STATE ESTABLISHMENT 'DNIPROPETROVSK MEDICAL ACADEMY OF MINISTRY OF HEALTH OF UKRAINE'
Chair of physical rehabilitation, sport medicine and valeologies

«Is confirmed»
At methodical meeting of physical rehabilitation, sports medicine and valeology chair _____
(the chair name)

The head of the chair
_____ Nekhanevich O. B.
«___»_____ 20 p.

METHODICAL INSTRUCTIONS

TO STUDENTS OF __IV__ course _medical_ faculty

FOR INDEPENDENT WORK

BY PREPARATION FOR THE PRACTICAL TRAINING

MODULE № 1: PHYSICAL REHABILITATION, SPORT MEDICINE

Thematic module 1: Sport medicine

Theme № 3: Investigation and an estimation of functional condition of an organism. The medical conclusion.

Dnipropetrovsk - 2013

MODULE I. PHYSICAL REHABILITATION, SPORT MEDICINE

Thematic module 1: Sport medicine

Theme № 3: *Investigation and an estimation of functional condition of an organism. The medical conclusion.*

1. **Theme urgency:**

   One of the most important aims of medical examination is the right evaluation of the functional state of organism. There is a special unit of medical science – the functional diagnostics. This metods register data in peace, which is not always informative. The functional diagnostics explaines the model of increasing changes in function of organs and systems.

2. **Theme duration:** 4 hours.

   The educational aim: Study to investigate cardiovascular and respiratory system of a patient, to marc the premature features of decompensation of organs because of non-adequate exertion. Choose the right motion mood and suitable kind of remedy gumnastics.

3. **Concrete aims:**

   To know:
   - Theoretical basement of functional test; their functional diagnostic meaning;
   - Functional test variants;
   - Functional features of endurance;
   - Functional state. Factors forming functional state;
   - Diseases contraindicating sport training.
   - Age recommendation for children to start sport training;
   - Medical gropes of athletes.

   To be able:
   - Hold the functional tests: with breath holding Stange and Genchi; orthostatic and kinostatic; with dosed physical exertion (20 squats in 30 s);
   - Analyze the data;
   - Give the conclusion;
   - Estimate cardiovascular system reaction type;
   - Analyze the results of complex medical examination, give the medical conclusion, chose the medical grope for an athlete.
   - Give recommendation about physical exertion;

   To develop practical skills:
   1. To hold the functional tests: with breath holding Stange and Genchi; orthostatic and kinostatic; with dosed physical exertion (20 squats in 30 s);
   2. make physical examination including heart rate and blood pressure definition .
   3. work with special medical documents.

Supplementary protocol

_____ _____

(Name) (investigations date)

1. Physical development assessment by standards method.

Index		Real (N)	Standard		Assessment	
			M	σ	σ` real	Words assessment
Height (sm)						
Weight (kg)						
Chest circumference	pause					
	inspiration					
	Expiration					
	Range					
Spirometry (ml)						
Dynamo-metry	Right manus					
	Left manus					
	Back					

$$\sigma` = \frac{N - M}{\sigma}$$

N – real date, M – average arithmetic,

σ – average square deviation from M, σ` - average real date.

2. **Anthropometric profile**.

Index		-3 σ	-2 σ	-1 σ	±0,5 σ		+1 σ	+2 σ	+3 σ
		Very low	Low	Lower	Average		Higher	High	Very high
Height									
Weight									
Chest circumfere	pause								
	range								
Spirometry									
Dynamo-metry	Right manus								

	Left manus								
	Back								

3. Physical development assessment by indexes method.

Indexes	The formula of account	***Average date***	Inspections date	***Assessment***
Weight-height (index Ketle)	Weight (kg) Height (m^2)	20-24,9		
Height-weight (index Brugsha)	Height (sm) -100 = Weight (if height is 155 - 165 sm) Height (sm) -105 = Weight (if height is 166 - 175 sm) Height (sm) -110 = Weight (if height is 176 - 185 sm)			
Vital index	VCL (ml) Weight (kg)	M=65-70ml\kg F=55-60ml\kg		
Index of somatotype proportion	Growth standing - Growth sitting Growth sitting *100%	87-92 %		
Power indexes	Right manus (kg)*100% Weight (kg)	M=65-80 % F=35-50 %		
	*Back (kg)*100%* Weight (kg)	M=200-220% F=135-150%		

Conclusion:

1.	Daily physical activity	
2.	Somatotype	

3.	Orthopedic status: muscles, extremities, range of motion, foot.	
4.	Physical development	
5.	Recommendations	

4. Basic knowledge, skills (interdisciplinary integration) – (table 4.1):

Table 4.1

The names of previous disciplines	Practical skills
Normal physiology	To be able to register main physiologic parameters, to know the normal results for different age.
Pathologic physiology	To define the development process of prepathologic and pathologic organic changes, non-adequate physical exertion impact
Propedeutics of internal disease	To take blood pressure, heart rate, describe pulsus. To be able to take electrocardiography. To evaluate the medical data.
Pediatric Propedeutics	To know the specifics of physical development in children according to different age.

№ з/п	term	definition
1.	Functional state	The adaptative level of the main systems
2.	Functional diagnostics	Estimation and evaluation of organs and systems functional state
3.	Functional test	Exactly dosed impairment by different factors, which represents the reaction of the system according to the direct factor and represents general organism functional state.

5. Students advice.

5.1 Theoretic qestions:

1. Modern understanding of sports medicine and physical rehabilitation.
2. Medical control during exercise.
3. Method comprehensive medical examination.
4. Identification and assessment of physical development.
5. Research and evaluation of the functional state of the body through functional tests.
6. Quantitative assessment of the level of physical health.
7. Medical opinion.
8. Access to physical training and sports, individual movement modes while health and athletic training.

5.2 Practical part:

1. Master the technique of comprehensive medical examination of persons engaged in physical culture and sports,
2. Decide on access to exercise and to select the most optimal form;
3. Conduct somatoskopy and somatometry, based on the analysis of the data to assess the physical development of recommendations for its correction in the training and improving processes;

5.4. Theme content:

Investigation of functional state (functional tests)

The stages of functional research

1. Estimation and assessment the initial indices (before an influence, in the rest condition).
2. Define and evaluate the degree and character of the responses of the body's organs and systems to an influence affecting it.
3. Analysis of time and character of the recovery period.

Respiratory tests:

Respiratory tests are used for functional condition of cardiovascular system assessment and ability of oxygen consumption.

1. Holding breath on inspiration (Schtange test)

In position sitting the patient makes submaximal inspiration and maximal holds the breath. The time of breath holding is measured by clock. In moment of expiration the time is stopped. The time of breath holding on inspiration an average 40-60 sec in men and 30-40 sec in women.

2. Holding breath on expiration (Genchy test)

In position sitting the patient makes normal inspiration and maximal holds the breath. The time of breath holding is measured by clock. In moment of inspiration the time is stopped. The time of breath holding on expiration an average 25-40 sec in men and 15-30 sec in women.

Tests involving changes of body position:

Functional tests involving changes of body position are used to assessment the functional condition of vegetative nervous system: simpatic and parasimpatic parts.

1. Orthostatic test

After 3-5 min in position lying the pulse rate of patient is measured by palpation method on radial artery by period of 15 sec and multiplied on 4. After that the patient stands up slowly. The pulse rate is measured at once after passage in vertical position and after 3 minutes of standing.

Normal reaction on orthostatic test is increase of HR on 10-16 beats per minute at once after passage in vertical position and increase on 6-10 beats per minute after 3 minutes of standing. If the reaction more then normal it is simpaticoyony; less then normal it is increase of parasimpatic tonus.

2. Clinostatic

After 3-5 min in position standing the pulse rate of patient is measured by palpation method on radial artery by period of 15 sec and multiplied on 4. After that the patient lies down slowly. The pulse rate is measured at once after passage in horizontal position and after 3 minutes of lying.

Normal reaction on orthostatic test is decrease of HR on 8-14 beats per minute at once after passage in horizontal position and decrease on 6-8 beats per minute after 3 minutes of lying. If the HR decreases more then normal it is parasimpaticotony; less then normal it is increase of simpatic tonus.

Tests involving physical exertion

Tests involving physical exertion are used for functional condition of cardiovascular system assessment. In tests is used standard physical exertion (for example 20 squats (deep knee bends) in 30 seconds).

Martine-Kushelevsky's test – 20 squats (deep knee bends) in 30 seconds)

Initial BP and HR are measured in position sitting before test and written in protocol. The HR is measured for 10 sec. periods till the dates repeat three times (for ex. 12-12-12). After that the patient makes standard physical exertion (20 squats (deep knee bends) in 30 seconds).

After exertion the patient sit down and the HR and BP are measured. First 10 sec. of recovery period is measured the pulse. Next 40 sec. of first minute of recovery period the BP is measured. Last 10 sec. of 1st minute and every 10 sec. interval 2nd and 3rd minutes of required period the HR is measured and written in protocol. After three minutes of recovery period the BP is evaluated. The pulse and BP must return to initial after 3 minutes. If the pulse doesn't return to initial the recovery period is unsatisfactory. To assess the functional test is used the evaluation the type of response the cardiovascular system to physical exertion.

To evaluate the quality of the cardio-vascular response to exertion we may calculate the index of the quality of the reaction (IQR):

IQR (according to Kushelevsk) = $\frac{PP_2 - PP_1}{P_2 - P_1}$,

Where PP_1 = pulse pressure before exertion
PP_2 = pulse pressure after exertion
P_1 = pulse rate (for 1 min.) before exertion
P_2 = pulse rate (for 1 min.) after exertion

Calculation of IQR: 0.1 – 0.2 -- irrational reaction
0.3 -- 0.4 -- satisfactory reaction
0.5 – 1.0 -- good reaction
> 1.0 -- irrational reaction

5.1 Self-control materials:

1) self-control questions

1. The definition of functional condition. The main tasks of functional investigation.
2. The definition of functional test. The functional tests kinds.
3. The functional test with breath holding (Shtange and Henchy). The methodic and estimation.
4. The functional test with body position changes (orthostatic and clinostatic). The methodic and estimation.
5. The functional test with physical loads.
6. The Martine test methodic.
7. The types of cardiovascular system responses to physical exertion.

2) Tests:

1. In healthy untrained females breath holding time at inhaling (Test Shtange) ranges:
A. 30-40 seconds,
B. 20-40 seconds,
C. 15-30 seconds,
D. 40-60 seconds,
E. 50-60 seconds.

2. Normal reaction of sympathetic vegetative system after changing body position from horizontal into vertical corresponds to the following changes:
A. Increase of pulse rate on 20-25 beats/minute,
B. Increase of pulse rate on 0-8 beats/minute,
C. Increase of pulse rate on 10-16 beats/minute,

D. Decrease of pulse rate on 10-16 beats/minute,
E. Decrease of pulse rate on 8-14 beats/minute.

3. While carrying out Test Shtange the examined person makes:
A. Maximal exhalation,
B. Ordinary exhalation.
C. Maximal inhalation,
D. Submaximal inhalation,
E. Ordinary inhalation.

3) Clinical mind improvement

There was held a functional test - 20 squats in 30 s. Student B.,age 13 has next results: before exertion 12 HB in 10 s. After - 26 HB per 10 s; BP: before - 120 / 80 after - 125 / 85 mm h. st. recovery time - 120 s.

1. Estimate the cardiovascular system reaction type;
2. Give the characteristic of recovery period;
3. Evaluate the cardiovascular system reaction on exertion;
4. Explain the adaptation mechanism;
5. Give the conclusion and recommendations.

literature:

1. Remedial gymnastics and sport medicine: textbook/ Klapchuk V.V., Dsiak G.V., Mutavov V.I.; red. Klapchuk V.V., Dsiak G.V. – K.: Zdorov`e, 1995. – 312 p.
2. Remedial gymnastics and sport medicine: Tests for knowlage control in students of medical and stomatological faculties of universitie IУ level of acreditation / Abramov B.B., Klapchuk B.B., Magl`ovanuy A.V., Smirnova O.L.,; red. Ph. Klapchuk V.V., Ph. Magl`ovanuy A.V. – Dnipropetrovsk: medical academy, 2006. – 124 p.
3. Remedial gymnastics and sport medicine (Lections) / Abramov B.B., Klapchuk V.V Smirnova O.L.,.; red. Ph. Klapchuk V.V.,– Dnipropetrovsk: medical academy, 2006. – 179 p
4. Medical control in physical training and sports: medical recommendations for students of medical and stomatological faculties of universitie IУ level of acreditation / V.S. Sokolovskyy, N.A. Romanova, V.S. Vladova, I.I. Bondarev. – Odessa: osmu, 2001. – 93p.
5. Sport medicine. textbook / Makarova G.A. – M.: Soviet sport, 2003. – 480 p.
6. Textbook «Remedial gymnastics and medical control» red. Epifanova and G. L. Apanasenko – p.14-16, 25-37.
7. Functional tests in sport medicine (methodical recomendations) /Mychaluk E. L. –Kyiv. –2005. – 37p.

Discussed on chair meeting «____»_____20___p. (Protocol № ____)

The head of the chair, Phd. _____ O.B.Nekhanevich

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