physical education of schoolchildren

The objective consists in improving children's health, promoting physical development and social involvement.

1. FORMS OF PHYSICAL EDUCATION:

1.1 The main form is a PE class.

1.2 There are some additional forms. They are the following: physical and health-improving exercises during the day at school (physical exercises to be done before classes; physical exercises to be done during the breaks; physical exercises and games to be done during the breaks; physical exercises to be done in prolonged school day groups).

1.3 Optional forms: going in for sports (physical training, sports, fitness, etc.)

1.4 There are some other activities, such as active games, excursions, hiking, swimming, etc.

2. MEANS OF PHYSICAL EDUCATION: physical exercises, natural factors, natural locomotion, personal hygiene.

Table 1

Physical education classes for schoolchildren of different health status groups

Description of the group	Obligatory exercises	Additional exercises and recommendations
Basic group Schoolchildren without any health problems or with slight morphological and functional problems. These children are quite fit for going in for sports.	Children attend classes in physical education according to the curriculum. They take control tests and participate in sports competitions	Children are allowed to go in for sports and participate in sports competitions. Hiking, excursions and sports games are possible as a kind of extra-curricular activities.

Preparatory group Schoolchildren with slight health problems; they are not fit for going in for sports	Children attend classes in physical education according to the curriculum (together with the children of the basic group). They should do physical exercises slowly.	Children are allowed to attend classes in physical education with children from the
Special group	Children attend classes in physical education according to a special program considering the nature and severity of the disease.	Walking, active games, walking are advisable. Children should do individual physical exercises. Abilities of a child for motor activity and dynamics of health should be controlled daily.

Evaluation of physical education classes

1. Physical load during the class must match the health of children, their physical fitness, age, and sex.

2. The classes must be properly organized. Certain structural components of the class should be clearly marked. It is also necessary to determine motor density of the class and physical load.

3. Schoolchildren must do physical exercises which contribute to the improvement of their health, physical development and formation of a correct posture.

4. PE classes should be delivered at regular periods and should be adequately combined with other classes in the time-table.

5. The classes should be delivered in special sports halls or gymnasiums, on sportsgrounds, on stadiums or in a swimming-pool.

6. Schoolchildren must wear special clothes during their classes and the temperature of the air should contribute to hardening of the human body.

Double PE classes are not allowed. It is not advisable to deliver PE classes in the first and last hours of the day. It is preferable to deliver PE classes on the days when work capability of children is decreased.

Three main parts in the structure of the class can be singled out. They are the following:

1. Preliminary part. It usually lasts for 5 - 10 minutes (general items, walking, breathing, running, etc.). Its objective is to create the desired mood of the students, draw their attention and to prepare the body for increased physical load.

2. Main part. It usually lasts for 25 - 30 minutes. It includes general exercises, games. Its objective consists in mastering basic motor skills by the students, developing some physical abilities, training various groups of muscles and developing physiological functions of the human body.

3. Conclusion. It usually lasts for 3 - 5 minutes. It includes walking, breathing, feedback to the students. Its objective consists in reducing the motor activity of the human body.

Table 2

Rehabilitation period after acute diseases

Disease	Rehabilitation period	Indications
Tonsillitis, influenza, acute otitis	2-4 weeks	One should avoid overcooling (in skiing, swimming)
Bronchitis, acute catarrh of the upper airways	1-3 weeks	One should avoid overcooling (in skiing, swimming)
Pneumonia, pleuritis, acute infection	1-2 months	If the functional heart test shows positive results (20 squats)
Acute nephritis	2 months	
Infectious hepatitis	6-12 months	
Fracture of the bones of the limbs	1-3 months	Obligatory remedial exercises
Appendicitis (after an operation)	1 -2 months	
Brain concussion	2 months and more (up to one year)	Depending on the nature and severity of the trauma, after consultation with neurologist

Table 3

Physical load in class depending on average pulse rate

Physical load	Average pulse rate during the class

Mild Average High	Up to 140 beats/min. 140- 160 beats/min. More than 160 beats/min.

External factors of fatigue (results of medical examination):

Moderate extent of fatigue: slight hyperemia, perspiration, tachypnea, regular breathing, normal movements, good well-being, accurate execution of movements;

Average extent of fatigue: pronounced hyperemia, perspiration (mainly of the upper part of the body), tachypnea followed by deep inspirations and expirations, imprecise movements, inaccurate execution of movements, complaints of fatigue;

High extent of fatigue (overfatigue): sudden redness or paleness, excessive perspiration (mainly of the lower part of the body), excessive tachypnea, shallow, irregular breathing (shortness of breath), coordination disorders, tremor of the limbs, slow execution of movements, complaints of fatigue, pain in muscles, dizziness, burning pain in the chest, nausea.

Hygienic requirements imposed on the layout & maintenance of sports facilities

The area of the gymnasium should be as follows: 4 m^2 per student (if the height of the gymnasium is 5 - 6 meters).

The air temperature in the gym should be 17C° (in the 1^{st} climatic region), 15C° (in the 2^{nd} - 4^{th} climatic regions). The temperature of the air in the changing room should be from 19 to 23C°. Relative humidity of the air in the gym should be 40 - 60%.

The gym must be ventilated 3 times an hour through a ventilating pipe (incoming air volume should be 80 m^3 per student an hour) or cross ventilation (e.g. small windows, etc.).

Coefficient of natural lighting must be 1%. Light factor must be 1:4 - 1:5. The level of artificial lighting must be 200 lx (for luminescent lamps). Windows and lamps must be protected with special removable sheets.

Some additional premises should include two changing rooms (one for boys and the other for girls) with bathrooms and a shower, a special room for sports facilities, teacher's office.

The gym must be cleaned 2-3 times a day (before classes, between shifts, after classes).

The gym must be cleaned with hot water once a week. Floor-mats must be cleaned with a vacuum-cleaner.

There must be a sportsground in front of the school.

Sportsgrounds should be separated from one another by bushes (vegetation).

Recommended age of children for going in for sports

- Rhythmic and sports gymnastics (for girls), swimming, tennis – 7 years.
- Acrobatics, diving, sports gymnastics (for boys) – 8 years.
- Skiing — 9 years.
- Basketball, volleyball, handball, football, wrestling, water polo, boat rowing, skating, hockey, rugby, and fencing - 10 years.
- Track and field athletics (running, hurdling, jumping), canoeing – 11 years.
- Cycling, boxing - 12 years.
- Heavy athletics - 13 years.

Table 4

Approximate indications for determining health status group of children and adolescents with impaired health

Disease	Health status group			
	Remedial exercises	**Special**	**Preparatory**	**Basic**
Cardiac muscle involvement: rheumatic myocarditis followed by convalescence	In acute period and in the first months following it	8 to 10 months following the attack; if there are no signs of aggravation of the disease or blood circulation insufficiency	Not earlier than a year following the attack if there are no signs of heart and joint involvement	2 years following the attack; if the person's health is quite normal
Mitral insufficiency	During the first months following the acute period; however, if there is blood circulation insufficiency or if there are any signs of aggravation of the disease, constant remedial exercises are not advisable	10 to 20 months following the recovery from acute bacterial endocarditis or subacute bacterial endocarditis or if there are no signs of aggravation of rheumatism and blood circulation insufficiency	2 years following the recovery from rheumatism or if the person's response to physical exertion is adequate	None

Cardiotonsillary syndrome (associated with rheumatism)	None	In recurrent streptococcal infections and in detecting marked changes in the work of the heart	A year following aggravation of the disease	When the patient is no longer supervised
Bronchial asthma	In recurrent attacks, secondary changes occurring in the lungs, in respiratory failure and cardiovascular collapse.	If there are no signs of respiratory failure at rest. If the person has mild attacks which sometimes recur (1 or 2 times a year).	A year following the attack. If there are no secondary changes in the lungs and respiratory failure at rest or on physical exertion	2 years after an attack in good health
Peptic ulcer	If there is no gastrointestinal bleeding or recurrent acute pain which need systematic therapy.	A year following treatment	None	None
Chronic nephritis, epidemic hemorrhagic fever, pyelonephritis	If renal function is compensated during remission or if arterial blood pressure is less than 160/95, or if there is blood circulation insufficiency	If renal function is compensated during remission and if there are no marked changes in the work of the cardiovascular system	None	None

Developmental lag associated with some diseases of the endocrine system	None	If the person's height and body weight are much less than the normal (M - 2 sigmas and more)	If the person's height and body weight are much less than the normal (within the range M - 2 sigmas and more)	None
Chronic pneumonia	At the 3rd stage. At all stages within the 1st or 2nd month following the attack.	At the 1st stage if there are local residual manifestations of the disease. At the 2nd stage in the 1st and 2nd months following the attack. At the 3r stage if there are no signs of aggravation of the disease	At the 1st stage in the 1st and 2nd month following the attack and if there are no signs of aggravation of the disease	At the 1st stage of remission (no less than 1 year)

PRINCIPLES OF HARDENING AGAINST COLDS

1. Taking into account the personality of the child when you decide upon the method of hardening (age, health condition, and central nervous system).

2. Do it gradually. Step up the intensity of the hardening factor by reducing the temperature of the stimulant or increasing the area or length of exposure.

3. Systemic approach. This is due to the conditioned reflex nature of response reactions to the hardening factor. A prolonged interval in the procedures promotes a reversal of the developed conditioned reflex: in preschool children in 5 to 7 days, in adults—in 2-3 weeks.

4. Varying the methods of hardening. A prolonged use of the same stimulant mostly reduces the body's resistance to this stimulant.

5. Optimum temperature regimen for the children. An optimum response is only possible when the temperature is comfortable. The maximum effect of thermoregulation exercise can be achieved by regular short-term exposure to the stimulant, and a prolonged straining of a function depletes it. If the child is cold,

which means a protective vasoconstrictor reaction has set in, trying to elicit the due response to the hardening stimulant would be in vain. If the child is hot, which means thermoregulation is strained and the child is sweating, even a moderate exposure to the stimulant may result in hypothermia as increased moisture of the skin changes its thermal conductivity.

6. Positive emotions. The hardening effect is associated with age-related specifics of conditioned reflexes in children. If the child is set against gardening, put off the procedures or change the nature of the stimulant.

7. Constant monitoring of the effect of procedures on the body. Insensible approach to hardening, especially abuse of effective stimulants, has a negative effect on the child's body and can result in serious health problems.

Hardening against colds in everyday life

1. Exposure to clean air, sensible combination of the air temperature and clothing.

2. Walks.

In winter season children should stay outside for 4-5 hours daily. The clothes and shoes should match the season and weather providing freedom of movement and temperature comfort. Children under 3 go out in winter when there is no wind with a temperature of -15°, children of 4-7 – at a temperature of - 22°, and the length of the walk is reduced.

In summer children should practically live in the open. Clothing is gradually reduced to the minimum.

3. Walking barefoot.

In summer time children should be made to walk barefoot on well cleaned ground (grass, gravel, sand). You should start on hot days gradually increasing the time from 2-3 minutes to 10-12 minutes, and continue at lower temperatures (to 20°). Then you should train the children to walk bare foot indoors. Before his midday nap, the child can walk up to his bed barefoot. For children aged 5-7 one can recommend doing morning exercises first wearing socks, and then barefoot in rooms with parquet, plastic flooring or a carpet.

4. The best health-improving effect is achieved when the child exercises in the open all year round wearing clothes that fit the weather.

5. Water in hardening against colds.

Water comes in when you teach the child to wash. Bring down gradually the temperature of water for the face and the final splashing of feet. Children under 3 wash their hands, face and neck. With time, increase the area: arms to the elbow, the upper part of chest and back.

Hardening technique

When starting the hardening measures, children are divided into three groups:

Group 1: healthy children with previous experience of hardening;

Group 2: healthy children without previous experience of hardening, or children with functional disturbance of health;

Group 3: children with chronic conditions or recovering after prolonged ailments.

As the hardening progresses, but no earlier than in 2 months, the children can be transferred from one group to another. Criteria for transfer: no acute diseases within this period, the child's positive emotional response to the procedure, no negative external response to the stimulant (pronounced dyspnea, a sudden increase in the heart rate, goose-bumps).

All recommendations about the hardening technique proposed below (the temperature and exposure time) match the functional ability of group 2 children. In group 1 the desired temperature of water and air during hardening procedures should be 2-4° lower than in group 2; in group 3 the temperature should be 2° higher, and you should decrease it slower (in 3-5 days upon local exposure, and in 5-6 days upon total exposure) or decrease the exposure time.

Classification of hardening procedures

- According to their intensity: local (rub-down, dousing, bath, surface water);
- According to exposure time;
- According to the stimulant (air, water, sunshine).

Hardening starts with milder procedures (local exposure), one starts with the air as a stimulant to be followed by water and sunshine.

1. AIR BATH is the mildest procedure.

You start with a local air bath when the child is dressed with bared arms and legs, during exercising or music classes; you do a total air bath when the child changes the under wear, after midday nap or in the morning. Infants are exposed to a total air bath 3-4 times a day when their diapers are changed, as well as during massage and exercises. The exposure time starts at 2-3 minutes to be increased to 4-8 minutes.

A method combining air bath and exercising to music of varying tempo is gaining in popularity lately. This method provides a cheerful mood and motivates the child to do hardening procedures both in preschool and at home.

2. HARDENING WITH WATER starts with the mildest local short-term exposure to be followed by total exposure.

2.1. LOCAL HYDROTHERAPEUTIC PROCEDURES

For small children, intimate washing is a way to start hardening; the water temperature is gradually brought down from 29-30° to 22-20° (by 2° every 5-6 days).

Local wet rub-down is indicated for weak children after a prolonged illness. After a wet rub-down the skin is rubbed with a dry towel massaging lightly until the skin is moderately pink. Start with rubbing down the arms, legs, and the trunk and proceed to rub down the whole body.

Dousing with water produces a greater stimulating effect as the effect is produced both by the water temperature and by the weight of water mass.

Local dousing of feet is done from a ladle, indoors with a temperature above 20°. Hold the jar with water (0.5 – 0.3 l) at a distance of 4-5 cm from the body, pour water on the ankles and feet. The dousing is for 15-20 seconds followed by rubbing with a dry towel until the skin is slightly pink. You can only achieve the hardening effect if cool water is poured over warm feet. That is why this procedure is usually recommended after the midday nap, in summer it is combined with washing the feet after a walk. The water temperature is 30°, in 1-2 days it is brought down by 2° to 18-16° for children aged 2-3, and to 16-18° for children aged 4-7.

Dousing the feet with water of contrast temperature is recommended for small children provided they were hardened during a cold season, when the indoor temperature is under 20°, during epidemics. There is a milder variety for weak children: first the feet are doused with warm water (36-35°), then with cool water (24-25°), and with warm water again (36-35°). Gradually, the warm temperature is increased to 40°, and the cold temperature is brought down to 18°. Complete the procedure with dry toweling. If the child is hardened, or does not often get colds, use water of contrast temperature: first with cold water (24-25°), and then with warm water (35-36°) completing with cold water; the temperature is then gradually decreased.

Rinsing your mouth with half glassful of boiled water of room temperature twice a day is a good way of hardening against colds and preventing diseases of the teeth, oral mucosa or nasopharynx. Children can be taught to do this from the age of 2-3. Children aged 4-5 can be taught to gargle the water in the throat.

2.2. GENERAL HYDROTHERAPEUTIC PROCEDURES (rubdown, dousing, bath) can be done 30-40 minutes after the meals. A total rubdown is made with a mitten of soft cloth, slightly massaging the skin in the direction from the fingers or toes to the trunk which prevents blood congestion in the veins and capillaries. First you rub down the arms, then the legs, the chest, the abdomen, and the back.

Douse the whole body with water at an air temperature above 23°. Pour water on the shoulders, chest and back (1.5 - 2 L) raising the watering pot 6-8 cm above the child's height. The procedure takes 15-35 seconds and is followed by dry toweling. Start with water temperature of 35°, then decrease it by 2° every 4-5 days to

achieve 28-26° for children aged 3, and 24° for children aged 3-4, and 22° for children aged 5-7. Having achieved the desired temperature, the dousing is continued for 2 months to provide the training effect. After that you can intensify the stimulant or increase the exposure time.

To maintain the hardening effect, in summer time you can have frequent water games, splashing in swimming pools or rivulets at a water temperature above 20°, exposure time starting from 30 seconds to 5-10 minutes.

Bathing in surface water is the most effective procedure as the whole of the child's skin is exposed to three factors at the same time: fresh air, a great water mass, and sunshine. You should start bathing in stable weather without wind at an air temperature above 23° (afterwards the air temperature can be down to 20°). The best time for bathing is from 10 to 12 AM. The first bathing should consist in two – three quick immersions in water. Afterwards the duration increases to 2-3minutes, and when the child is adapted – to 5-6 minutes. Do not allow more than one bathing within a day. You should watch that overheated or overcooled children should not go into water. Once you see the first signs of overcooling (paleness, blue lips, shivering), stop the bathing immediately. After bathing dry towel the child's body and get him dressed.

3. HARDENING WITH SUNSHINE

3.1. Sunbathing

3.2. Using man-made radiation sources

There are no contraindications against hardening with sunshine and air, except for acute conditions. After a disease that left no complication, a healthy child who was hardened previously can miss 1-2 procedures; children who were not hardened previously, with functional disorders, can miss 3 procedures. Children with chronic conditions should start hardening in a warm season, with due attention to their individual specifics.

THEME 3.5
FORMATION OF A HEALTHY LIFESTYLE

Motivational statement of theme

"Health is not everything, but without health everything amounts to nothing."

Socrates

The main principle of preserving and strengthening the health of people is the principle of prevention, which should be implemented in the activities of

a doctor of any specialty. An important section of this activity is the formation of a healthy lifestyle since according to modern scientific data, health is determined by 50% the way of life.

In this country, up to 80% of men and women lead an unhealthy lifestyle in its various elements and their complex: they have irrational regimens of work and rest, unbalanced nutrition, use legal drugs like nicotine, alcohol, a number of medicines, and illegal drugs, and more.

It is necessary to instill in a person the correct attitude to their own health and the health of others from an early age. The person must have comprehensive knowledge and skills for the preservation and strengthening of personal health, self-preserving behavior. Important means of forming a hygienic consciousness, the concepts of a healthy lifestyle are propaganda, education, and training. A large role in this belongs to the doctor, who must carry out this activity when working with patients and the public.

Objective: the formation of notions about a healthy way of life, as the most important factor in the prevention of multifactorial diseases, preservation of health and creative longevity; mastering the skills of promoting and shaping a healthy lifestyle.

Students' classroom activities

1. Listening to and discussing of reports prepared by students according to the teacher's individual assignment.

2. Performing tests and evaluating the results to determine individual circadian rhythm.

3. Study and assessment of the student's daily routine by the method of questionnaires (questionnaire "Your daily routine").

4. Implementation and evaluation of the results of tests of self-assessment of physical fitness.

5. Assessment of the student's motor activity according to the results of the questionnaire (Questionnaire "Student's motor activity")

Algorithm:

- assessment of physical activity in points based on the results of the summation of points;

- listing and counting the duration of moderate-intensity physical activity (approximately 3-6 METs) during the day;

- note down and calculate the duration of vigorous physical activity (more than about 6 METs) during the day;

- assessment of motor activity according to the results of step meter.

6. solving case problems.

Students' independent activities

1. The concept of a healthy lifestyle. The role of a healthy lifestyle in maintaining and strengthening health.

2. Elements of a healthy lifestyle and methods of its promotion.

3. Hygiene of mental work; modes of work and rest.

4. Locomotor activity. Prevention of hypodynamia. WHO documents regulating physical activity?

5. Hardening: its concept, types, and methods. Hardening principles.

6. Competent environmental behavior.

7. Bad habits, preventive measures and fight against them.

8. Individual prevention of AIDS and other diseases.

Plan of students' independent activities

"__"_____20__.

1. Test to determine the individual type circadian rhythm.

1 - ; 2 - ; 3 - ; 4 - ; 5 - ; 6 - ; 7 - ; 8 - .

The sum of points for the test: points _____

Conclusion: "lark", "owl", arrhythmic (underline).

2. Analysis of the results of the survey on the questionnaire "Your daily routine"

Table 1

Activities	Duration	Assessment
Night sleep		
Walking -On weekends - weekdays		
Academic work		
Leisure		
Passive rest		
Leisure organization		

Conclusion: _____
_____

Recommendations: _____
_____
_____

3. Test of self-assessment of physical fitness.

3.1. Pulse rate after rising to the 4th floor beats / min _____

Conclusion: excellent, good, fair, poor (underline).

3.2. Initial heart rate beats _____ /min.

Pulse rate after doing 20 squats in 30 seconds beats ____ / min.

Pulse rate increased by _____ %.

Conclusion: excellent, good, fair, poor (underline).

3.3. Assessment of physical activity (based on the findings of the questionnaire).

1. Assessment of the level of physical activity in points based on the findings of the questionnaire

Table 2

Physical activity	**Points**
Very high	≥109
High	85 - 108
Moderate	62 - 84
Low	39 - 61
Very low	<38

Conclusion:

_____

2. Duration of physical activity of moderate intensity (approximately 3-6 METs) during the day.

Table 3

Moderate intensity exercise	**Duration**
Total:	

3. Duration of vigorous physical activity (more than 6 METs) during the day.

Table 4

High-intensity exercise	**Duration**
Total:	

Conclusion: _____

3. Pedometry (number of locomotion) per week.

Table 5

Pedometry _____ results (number of locomotion) per week.
Observation period:

Monday	Distance of walking and running	
	Number of steps	
	Number of floors	
Tuesday	Distance of walking and running	
	Number of steps	
	Number of floors	
Wednesday	Distance of walking and running	
	Number of steps	
	Number of floors	
Thursday	Distance of walking and running	
	Number of steps	
	Number of floors	
Friday	Distance of walking and running	
	Number of steps	
	Number of floors	
Saturday	Distance of walking and running	
	Number of steps	
	Number of floors	
Sunday	Distance of walking and running	
	Number of steps	

	Number of floors	
Total for the week	Distance of walking and running	
	Number of steps	
	Number of floors	

Conclusion _____
Recommendations for the correction of physical activity: _____
_____
_____
_____
_____

Done by: _____
Supervisor: _____

Reference information

Term definition

HEALTH is not merely absence of disease or infirmity, but a state of physical, mental, and social well-being (World Health Organization).

The health of an adult is determined by the following factors: 20% - by heredity, 20% - by ecology, 50% - by lifestyle, 10% - by medicine and healthcare.

HARDENING means complex actions aimed at improving the functional reserve and resilience of the body to the adverse effect of physical factors of the surrounding environment (increase or decrease in temperature of the air, water, and others.) due to systematic effects of these factors.

HARDNESS is a property of the body that ensures its resistance to unfavorable meteorological factors.

HEALTHY WAY OF LIFE is a set of hygiene rules and regulations implemented in the way of life.

LIFESTYLE is a way of life (in the spheres of work, life, learning, culture, social and political activity) of an individual, social group, society.

PSYCHOLOGY OF HEALTH is comprehensive improvement of a person by increasing psychological competence, literacy, and the level of communication culture (with one another and oneself), determining the conditions and ways of self-realization of the individual.

A healthy way of life, like health, is a complex concept, which includes social, economic, biological, medical, ethical, psychological aspects.

Basic Elements of HEALTHY LIFESTYLE

1. Rational organization of work and rest.
2. Physical education and hardening.
3. Food culture.
4. Psychological culture.
5. Sexual culture.
6. Ecological culture.
7. Prevention of alcoholism.
8. Prevention of nicotinism.
9. Prevention of drug and substance abuse.
10. Individual prevention of AIDS and other infections.
11. Self-medication and harm from it; tricks himself and mutual assistance in emergency situations.
12. Personal hygiene.

METHODS FOR PROMOTING a healthy lifestyle:

- methods of individual exposure,
- methods of exposure to a group of people,
- methods of mass media.

In his work a physician often holds individual conversations offering instructions, consultations, group conversations, lectures, discussions.

The physician's approach to each patient is individual, which is determined by age, sex, constitutional and heredity features, the presence and severity of external, professional and behavioral risk factors.
The approximate basis for the physician's actions includes examination (screening), preventive recommendations (lifestyle correction), treatment and prophylactic prescriptions.

Appendix

TEST TO DETERMINE INDIVIDUAL CIRCADIAN RHYTHM

RATIONALE. With regard to humans, classification of people according to their circadian rhythms is based on individual differences in the phases of maximum mental and physical performance. Larks prefer to work in the morning, and their circadian rhythms are shifted to early hours relative to average. Owls are more efficient in the afternoon and even at night.

PROCEDURE. Get a form with questions from the teacher, answer them, writing down the scores in the protocol.

PROCESSING AND INTERPRETATION

Summarize by adding the scores.

- 0 to 7 points - lark (it is better to work, study in the morning).
- 8 to 13 points - arrhythmic (person with a labile biorhythmic structure). People of this type do not have clear guidelines whether to get up sooner or later. They can easily adapt to circumstances, any schedule of work and rest.
- 14 to 20 points – owl (great performance in the afternoon). People of your type are much less susceptible to panic in a critical situation; they are more organized and think over their actions more carefully.

PHYSICAL FITNESS SELF-ASSESSMENT TEST

The simplest methods of self-control before starting regular physical exercise will reveal the degree of adaptation of the body to physical activity. They can be used for screening examinations of patients.

1. Initial fitness can be checked by a preliminary assessment of the performance of the cardiovascular system while climbing stairs. This is done like this: you need to go up to the 4th floor at a normal pace, without stopping, and calculate the heart rate. If it turns out to be less than 100 beats per min., excellent, less than 120 - good, less than 140 - satisfactory, 140 and above - poor.

2. Do 20 squats in 30 seconds, raising your arms forward and keeping your torso straight.

If the pulse rate increases by no more than 25% - excellent, by 25-50% - good, by 50-75% - satisfactory, more than 75% - poor.

OPTIMUM LOAD

Controlling the optimal load at any form of physical exercise is best of all by checking the pulse:

- The heart rate should not be higher than that calculated by the formula:

HR = (220- age in years) x K,

where K = 1 for trained people;

= 0.6 for beginners with an adequate load,

10 minutes after its end, the heart rate should be no more than 16 beats in 10 seconds, and after 1 hour, return to the initial level measured before the load in the sitting position.

If this figure exceeds the indicated values, it is necessary to reduce the intensity or duration of training.

Table 6

QUESTIONNAIRE FOR STUDENTS "Your daily routine"

Read the questions carefully, underline the answer

Year _____ Age _____ Sex _____

No	Question	Answer
1	What time do you usually go to bed:	1) 21.00-22.00 2) 22.00 - 23.00 3) after 23.00
2	What time do you usually get up on university days:	1) 6.00 - 7.00 2) 7.00 - 7.30 3) 7.30 - 8.00
3	On average, how many hours a day do you study at the university?	1) Less than 4 hours 2) 4-6 hours 3) 6 or more hours
4	On average, how many hours a day do you study additionally outside the university (taking into account the preparation of homework)	1) Less than 2 hours 2) 2-4 hours 3) more than 4 hours
5	Walking on school days	1) Almost every day 2) 3-4 times a week 3) 1-2 times a week 4) No
6	How long do you walk on school days	1) More than 2 hours 2) 1-2 hours 3) Less than 1 hour 4) I don't walk
7	Weekend walks	1) Regular 2) Often 3) Rare 4) No
8	How long do you walk on weekends	1) More than 2 hours 2) 1-2 hours 3) Less than 1 hour 4) I don't walk
9	How long does it take to watch entertainment programs, films (TV, on line) on school days	1) I do not watch tv 2) Up to 1 hour 3) 1- 2- hours 4) More than 2 hours
10	How long does it take to watch entertainment programs, films (TV, on line) on weekends	1) I do not watch tv 2) Up to 1 hour 3) 1- 2- hours 4) More than 2 hours
11	How is your leisure time organized most	1) Exercising, sports

	often?	2) I prefer walking 3) Housework 4) I read, watch movies, play computer games , communicate with friends

Table 7

Questionnaire to study and assess students' physical activity

No	Question	Answer	Score	Comment
1	If you are studying or working, what is your physical activity at school or at work?	1 – My studies are mainly done in a sitting posture 2 - I walk quite a lot while studying , but I don't have to lift or carry weights 3 - I have to walk a lot and carry weights	1.4 4.1 5.8	
2	Do you experience psycho-emotional stress at work, at home?	1– Yes 2 - No	3 1.7	
3	How physically active are you during your free time from university and work during the day?	1 - I usually do not do anything requiring a physical effort 2 - I go for walks in the open, do work that requires little effort 3 - I try to lead an active lifestyle, exercise, not especially limiting myself in loads	0.9 3.5 5.7	Formulas for calculating the score (E): answer No. 1-calculation: E 1 = 0.9 / n; answer No. 2-calculation: E 2 = 3.5x 0.4
4	How many times a week do you spend your time like this?	Number of times_____		
5	How many minutes a day do you walk in total?	1) Less than 15 min 2) 15-30 minutes 3) 30-60 min 4) More than 1 hour a day	1.1 2.3 4.1 5.5	
6	At what pace do you usually walk?	1) Fast 2) Medium pace 3) Taking my time	5.7 3.8 1.3	

7	What is the maximum distance you can walk without stopping?	Indicate the number of km _____ 1) More than 1 km 2) 1 km 3) 900-500 m 4) 400-200 m 5) less than 200 m	 4.7 + A 4.7 3.3 1.8 0.8	A = 0.6 n n - number of kilometers
8	For what reason do you stop?	1) Chest pain 2) Discomfort in the region of the heart 3) Shortness of breath 4) Palpitations, arrhythmias 5) Dizziness 6) Leg pain or other discomfort 7) Fatigue, etc. (without deterioration of health)	0.7 0.7 1.2 1.2 1.7 1.7 3.8	
9	Maximum distance in kilometers that you walk throughout the day	1) Less than 1 km 2) 1 km or more	2 3.5	If the answer to questions 9 and 10 counting
10	Indicate how many kilometers	Number of km - n _____	3.5+ n	Calculate the total score
11	How often do you use the elevator?	1) I try to climb stairs on foot 2) I try to climb stairs on foot, but not higher than the 3rd floor 3) There is no elevator in my house (at the place of study), several times a day I have to climb the stairs on foot (2 floors or more) 4) I rarely use the elevator, because I live (work) on the 1st (2nd) floor 5) Occasionally, if you need to climb 12 floors, I go on foot 6) I prefer to take the elevator in all cases	5.8 4.7 4.9 2.6 2.5 1.2	
12	How often do you have an exercise that	1) Daily 2) Two to three times a week	5.3 4.5	

	causes mild shortness of breath or sweating?	3) Once a week 4) Two to three times a month 5) Once a month or less 6) I have no such activity	 3.4 2.3 1.6 0.2	
13	How do you assess your physical condition (fitness) at the present time?	1) Very good 2) Good enough 3) Average 4) Below average 5) Poor	5.6 4.9 3.7 1.7 0.7	
14	Has your physical activity changed over the past six months?	1) Significantly decreased 2) Slightly decreased 3) Remains the same 4) Increased	0.8 2.3 3.5 5.2	
15	Are you currently engaged in physical training (in addition to physical education at the university)?	1) Yes (strated recently) 2) No	5.3 0.8	
16	Where have you been doing or have recently been doing physical training?	1) Organized on the basis of a gym or university 2) Individually (at home)	5.4 4.2	
17	Indicate what your home workouts include	1) Gymnastic exercises 2) Walking 3) Jogging 4) Cycling 5) Exercising on a stationary bike or other simulators 6) Exercises with dumbbells 7) Swimming 8) Skis 9) Sports games (football, volleyball, tennis, etc.)	3.1 4.2 5.1 5.3 5.3 5.4 5.4 5.5 5.5	The total number of marked items is estimated
18	How many times a week do you exercise?	) Less than once a week 2) 1-2 times a week 3) 4 times a week 4) 5 times or more	2 3.8 5.2 6.1	
19	Specify the duration of this workout in minutes	1) Less than 20 minutes 2) 20-30 min 3) More than 30 minutes	3.2 4.7 5.9	

20	If you are not engaged in physical training, then indicate why	I do not consider this necessary, since: 1) It's bad for my health 2) It won't do me good 3) My lifestyle is active enough 4) I don't know I consider it necessary, but: 5) I can't bring myself to 6) It is desirable that classes are conducted in an organized manner in a medical institution 7) My health does not allow this 8) No possibility	 0.4 0.7 4 1.3 1.6 2.5 0.8 1.5	
21	What is your sexual activity (having sex)?	1) More than once a week 2) 2-4 times a month 3) 1 time per month or less 4) Very rare or not	5.3 4.1 2.1 0.5	
22	How long do you spend in a car as a driver or passenger?	1) 3 hours or more daily 2) Daily 2-3 hours 3) 1-2 hours a day 4) Less than 1 hour a day or not every day	1.6 2.3 3 3.8	
23	What is your housekeeping activity (buying goods in stores, cooking, cleaning the house, doing laundry, caring for animals, etc.)?	1) I do housekeeping for more than 1 hour every day 2) I do household chores no more than 1 hour a day, but on weekends I spend more than 1 hour on it 3) I do household chores daily or almost daily, but no more than 1 hour a day 4) I do little housework, but I have to do heavy housework 5) I do housework sometimes 6) I have no housework	5.2 4.5 3.8 3.7 2 0.8	

Table 8

Assessment of the level of physical activity in points according to the questionnaire

Physical activity	Points
Very high	≥109
High	85 - 108
Moderate	62 - 84
Low	39 - 61
Very low	<38

1. An example for listing and calculating the duration of moderate-intensity physical activity (approximately 3-6 METs) during the day:

Table 9

Moderate intensity exercise	**Duration**
Fast walk	20 minutes
Dancing	60 mins
Carrying / moving objects of moderate weight (less than 20 kg)	10 minutes
Total:	90 minutes

2. An example for listing and calculating the duration of high-intensity physical activity (about more than 6 METs) during the day:

Table 10

High-intensity exercise	**Duration**
Running	20 minutes
Fast cycling	60 min
Carrying / moving heavy loads (over 20 kg).	0 minutes
Total:	80 minutes

Physical activity

About about 40% of the adult population of Russia is currently low in activity both at work and in their free time.

Physical activity is defined as any bodily movement produced by skeletal muscle that requires energy.

Physical inactivity (lack of physical activity) is the fourth leading risk factor for global mortality (6% of deaths in the world). In addition, it is estimated that physical inactivity is the main cause of about 21-25% of breast and colon cancers, 27% of diabetes and about 30% of coronary heart disease.

Regular physical activity of appropriate levels among adults has the following health effects:

- Reducing the risk of developing high blood pressure, coronary heart disease, stroke, diabetes, breast and colon cancer, depression and the risk of falls;

- Promoting bone health and functional health and being a major determinant of energy expenditure therefore playing a critical role in energy metabolism and maintaining proper weight.

Physical activity should not be confused with exercise. Exercise is one of the subcategories of physical activity that encompasses planned, structured and repetitive physical activity aimed at improving or maintaining one or more components of physical fitness. In addition to physical exercise, physical activity also includes other types of active body movements performed during games, work, active movement, housework, as well as leisure and entertainment.

Increasing the level of physical activity is a problem not only for individuals but for the whole society. Therefore, to solve it, a multisectoral, multidisciplinary approach is required, focused on certain groups of the population and taking into account the specifics of culture.

Intensity of physical activity

Intensity is the pace of physical activity or the amount of effort required to perform an activity or exercise. It can be described in words: how hard a person works to perform a certain type of activity.

Physical activity in humans varies in intensity. The intensity of physical activity depends on the person's experience with exercise and the relative level of his physical condition. Therefore, the examples below are only guidelines that require a differential approach.

- **Moderate physical activity (approximately 3-6 METs)**
  Requires moderate effort and increases the heart rate markedly.
- **High intensity physical activity (more than about 6 METs)**
  It takes a lot of effort and leads to rapid breathing and a significant increase in heart rate.

Table 11

Examples of moderate to vigorous physical activity:

Moderate physical activity	**Intense physical activity**
Walking (over 4 km / h)	Jogging
Gardening (must be regular)	Aerobics, step aerobics or kickboxing
Slow cycling on flat terrain (up to 15 km / h)	Basketball
Dancing	Fast cycling
Ice skating or roller skating	Sports competitions and games (for example, traditional games, football, volleyball, hockey, basketball); vigorous uphill / ascent
Tennis	
Climbing the local area on foot	Heavy housework (with a significant

	increase in heart rate)
Active forms of Yoga	Energetic work with a shovel
Swimming, water aerobics	Cross-country skiing
General yard work and house repair	Carrying / moving heavy loads (over 20 kg)

The metabolic equivalent (MET) is widely used to show the degree of intensity of physical activity.

MET is the ratio of a person's metabolic rate during physical activity to their resting metabolic rate.

MET stands for metabolic equivalent, 1 MET is the amount of energy expended by a person at rest and is equivalent to burning 1 kcal / kg / hour.

1 MET is the rate of energy expenditure at rest. It is conventionally assumed that oxygen consumption is 3.5 milliliters per kilogram of body weight per minute.

High-intensity physical activity: On an absolute scale, high intensity means that physical activity is performed at a level of 6.0 or more times the rest intensity for adults and, as a rule, 7.0 times or more for children and young people. On a scale of individual capabilities of a person from 0 to 10, high-intensity physical activity ranges from 7 to 8.

Physical activity of moderate intensity: On an absolute scale, average intensity means that physical activity is performed at a level of 3.0-5.9 times the intensity of rest. On a scale of individual capabilities of a person from 0 to 10, physical activity of average intensity ranges from 5 to 6.

HARDENING

Hardening is a part of a healthy way of life, a measure of non-specific prevention of diseases and improves stability against the impact of constantly changing conditions of the external environment. An increase in stability is most often associated with the concept of hardening the body against adverse meteorological factors. The doctor develops hardening measures in different seasons of the year; provides education explaining the importance of hardening and the methods of its implementation.

Hardening in everyday life

1. Revitalizing effect of clean air, a rational combination of air temperature and clothing.
2. Walking.
3. Walking barefoot.
4. The biggest health effect is achieved when carrying out physical exercises in the open the year round in sportswear matching the season.

5. The use of water in order to harden combined with the formation of personal hygiene. A prerequisite is a gradual decrease in the temperature of the water when washing and for the final rinse when washing the feet.

Classification of special hardening measures

- By the strength of impact: local (rubdown, shower, bath), general (rubdown, shower, bath, swimming in an open reservoir);

- By duration;

- By the acting factor (air, water, sun). Hardening begins with softer impacts (local); air-hardening must precede water and sun hardening.

1. Air bath is the softest special hardening procedure.

2. Water hardening begins with extremely weak impacts (local and short-term), then proceeds to general measures.

2.1. Local water treatments.

2.2. General water procedures (wiping, dousing, and bathing) are carried out no earlier than 30-40 minutes after eating.

3. Hardening by means of ultraviolet irradiation.

3.1. Sunbathing

3.2. Use of artificial sources of radiation.

PRINCIPLES OF HARDENING AGAINST COLDS

1. Taking into account the personality of the child when you decide upon the method of hardening (age, health condition, and central nervous system).

2. Do it gradually. Step up the intensity of the hardening factor by reducing the temperature of the stimulant or increasing the area or length of exposure.

3. Systemic approach. This is due to the conditioned reflex nature of response reactions to the hardening factor. A prolonged interval in the procedures promotes a reversal of the developed conditioned reflex: in preschool children in 5 to 7 days, in adults—in 2-3 weeks.

4. Varying the methods of hardening. A prolonged use of the same stimulant mostly reduces the body's resistance to this stimulant.

5. Optimum temperature regimen for the children. An optimum response is only possible when the temperature is comfortable. The maximum effect of thermoregulation exercise can be achieved by regular short-term exposure to the stimulant as a prolonged straining of a function depletes it. If the child is cold,

which means a protective vasoconstrictor reaction has set in, trying to elicit the due response to the hardening stimulant would be in vain. If the child is hot, which means thermoregulation is strained and the child is sweating, even a moderate exposure to the stimulant may result in hypothermia as increased moisture of the skin changes its thermal conductivity.

6. Positive emotions. The hardening effect is associated with age-related specifics of conditioned reflexes in children. If the child is set against gardening, put off the procedures or change the nature of the stimulant.

7. Constant monitoring of the effect of procedures on the body. Insensible approach to hardening, especially abuse of effective stimulants, has a negative effect on the child's body and can result in serious health problems.

Hardening against colds in everyday life

1. Exposure to clean air, sensible combination of air temperature and clothing.

2. Walks.

In winter season children should stay outside for 4-5 hours daily. The clothes and shoes should match the season and weather providing freedom of movement and temperature comfort. Children under 3 go out in winter when there is no wind with a temperature of -15°, children of 4-7– at a temperature of -22°, and the length of the walk is reduced.

In summer children should practically live in the open. Clothing is gradually reduced to the minimum.

3. Walking barefoot.

In summer time children should be made to walk barefoot on well cleaned ground (grass, gravel, sand). You should start on hot days gradually increasing the time from 2-3 minutes to 10-12 minutes, and continue at lower temperatures (to 20°). Then you should train the children to walk bare foot indoors. Before his midday nap, the child can walk to his bed barefoot. For children aged 5-7 one can recommend doing morning exercises first wearing socks, and then barefoot in rooms with parquet, plastic flooring or a carpet.

6. The best health-improving effect is achieved when the child exercises in the open all year round wearing clothes that fit the weather.

7. Water in hardening against colds.

Water comes in when you teach the child to wash. Bring down gradually the temperature of water for the face and the final splashing of feet. Children under 3 wash their hands, face and neck. With time, increase the area: arms to the elbow, the upper part of chest and back.

Hardening technique

When starting the hardening measures, children are divided into three groups:

Group 1: healthy children with previous experience of hardening;

Group 2: healthy children without previous experience of hardening, or children with functional disturbance of health;

Group 3: children with chronic conditions or recovering after prolonged ailments.

As the hardening progresses, but no earlier than in 2 months, the children can be transferred from one group to another. Criteria for transfer: no acute diseases within this period, the child's positive emotional response to the procedure, no negative external response to the stimulant (pronounced dyspnea, a sudden increase in the heart rate, goose bumps).

All recommendations about the hardening technique proposed below (the temperature and exposure time) match the functional ability of group 2 children. In group 1 the desired temperature of water and air during hardening procedures should be 2-4° lower than in group 2; in group 3 the temperature should be 2° higher, and you should decrease it slower (in 3-5 days upon local exposure, and in 5-6 days upon total exposure) or decrease the exposure time.

Classification of hardening procedures

- According to their intensity: local (rub-down, dousing, bath, surface water);
- According to exposure time;
- According to the stimulant (air, water, sunshine).

Hardening starts with milder procedures (local exposure), one starts with the air as a stimulant to be followed by water and sunshine.

1. AIR BATH is the mildest procedure.

You start with a local air bath when the child is dressed with bared arms and legs, during exercising or music classes; you do a total air bath when the child changes the underwear, after midday nap or in the morning. Infants are exposed to a total air bath 3-4 times a day when their diapers are changed, as well as during massage and exercises. The exposure time starts at 2-3 minutes to be increased to 4-8 minutes.

A method combining air bath and exercising to music of varying tempo is gaining in popularity lately. This method provides a cheerful mood and motivates the child to do hardening procedures both in preschool and at home.

2. HARDENING WITH WATER starts with the mildest local short-term exposure to be followed by total exposure.

2.1. LOCAL HYDROTHERAPEUTIC PROCEDURES.

For small children, intimate washing is a way to start hardening; the water temperature is gradually brought down from 29-30° to 22-20° (by 2° every 5-6 days).

Local wet rub-down is indicated for weak children after a prolonged illness. After a wet rub-down the skin is rubbed with a dry towel massaging lightly until the skin is moderately pink. Start with rubbing down the arms, legs, and the trunk and proceed to rub down the whole body.

Dousing with water produces a greater stimulating effect as the effect is produced both by the water temperature and by the weight of water mass.

Local dousing of feet is done from a ladle, indoors with a temperature above 20°. Hold the jar with water (0.5 – 0.3 l) at a distance of 4-5 cm from the body, pour water on the ankles and feet. The dousing is for 15-20 seconds followed by rubbing with a dry towel until the skin is slightly pink. You can only achieve the hardening effect if cool water is poured over warm feet. That is why this procedure is usually recommended after the midday nap, in summer it is combined with washing the feet after a walk. The water temperature is 30°, in 1-2 days it is brought down by 2° to 18-16° for children aged 2-3, and to 16-18° for children aged 4-7.

Dousing the feet with water of contrast temperature is recommended for small children provided they were hardened during a cold season, when the indoor temperature is under 20°, during epidemics. There is a milder variety for weak children: first the feet are doused with warm water (36-35°), then with cool water (24-25°), and with warm water again (36-35°).Gradually, the warm temperature increases to 40°, and the cold temperature is brought down to 18°. Complete the procedure by dry toweling. If the child is hardened, or does not often get colds, use water of contrast temperature: first with cold water (24-25°), and then with warm water (35-36°) completing with cold water; the temperature is then gradually decreased.

Rinsing your mouth with half glassful of boiled water of room temperature twice a day is a good way of hardening against colds and preventing diseases of the teeth, oral mucosa or nasopharynx. Children can be taught to do this from the age of 2-3. Children aged 4-5 can be taught to gargle the water in the throat.

2.2. GENERAL HYDROTHERAPEUTIC PROCEDURES (rubdown, shower, bath) can be done 30-40 minutes after the meals. A total rubdown is made with a mitten of soft cloth, slightly massaging the skin in the direction from the fingers or toes to the trunk which prevents blood congestion in the veins and capillaries. First you rub down the arms, then the legs, the chest, the abdomen, and the back.

Douse the whole body with water at an air temperature above 23°. Pour water on the shoulders, chest and back (1.5 - 2 L) raising the watering pot 6-8 cm above the child’s height. The procedure takes 15-35seconds and is followed by dry toweling. Start with water temperature of 35°, then decrease it by 2° every 4-5 days to achieve 28-26° for children aged 3, and 24° for children aged 3-4 лет, and 22° - for children aged 5-7. Having achieved the desired temperature, the dousing is continued

for 2 months to provide the training effect. After that you can intensify the stimulant or increase the exposure time.

To maintain the hardening effect, in summer time you can make a frequent use of water games, splashing in swimming pools or rivulets at a water temperature above 20°, exposure time starting from 30 seconds to5-10 minutes).

Bathing in surface water is the most effective procedure as the whole of the child's skin is exposed to three factors at the same time: fresh air, a great water mass, and sunshine. You should start bathing in stable weather without wind at an air temperature above 23° (afterwards the air temperature can be down to 20°). The best time for bathing is from 10 to 12 AM. The first bathing should consist in two – three quick immersions in water. Afterwards the duration increases to 2-3minutes, and when the child is adapted, to 5-6 minutes. Do not allow more than one bathing within a day. You should watch that overheated or overcooled children should not go into water. Once you see the first signs of overcooling (paleness, blue lips, shivering), stop the bathing immediately. After bathing dry towel the child's body and get him dressed.

3. HARDENING WITH SUNSHINE

3.3. Sunbathing

3.4. Using man-made radiation sources

There are no contraindications against hardening with sunshine and air, except for acute conditions. After a disease that left no complication, a healthy child who was hardened previously can miss 1-2 procedures; children who were not hardened previously, with functional disorders, can miss 3 procedures. Children with chronic conditions should start hardening in a warm season, with due attention to their individual specifics.

SAMPLE REPORT THEMES

Theme 4.1:

1. Exposure to high temperature on the workplace, its prevention.

1) Main types of human activity associated with exposure to high or low temperature.

2) Pathogenesis and clinical manifestations of thermal impact on the workplace.

3) Prevention of thermal impact on the workplace.

2. Effect of vibration on the body. Vibration disease and its prevention.

1) Occupational sources of vibration

2) Physical properties of vibration

3) Pathogenesis of vibration disease

4) Clinical presentations of vibration disease

5) Preventive measures.

4. Noise as work-related exposure. Prevention of harmful effects of noise on the workplace.

1) Physical characteristics of noise; its frequency response.

2) Pathogenesis of noise sickness

3) Clinical presentations of noise sickness.

4) Preventive measures against harmful effects of noise.

5. Dust as work-related exposure; prevention of dust-induced disease.

1) Main industries where exposure to dust is possible.

2) Hygienic significance of physical and chemical properties of dust.

3) Effect of exposure to dust on the body.

4) Preventive measures against occupational disease.

6. Chemicals in industry; prevention of occupational intoxication.

1) Notion of industrial toxins.

2) Effect of chemical structure and physico-chemical properties on the toxic effect.

3) Routes of toxin intake and excretion.

4) Distribution and transformation of toxins in the body.

5) Combined effect of toxins.

6) Occupations intoxication.

7) Preventive measures against occupational intoxication.

Theme 4.2:

1. Response of human body to work.

1) Types of work.

2) Physiological changes in the working body.

3) Fatigue and overstrain.

4) Major methods of studying the functional systems of the body in occupational physiology.

2. Psychophysiological factors promoting work efficiency and preventing fatigue.

1) Importance of work rhythm.

2) Rational regimen of work and leisure.

3) Rational workplace organization; notion of ergonomics.

4) Functional music.

5) Work space design.

3) Prevention of smoking among teenagers.

Theme 5:

1. Acceleration of physical development as a socio-hygienic issue.

1) Notion of *acceleration of physical development*.

2) Effect of acceleration on health

3) Tentative causes of acceleration.

4) Prediction of acceleration dynamics in developing countries.

2. Prevention of skeletal deformity in relation to anatomical and physiological specifics of musculoskeletal system in children and teenagers.

1) Specifics of musculoskeletal system in children and teenagers.

2) Prevention of skeletal deformity (choice of furniture, physical education, hardening against colds, balanced diet, daily routine etc.).

Theme 6:

1. Daily routine: hygiene requirements, its significance for health.

1) Concept of daily routine and its significance for health.

2) Circadian rhythms: notion of circadian rhythm, its types, peaks of activity, and performance in humans during the day with different types of biorhythmic activity.

3) Stage of fatigue development at which timed breaks are more effective.

4) Active and passive rest.

2. Physical activity as a factor in maintaining health

1) Physical activity: concept of physical activity, its types.

2) Regularity and duration of classes. WHO recommendations on physical activity for people of different age groups.

3) Intensity of physical activity and its assessment.

4) Recommendations for increasing daily physical activity.

Questions for formative assessment

Test 1. Hygiene of medical establishments

1. Types of hospital construction.

2. What is the centralized system of hospital construction? Its advantages and disadvantages.

3. What is the decentralized system of hospital construction? It advantages and disadvantages.

4. Hygienic requirements imposed on the selection of land for the construction of hospital.

5. What is the density of construction in the hospital area?

6. What is the density of planting and trees?

7. What is ward section? Definition.

8. Recommended indicators of microclimate for wards.

9. Standard natural lighting in ward, operation halls.

10. Standard artificial illumination in ward, operation halls.

11. Hospital infection: notion of hospital infection, its sources.

12. What zones are indicated in hospital area?

13. Sanitary requirements for space per one person in ward for adults.

14. Non-specific prevention measures against hospital infections.

15. Constructing and planning measures for preventing hospital infection.

Test 2. **Workplace hygiene** (Working environment factors)

1. What diseases may be associated with the effects of occupational dust on the human body?

2. What health-improving measures may be taken by modern industry?

3. What diseases may be associated with the effects of noise on the human body?

4. Which diseases may be associated with the effects of vibration on the human body?

5. Which diseases may be associated with the effects of chemical substances?

6. Which diseases may be associated with the effects of aerosols?

7. Which diseases may be associated with the effects of biological factors?

8. Which diseases may be associated with the effects of ore on the human body?

9. Make a list of the types of working conditions and characteristics of workplace.

10. What does the notion “dangerous factor on the workplace” imply?

11. What does the notion “harmful workplace factor” imply?

12. What does the notion “occupational diseases” imply?

13. What does the notion “hygienic standards of working conditions” imply?

14. What does the notion “maximum permissible level” imply?

Test 3. Workplace hygiene (The extent of strain and intensity of the job)

1. What physiologic indicators are used for evaluating the changes which occur in the human body in hard physical load?

2. Which criteria are used for evaluating the extent of strain of the job?

3. Which criteria are used for evaluating the extent of intensity of the job?

4. What does the notion "the extent of workplace strain " imply?

5. Explain the notion of fatigue.

6. Explain the notion of overfatigue.

7. What health-improving measures may be taken to prevent overfatigue?

Test 4. Hygiene of children and adolescents

(Physical development of children and adolescents).

1. What does the notion of physical development imply?
2. What does the notion of biological age imply?
3. What does the notion of chronological age imply?
4. How does the doctor examine the child's posture?
5. Describe platypodia evaluation technique.
6. What indicators of the biological age of a child should be considered?
7. What is the main indicator of biological maturity of pre-school and primary school children (5.5-10)?
8. What is the main indicator of biological maturity of secondary and higher school teenagers (11 - 16)?
9. What are possible conclusions concerning the evaluation of biological age?
10. Describe physical development evaluation technique.
11. What is the method of evaluating physical development according to regression scales?
12. What are possible conclusions concerning the evaluation of physical development according to regression scales?
13. What does deficient body weight according to regression scales imply?
14. What does excessive body weight according to regression scales imply?

15. When is it recommended to measure skin fold thickness in children to avoid any mistakes in evaluating physical development?

Test 5. Hygiene of children and adolescents (Health status groups).

1. What are the criteria of children's health?
2. What does the first criterion of children's health include?
3. What values of inherited burden index prove that it is burdened?
4. What does the third criterion of children's health include?
5. How is the extent of the child's resistance determined?
6. What does the fifth criterion of children's health mean?
7. What are the health status groups of the children?
8. Name indications for assigning children to group 1.
9. Name indications for assigning children to the risk group.
10. What groups do children with chronic diseases belong to?
11. Which of the health groups do the children with chronic diseases at the stage of compensation belong to?
12. Describe medical management of children of health status group 2.
13. Describe medical management of children of health status group 3.

Test 6. Hygiene of children and adolescents (Complex estimation of studying conditions at educational establishments)

1.Recommended area of the classroom (per person).

2.Recommended air temperature in the classroom.

3.Which is the recommended level of artificial lighting in the classroom?

4.How many types of school furniture are distinguished?

5.Which type of school furniture is intended for children with a height of 115 cm?

6 Recommended distance between the first writing desk and the blackboard.

7.Which criteria are considered when determining if the child is ready for studying at school?

8.Which medical criteria are used for evaluating "school readiness"?

9.How many points should the child score in the Kern & Irasek test to be found ready for starting school?

10.What is the recommended area of the premises in which PC classes are held (per person)&

11. What is the proper distance from the computer screen to the child's eyes?

12. What health problems may be associated with the use of audiovisual training aids in class?

13. What is the proper distance from the back side of the first monitor to the screen of the second one?

14. What does the notion of school readiness imply?

15. List the external factors of school readiness.

16. List risk factors associated with non-readiness of children for schooling.

Appendix

Fig. 1

Main syndromes of vibration disease

Angiospastic syndrome occurs at I, II and III stage of vibration disease due to high-frequency and medium-frequency vibration. Typical signs are pronounced paresthesia and moderate ache, attacks of angiospasm of the type “white fingers”.

Fig. 2

Individual protection gear

STUDYING A PERSON'S ABILITY TO BRAINWORK AT A FORCED RATE

“NUMBER/LETTER COMBINATIONS”

In the conditions of modern industry solving of problems and tasks demands fast and correct perception (recognition) and processing of incoming information. And in some cases the activity of a person is quite strictly regulated by timing parameters, therefore the abilities of a person to providing successful work at a required rate represent a professional value, increasing the efficacy and quality of the work. This is fully applicable to the medical profession.

Various techniques are used to study the ability to work at a required rate and peculiarities of attention switching, for example the "number/letter combinations" technique.

The essence of the task is to find and cross out various combinations of figures and letters, placed in different parts of the form, over a limited period of time.

The form contains 15 vertical lines, each of which includes 25 identical clusters of 2 - 3 letters with corresponding serial numbers. For example:

1АБ 26АВ 51БВ, etc.

2АБ 27АВ 52БВ, etc.

The researcher calls out the number and cluster of letters (for example, 27АВ, 19ВС, etc.), which should be found and crossed out quickly.

For exact keeping to time intervals the called out clusters are recorded. The task is carried out in a group with an interval of 2 seconds (50 combinations).

Instruction to the test: The form has vertical lines consisting of identical clusters of two-three letters. Each cluster of letters has a serial number. Your task is to find and cross out the clusters of letters called out by the experimenter or on the tape recorder. The rate is high enough, therefore it is necessary to work quickly, trying not to miss any of the number/letter combinations. Analysis of results:

Primary processing of the obtained results is done with the help of a key, in which required clusters of letters are cut out. The number of correctly crossed out, missed clusters and incorrectly crossed out clusters is calculated. Then the factor of success (A) is calculated with the formula:

$$A = \frac{C - H}{M + O}$$, where

C - number of all the crossed out clusters;

H - number of clusters which were crossed out erroneously;

M - total number of clusters to be crossed out (50);

O - number of missed clusters.

Results with a factor above 0.65 indicate a high ability to work at a required pace, from 0.65 up to 0.57 - average ability, under 0.57 - low ability to work at a required pace.

Table 1

Classification of types of working conditions based on the extent of intensity of production process

Parameters of the extent of strain of production process	Optimum	Maximum permissible	Harmful (hard work)	
	Mild physical activity	Average physical activity	1st degree	2nd degree
	1	2	3.1	3.2
1. Intellectual load				
1.1. Content of work	No decision- making processes are involved	Solving some problems according to the given algorithm	Solving difficult problems according to the given algorithm	Creative activity which is associated with decision-making processes and solving difficult problems
1.2. Perception of signals (i.e. information) and their evaluation	Perception of signals without their correction	Perception of signals with their subsequent correction	Perception of signals with evaluation of actual values of the parameters of work	Perception of signals with comprehensive evaluation of the parameters of work
1.3. The extent of strain of work	Processing information and solving a problem	Processing information, solving a problem and checking the results	Processing information, checking the results and controlling work	Controlling work and distribution of functions according to the extent of strain of work

1.4. Character of work	The work is performed according to an individual plan	The work is performed according to the plan which can be corrected in the course of work	The work is performed in the conditions of shortage of time	The work is performed in the conditions of shortage of time and the worker takes responsibility for the end results
2. Sensory load				
2.1. The duration of observation (given in percent per shift)	up to 25%	26-50%	51-75%	more than 75%
2.2. Number of signals and messages per hour	up to 75	76-175	176-300	more than 300
2.3. Number of production objects which should be observed at the same time	up to 5	6-10	11-25	more than 25

2.4. Load on the visual analyzer, size of the object to be observed (the distance from the eyes to the object should not be more than 0, 5 m) - working with optical devices (given in percent per shift) - working at a display (hours)	more than 5 mm up to 25% up to 2	5 — 1, 1 mm 25 - 60% 2-3	1 - 0, 3 mm 51-75% 3-4	less than 0,3 mm more than 75% more than 4
2.5. Load on the auditory analyzer:	100-90%	90 - 70%	70 - 50%	less than 50%
3. Emotional load				
3.1. The extent of responsibility for the results of work, implications of a slight mistake	The person takes responsibility for fulfilling certain work. It involves additional efforts of the worker	The person takes responsibility for a high quality of auxiliary work. It involves additional efforts of the management	The person takes responsibility for a high quality of auxiliary work. It involves additional efforts of the staff	The person takes responsibility for a high quality of the end product. It involves damage to equipment, stopping of work and personal risk

3.2. The extent of personal risk	No risk	-	-	Possible

3.3. The extent of risking the safety of other people's lives	No risk	-	-	Possible
4. Monotonous load				
4.1. The number of work operations necessary for performing a simple task or performed repeatedly	more than 10	9-6	5-3	less than 3
4.2. The duration (sec.) of performing simple or repeated operational tasks	more than 100	100-25	24-10	less than 10
5. Work regimen				
5.1. Actual duration of a working day	6-7	8-9	10-12	more than 12

5.2. Work shifts	One shift work (without night shifts)	Two shift work (without night shifts)	Three shift work (night shifts)	Irregular shiftwork alternating with night shifts

Table 2

Classification of types of working conditions based on the extent of strain of production process

Parameters of the extent of intensity of production process	**Optimum (mild physical activity**	**Maximum permissible (average physical activity**	**Harmful (hard work)**		
			1st degree	**2nd degree**	**3rd degree**
1	**2**	**3**	**4**	**5**	**6**
1. Physical dynamic load (given in units of external work per shift, kg/m)					
1.1. Regional load (the work which involves the muscles of the shoulder girdle and the girdle of upper extremities). It is used when moving an object at a distance of 1 m - males - females	up to 2500 up to 1500	up to 5000 up to 3000	up to 7000 up to 4000	up to 9000 up to 5500	More than 9000 More than 5500

1.2. Total work is the work which involves various groups of muscles (muscles of lower and upper extremities, muscles of the trunk). It is used when moving an object at a distance of 1 - 5 m - males - females	up to 12500 up to 7500	up to 25000 up to 15000	up to 35000 up to 25000	up to 45000 up to 27000	More than 45000 More than 27000
Total work is used when moving an object at a distance of less than 5 m - males - females	up to 24000 up to 14000	up to 46000 up to 28000	up to 70000 up to 40000	up to 90000 up to 55000	More than 90000 More than 55000
2. Net mass of weight lifted and/or moved (kg)					
2.1. Lifting and moving weight alternating with some other work (2 times per hour) - males - females	up to 15 up to 5	up to 30 up to 10	less than 30 less than 10		
2.2. Lifting and moving weight repeatedly (during work shift) - males - females	up to 5 up to 3	up to 15 up to 7	up to 30 less than 7	More than 30	

2.3. Total weight which is moved per hour • from work surface: - males - females • from the floor - males - females	- 	 up to 870 up to 350 up to 435 up to 175	 less than 870 less than 350 less than 435 less than 175		

3. Stereotype work movements (amount of movements per shift)					
3.1. Stereotype work movements in local load (the work which involves the muscles of the hands and fingers)	up to 20000	up to 40000	up to 60000	More than 60000	
3.2. Stereotype work movements in regional load (the work which involves the muscles of the shoulder girdle and the girdle of upper extremities)	up to 10000	up to 20000	up to 30000	More than 30000	

4. Static load (values per shift)					
4.1. Moving weight - with one hand - with both hands - involving the muscles of the trunk For women these values are reduced by 40%	up to 18000 up to 36000 up to 43000	up to 36000 up to 70000 up to 100000	up to 70000 up to 140000 up to 200000	More than70000 More than 140000 less than 200000	

5. Position at work					
	Free, comfortable (The person may change position at work, e.g. “standing- sitting”)	The person has to stay in an uncomfortable fixed position at work (up to 25%)	The person has to stay in an uncomfortable fixed position at work (up to 50%)	The person has to stay in an uncomfortable fixed position at work (over 50%)	

6. Inclination of the human body (amount of body inclinations per shift)					
6.The amount of body inclinations per shift	up to 50	Body inclinations at an angle of 30°) 51-100	Body inclinations at an angle of 30°) 101-300	Body inclinations at an angle of 30°) more than 300	
7. Movements in space (km)					
7. Movements in space (per shift, km)	up to 4 km	up to 10 km	up to 15 km	More than 15 km	

RESEARCH OF THE PERSON'S ABILITY TO BRAINWORK IN THE FORCED RATE. "NUMERICAL - LITERAL COMBINATIONS"

In the conditions of modem industry solving of problems and tasks demands fast and correct perception (recognition) and processing of incoming information. And in some cases the activity of a person is considerably strictly regulated by timing parameters, therefore the abilities of the person, providing successful work with a required rate represent a professional value, increasing efficacy and quality of the work. It is

fully concerns the trade of a doctor.

Various techniques are used to study the ability to work with a required rate and peculiarities of attention switching, for example "numerical - literal combinations".

The essence of the task is to find and to cross out various combinations of figures and letters, placed in different parts of the form in a limited period of time.

The form contains 15 vertical lines, each of which includes 25 identical groups of 2 - 3 letters with corresponding serial numbers. For example:

1AJB 26AT3 5IBB, etc.

2AE 27AB 52EB, etc.

etc.

The researcher calls out a number and a group of letters (for example, **27AB,19Br,** etc.), which should be found and crossed out quickly.

For exact keeping to time intervals the called out groups are recorded. The technique is carried out in a group with an interval of 2 seconds (50 combinations).

The instruction to the testee:

The form has vertical lines consisting of identical groups of two-three letters. Each group of letters has a serial number. Your task is to find and cross out the groups of letters called out by the experimenter or on the tape recorder. The rate is high enough, therefore it is necessary to work quickly, trying not to miss any of the numerical - literal combinations.

The analysis of results:

Primary processing of the received results is made with the help of a "key", in which required groups of letters are cut out. The number of correctly crossed out, missed groups and incorrectly crossed out groups is calculated. Then the factor of success (A) is calculated with the formula:

$$A = \frac{C - H}{M + O}, \text{ where}$$

C - number of all the crossed out groups;

H - number of groups which were crossed out incorrectly;

M - total number of groups which should be crossed out (50);

O - number of missed groups.

Results with a factor higher than 0,65 correspond to high ability to work with a required pace, from 0,65 up to 0,57 - average ability, lower than 0,57 - low ability to work with a required pace

Table 3

Indicators of biological age

Age	Boys				Girls			
	Height (cm) M±	Annual growth gain (cm)	Number of permanent teeth, M±	Secondary sexual characteristics	Height (cm) M±	Annual growth gain (cm)	Number of permanent teeth, M±	Secondary sexual characteristics
7	120-130	4-6	7±3		121 - 129	4-5	8±3	
8	121-133	4-6	11±2		121 - 131	4-5	12±2	
9	128-140	4-6	13±3		126-140	4-5	14±3	
10	132-140	4-6	14±4		133-145	4-5	19±4	MaOPOAxO
11	137-149	4-6	21±5	POAxO	139-153	6-8	22±4	Mai POAxO
12	141-155	4-6	24±3	PlAxO	143-157	6-8	25±3	Ma2Pl, 2Axl, 2
13	145-163	7-10	22±2	PI, 2Axl	148-162	4-6	27±1	Ma3P3Ax3Me2,3
14	152-170	7-10	26	PI, 2.3Axl.2	153-165	2-4	28	Ma3P3Ax3Me2,3
15	158-174	4-7	26	P3Ax2.3	155-167	1-2	28	Ma3P3Ax3Me3
16	163-177	3-4	28	P3.4Ax3	156-166	1 -2	28	Ma3P3Ax3Me3
17	167-179	1-2	28	P3.4Ax3	158-168	0-1	28	Ma3P3Ax3Me3

Table 4

Standard physiological needs for food and energy of children and adolescents (per day)

Age, sex	Energy, kcal	Protein		Fat	Carbohy-drate	Mineral													
		Total protein require	Animal proteins			Ca	P	Mg	Fe	Zn	I	C mg	A mkg	E	D	B1	B2	B6	B12
1 -3	1540	52	37	53	212	800	800	150	10	5	0.06	45	450	5	10	08	09	09	1.0
4-6	1970	68	44	68	272	900	1350	200	10	8	0.07	50	500	7	2.5	09	1 0	1.3	1.5
6	2000	69	45	67	285	1000	1500	250	12	10	0.08	60	500	10	2.5	1 0	1 ->	1.3	1 5
7-10	2350	77	46	79	335	1100	1650	250	12	10	0. 1	60	700	10	2.5	1 7	1 4	1.6	2.0
11-13 (boys)	2750	90	54	92	390	1200	1800	300	15	15	0. 1	70	1000	12	2.5	1.4	1.7	1.8	3.0
11-13 (girls)	2500	82	49	84	355	1200	1800	300	18	12	0. 1	70	800	10	2.5	1.3	1.5	1.6	3.0
14-17 (males)	3000	98	59	100	425	1200	1800	300	15	15	0. 13	70	1000	15	2.5	1.5	1.8	2.0	3.0
14-17 females	2600	90	54	90	360	1200	1800	300	18	12	0. 13	70	800	12	2.5	1.3	1.5	17	3.0

Fig. 3

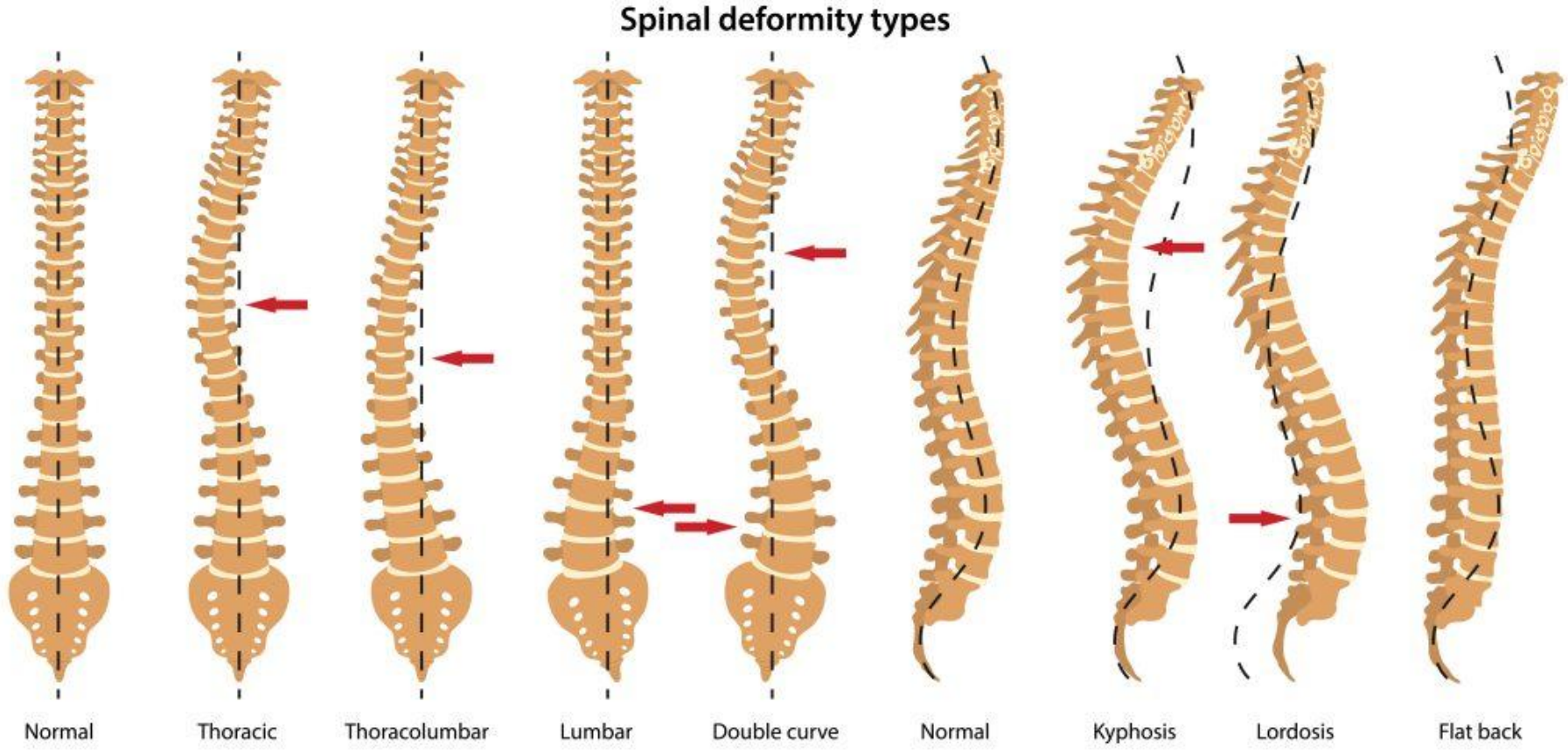
Spinal deformity types
Normal
Thoracic
Thoracolumbar
Lumbar
Double curve
Normal
Kyphosis
Lordosis
Flat back

Fig. 4

Plantogram: 1 -normal foot, 2- platypodia first degree, 3- platypodia second and third degree

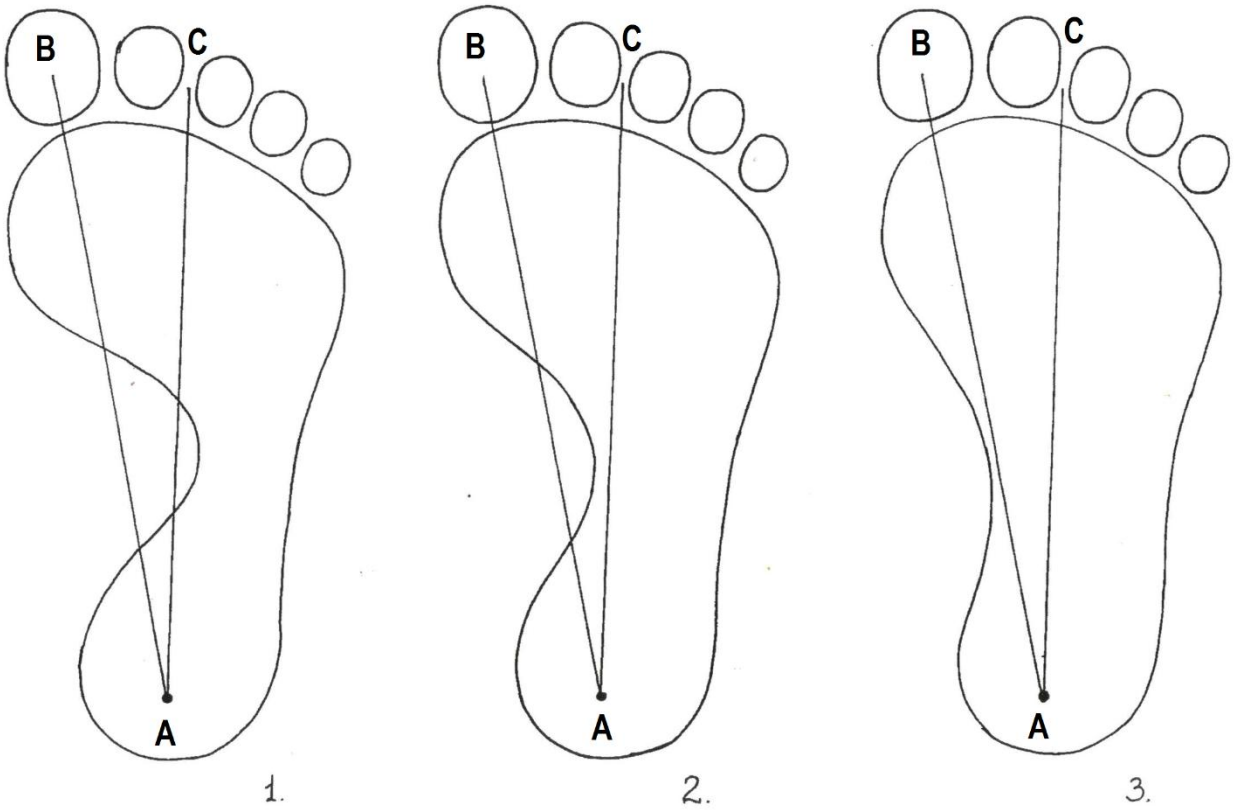

Fig. 5

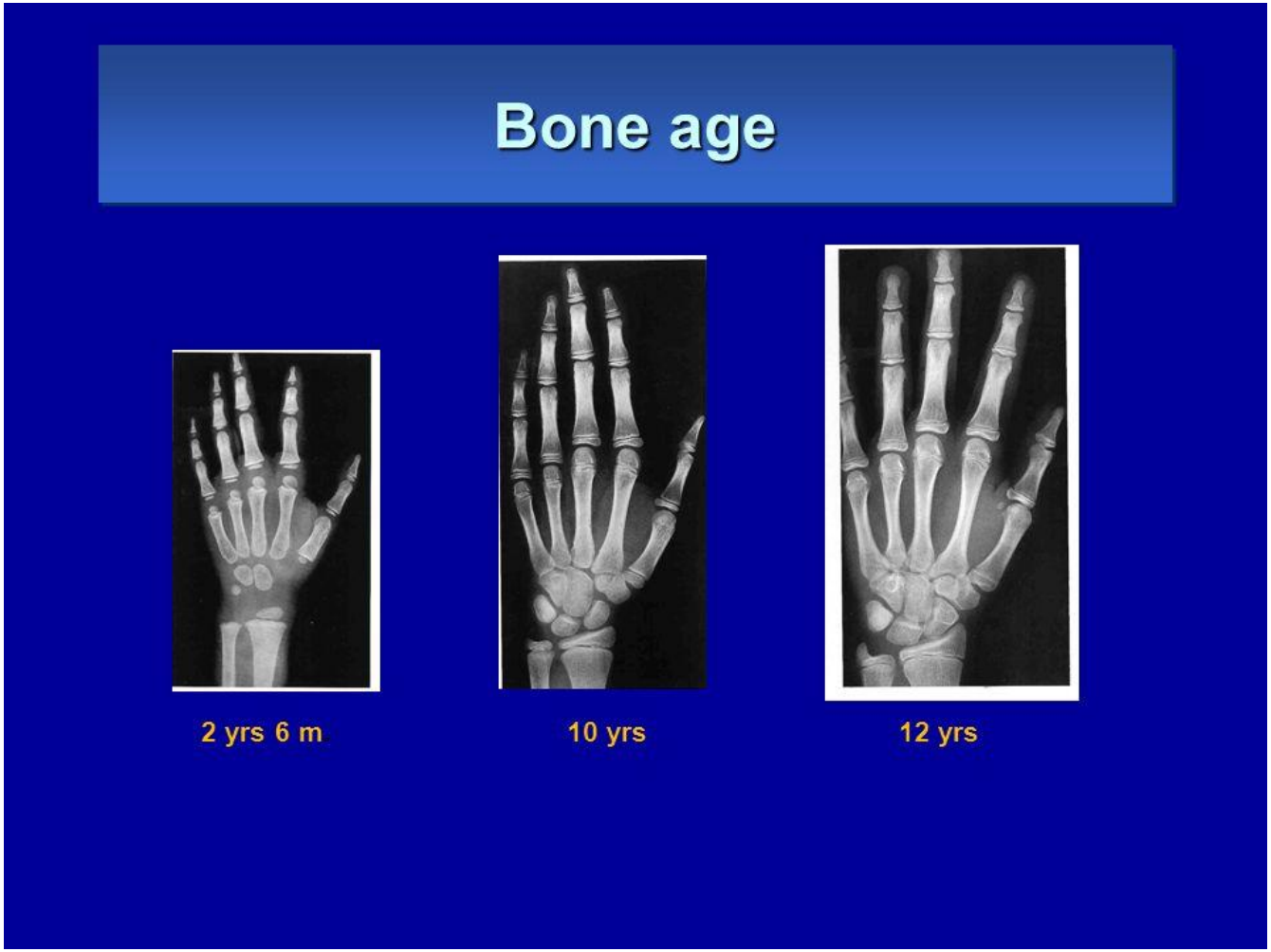

Fig. 6

Familial history of a child (18 month)

(model)

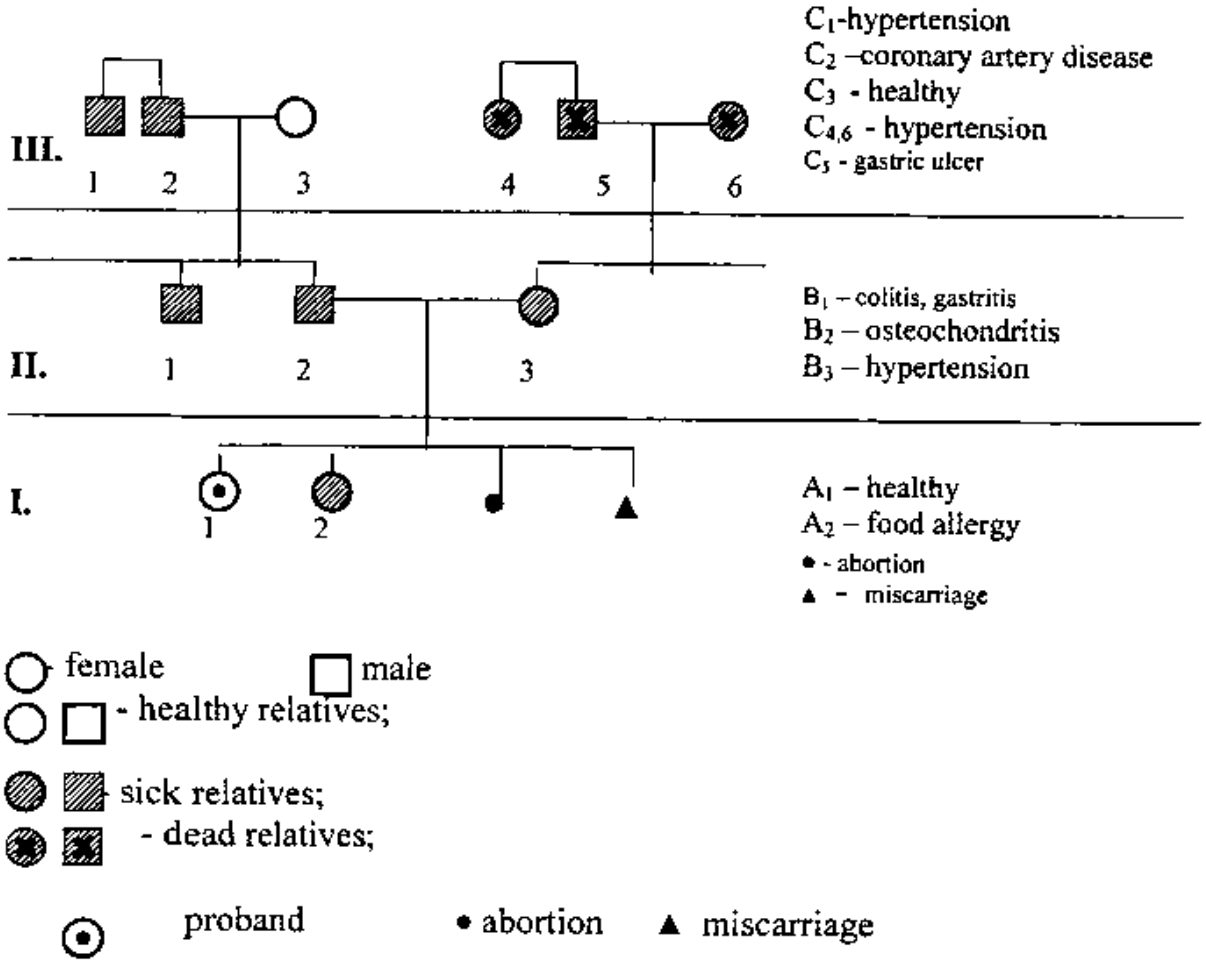

Fig. 7

Kern and Irasek test

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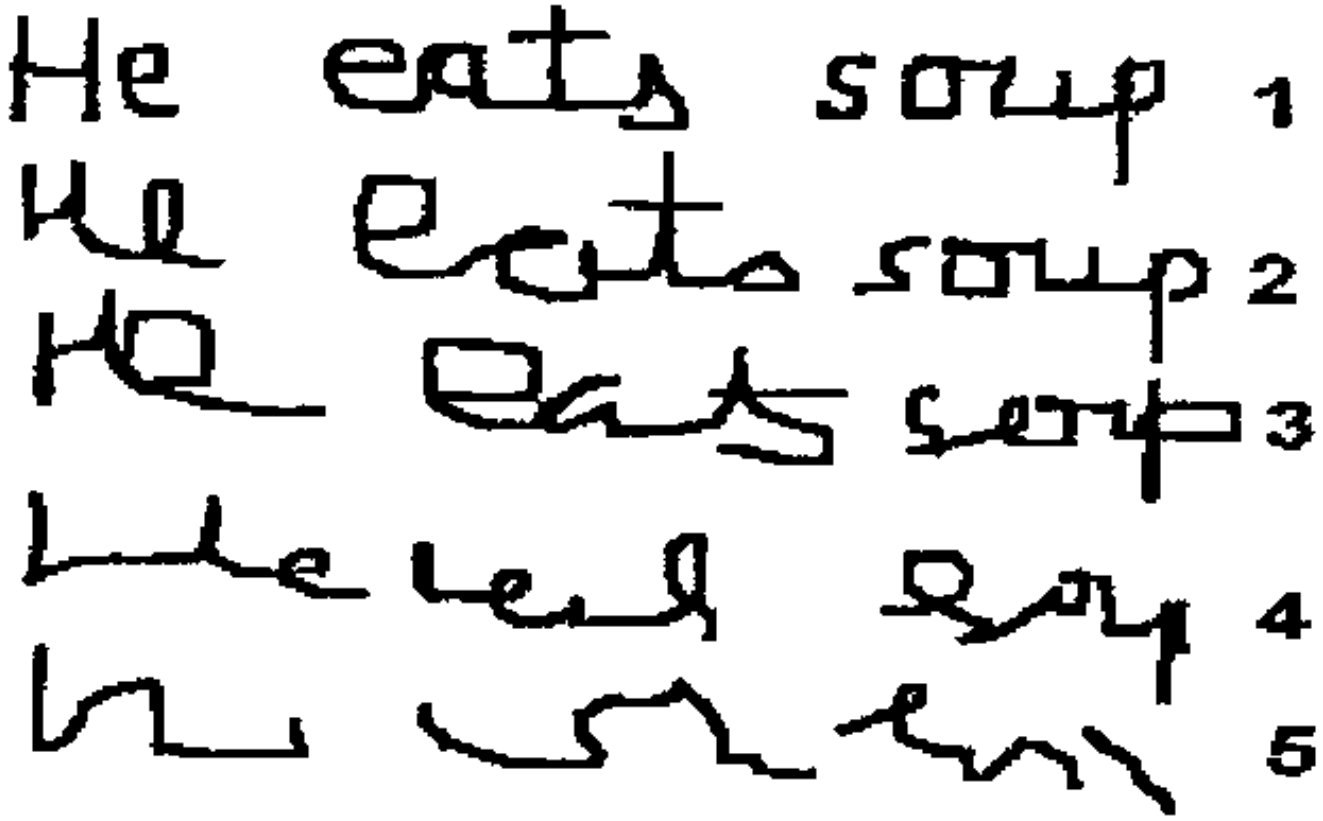

Fig. 8

Kern and Irasek test

Drawing a man figure

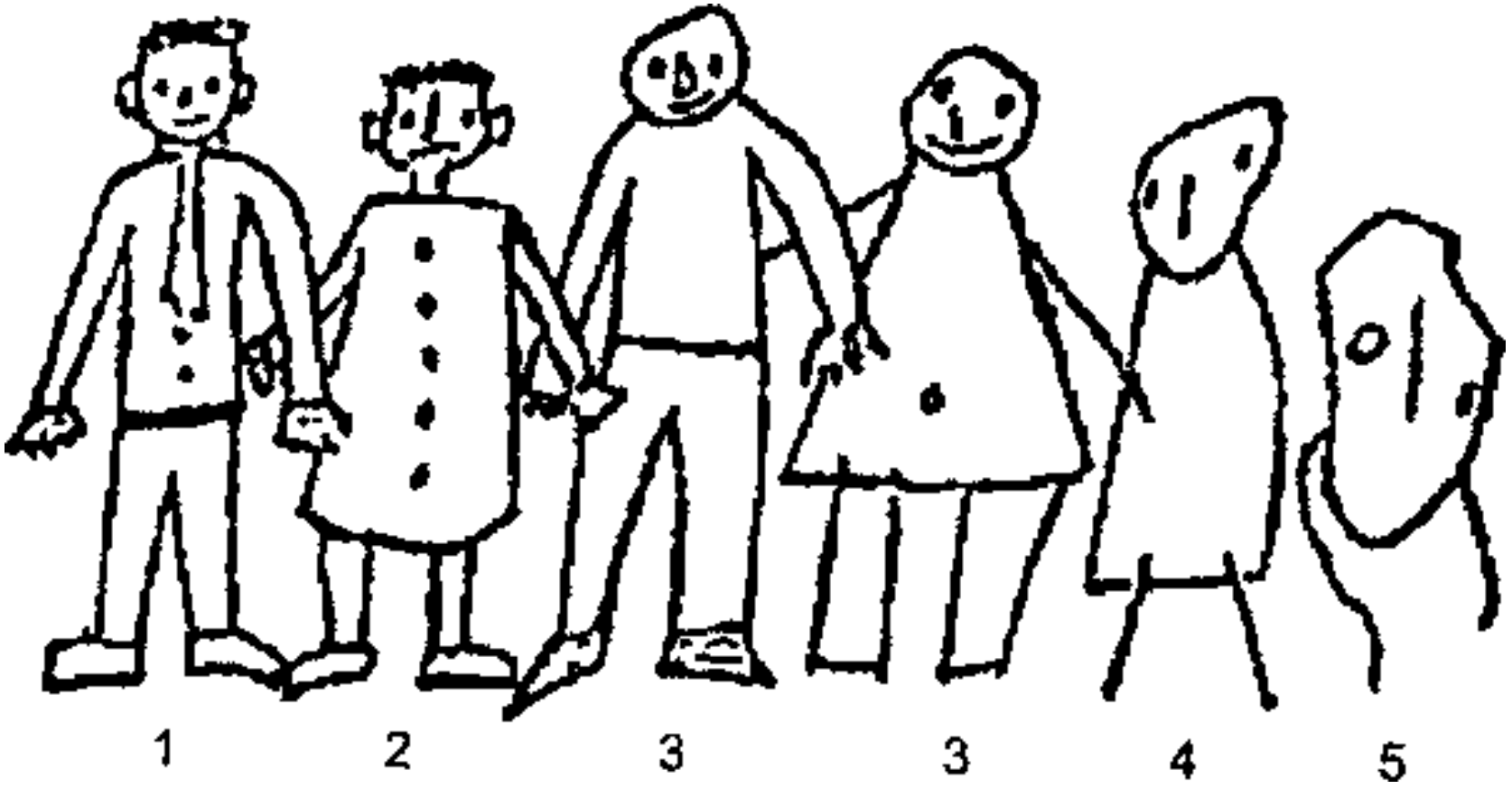

Fig. 9

Kern and Irasek test

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