KAZAKH NATIONAL UNIVERSITY OF AL-FARABI

**Faculty of Medicine and Health**
**Department of Fundamental Medicine**
**ISW implementation schedule**
**Discipline**
**"Normal structure and function of human body"**

| № | Project of ISW | Form of ISW execution | Deadline (academic week) | Scores |
|---|---|---|---|---|
| 1 | Study of age-related changes of the main sensitive analyzers (visual, auditory, vestibular, tactile). | Work in teams by 5-7 students | 15th week | 5 |

**Independent student work (ISW) - educational, educational-methodical and research activities of students, carried out by them independently in extracurricular time, according to the program of the discipline. The ISW not only helps to assimilate the educational material, but in general contributes to the formation of the experience of educational, creative and research activities. To perform the ISW, both the educational literature and sources recommended in the course and those found independently are used. ISW is rented out strictly on schedule. In case of justifiable circumstances (if there is documentary evidence), the ISW may be accepted outside the schedule.**

**Project name**: Study of age-related changes of the main sensitive analyzers (visual, auditory, vestibular, tactile).

**Idea of the project**: Independent research of sensitive analyzers and comparison of the results with generally accepted indicators of the norm.

**Project map:**
1) Define age groups. Justify the choice of classification of the person's age.
2) Familiarize the subjects with the purpose and methodology of the research (each team member conducts research for all members of his family)
3) Evaluate the functioning of the analyzers, enter the results in the table
4) Collect the survey results of all team members into one form.
5) Organize the information: determine the average, rate variation, etc. Discuss in a group.
6) Search for the relevant similar statistics in the world, provide links to articles from where the information was taken
7) Based on comparison with general population data, draw conclusions on the difference in results by age group.
8) Form the research results in the ppt presentation format.

**Number of the Test Subjects**: Each student must research at least 1 person for each age group (or all the relatives living with).

**Output**: A multimedia presentation created by your team that will reflect your research work.

**Learning objectives:**
1) Form teamwork skills.
2) Form the skills of studying and critical analysis of literature on a given topic
3) Form the skills of conducting research, analyzing and comparing the results with literature data, formulating conclusions and justifying them.
4) Form the skills of researching sensitive analyzers

| **Required knowledge and skills** |
|---|
| 1. Theoretical knowledge of the normal anatomy and physiology of this analyzer. |
| 2. Ability to explore the functions of this analyzer: |
| Research of visual acuity |
| Color Sensing Research |
| Binocular vision examination |
| Hearing acuity test |
| Examination of the vestibular apparatus: finger-nose test |
| Calcaneal knee test |

| |
|---|
| Romberg pose |
| Study of pain and tactile sensitivity |
| Temperature Sensitivity Study |
| Investigation of deep sensitivity (muscular-articular feeling) |

**Process control:**
This project will run until the end of the semester.
Deadline: 15th week.
Every 2 weeks the teacher discusses with the group at what stage the project is progressing, problems.

**Criteria for evaluation:**
1) Presentation of the report in a presentable form: title page indicating the university, faculty, discipline and group
2) Presentation of results in the form of a table, diagram or graph
3) Reflection of all research points
4) Use of relevant literature (indicate at the end of the presentation)
5) Put photos of how you were testing analyzers on relatives
5) Presentation at a general conference and discussion with another team

## Visual acuity test

Visual acuity is the ability of the eye to separately perceive two points located at a minimum conditional distance from each other.

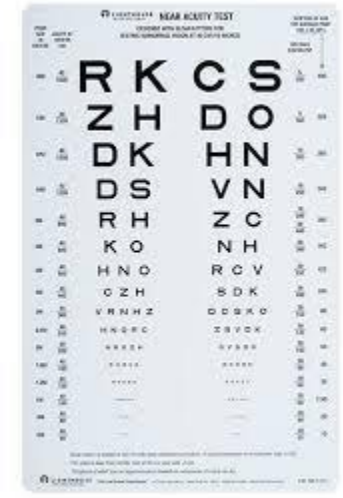
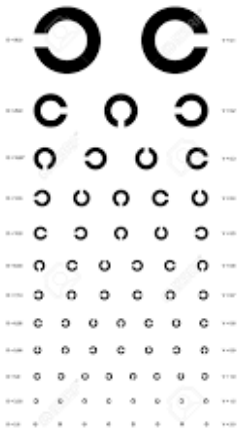
When examining visual acuity from a different distance (less than 0.1 - if a person from 5 meters does not recognize the signs of the upper row), the person being tested is brought closer to the table and every 0.5 meters is asked until he names the signs of the upper row correctly. The value is calculated by the formula:

$V = d / D$, where

V - visual acuity;

d is the distance from which the study is carried out;

D is the distance at which the normal eye sees the given row.


**VISUAL ACUITY TESTS**

Tables for checking visual acuity are made up of the same type of signs (optotypes) of different sizes - these can be letters, rings with a gap in different places (Landolt's rings) or pictures (for children). For the first time such a table was developed in 1862 by the Dutch ophthalmologist G. Snellen - and it is still used abroad. In Russia, a similar table is used, developed by the Soviet ophthalmologist D. Sivtsev. It includes Landolt's letters and rings.

Use matte white paper to make the table. Each sheet of paper should be printed in A4 size and in landscape orientation. Having printed three sheets, they need to be glued together and the table must be attached to the wall so that the 10th line is at eye level when checking eyesight.

Step-by-step instructions for completing the task:

1) Before the eye examination, the table must be illuminated with a lamp.

2) The table should be at a distance of 5 meters from the eyes.

3) It should take 2-3 seconds to recognize a sign.

4) We check each eye separately, cover one eye with a palm, and the second “read the letters”.

5) Do not screw up your covered eye.

6) The numerical value of visual acuity is equal to the numerical value of the letter V in the last of the lines in which you did not make more than normal errors.

Note: Visual acuity is considered complete if in rows with V = 0.3–0.6 you made no more than one mistake while reading, and in rows with V> 0.7 - no more than two.

If you received a visual acuity value less than 1.0, that is, you do not see or do not see all the letters below the conditional 10 lines, then you should undergo a professional examination by an ophthalmologist.

Control questions:

1) What area of the retina provides the highest visual acuity?

2) What tables are used to test children's vision?

3) How many mistakes are made when reading a line with a visual acuity V = 0.2?

4) Describe your visual acuity using the formula

5) What is the name of the state of refractive error in poor distance vision?

6) Indicate visual acuity if the patient sees line 10 of the Sivtsev-Golovin table from a distance of 3.5 meters.

7) Indicate visual acuity if the patient sees line 10 of the Sivtsev-Golovin table from a distance of 5 meters.

## COLOR SENSATION STUDY

Color perception is the ability of vision to perceive and transform light emission of a certain spectral composition into a sensation of various color shades and tones, forming a holistic sensation ("chromaticity", "chromaticity", "color").

Color perception is related to the function of the cone cells of the retina. Of the theories explaining color vision, the three-component theory is the most widespread. According to this theory, it is assumed that there are three color-perceiving apparatus in the eye, which are excited to varying degrees by the action of red, green and blue. Normal color vision is called normal trichromasia, and people with normal color vision are called normal trichromes.

The study of color perception is carried out using special polychromatic tables by EB Rabkin or a special anomaloscope device.

Rabkin tables for checking color perception are used to check color perception and identify the shape and degree of its violation. The set consists of 48 tables. Tables from 1 to 27 are basic, from 28 to 48 - control, for detailed diagnosis and identification of cases of simulation and aggravation.

(Rabkin's table is placed after the control questions)

Control questions:

1) What is the purpose of the study of color perception?

2) For which professions is it important to have the correct color perception?

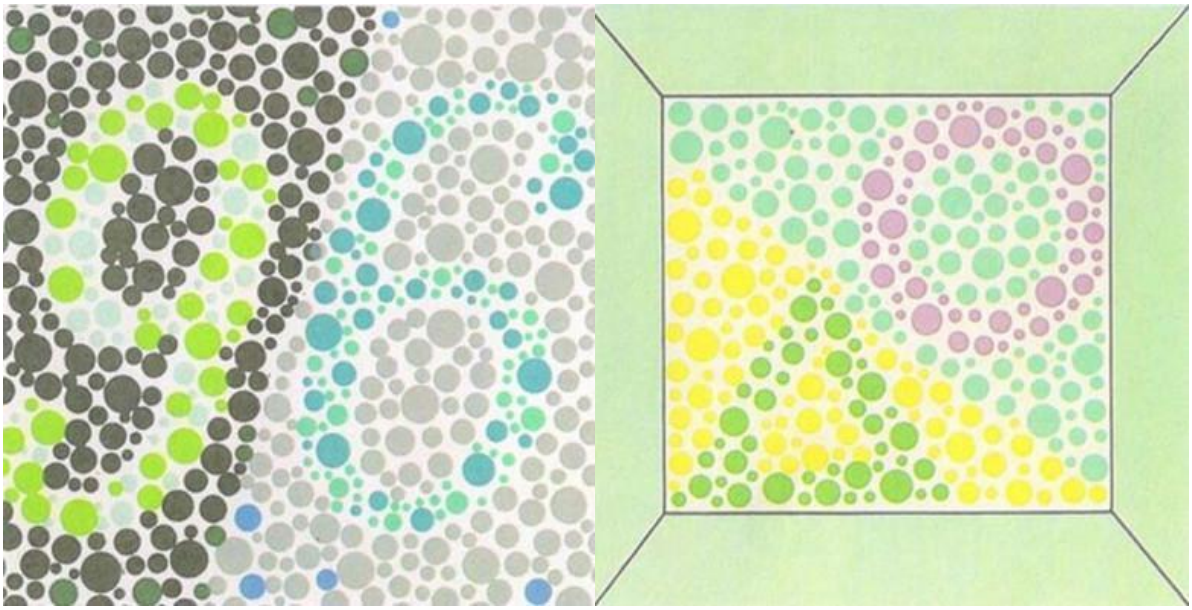
3) A disease in which there is a violation of the determination of the correctness of color?

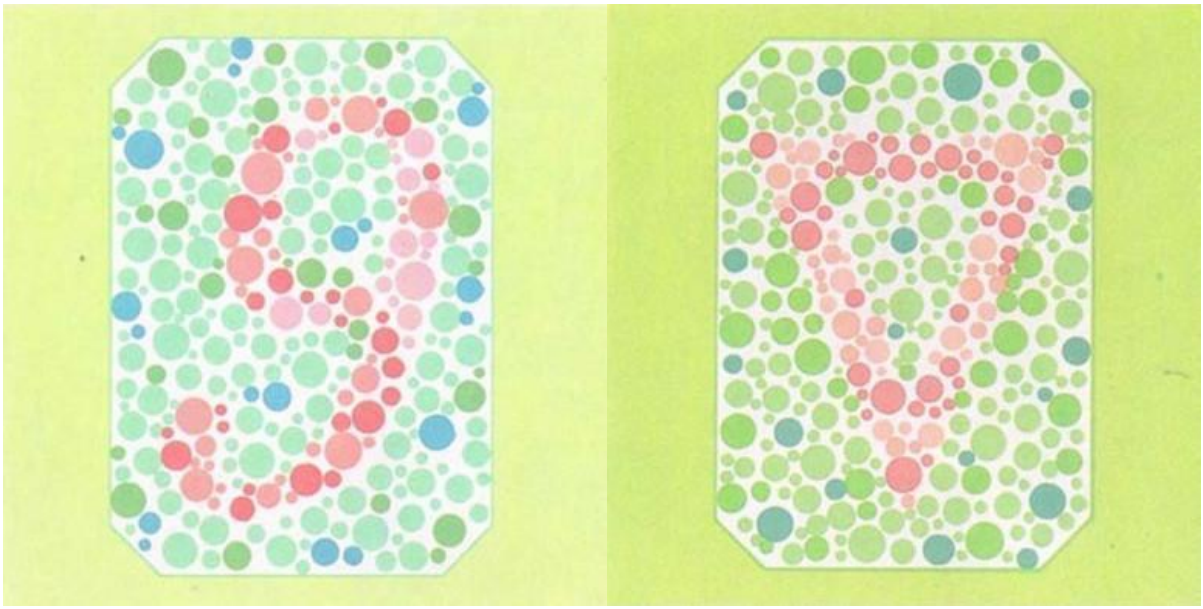
4) Color blindness is mainly called red light -?

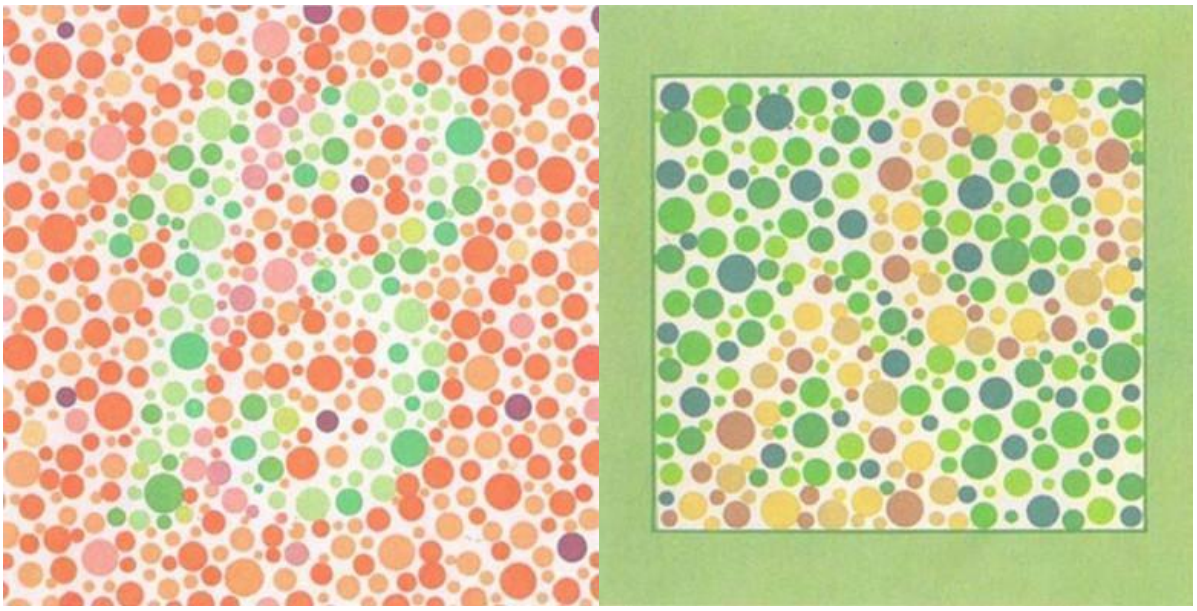
5) Color blindness is mainly called green light -?

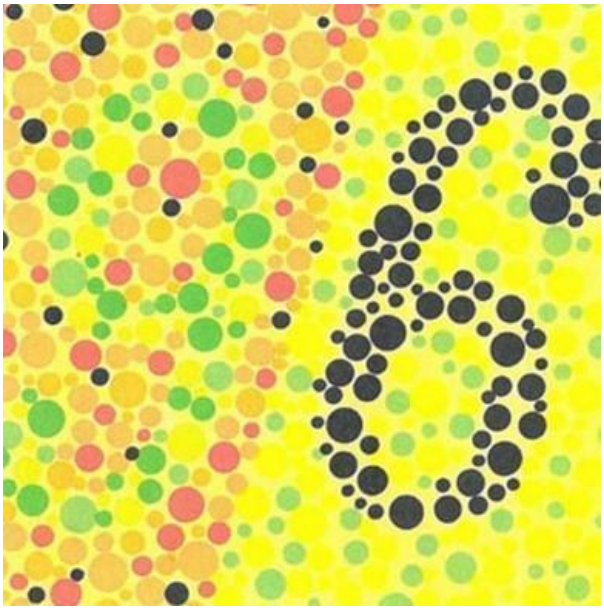
6) Color blindness is mainly called blue light -?

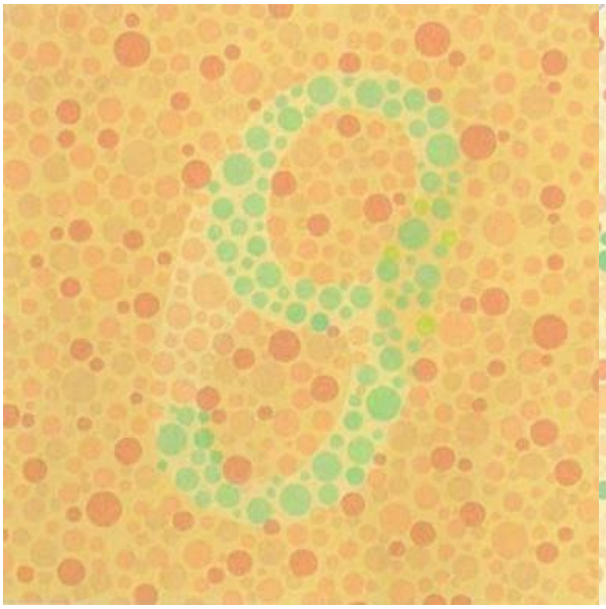
7) Record your research results and give an interpretation

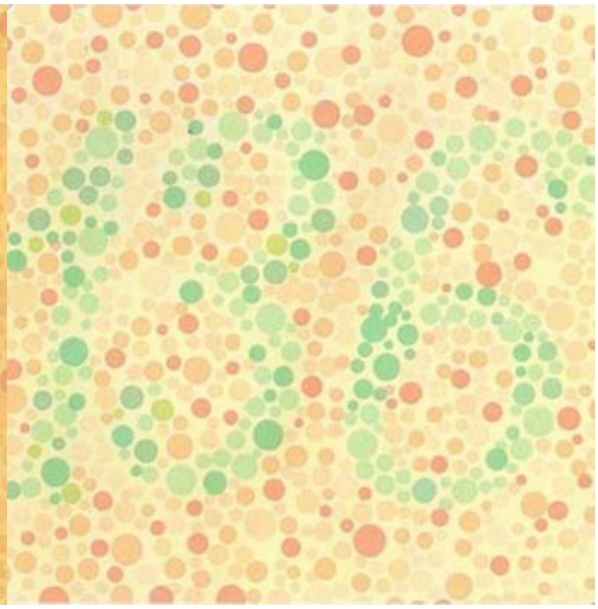


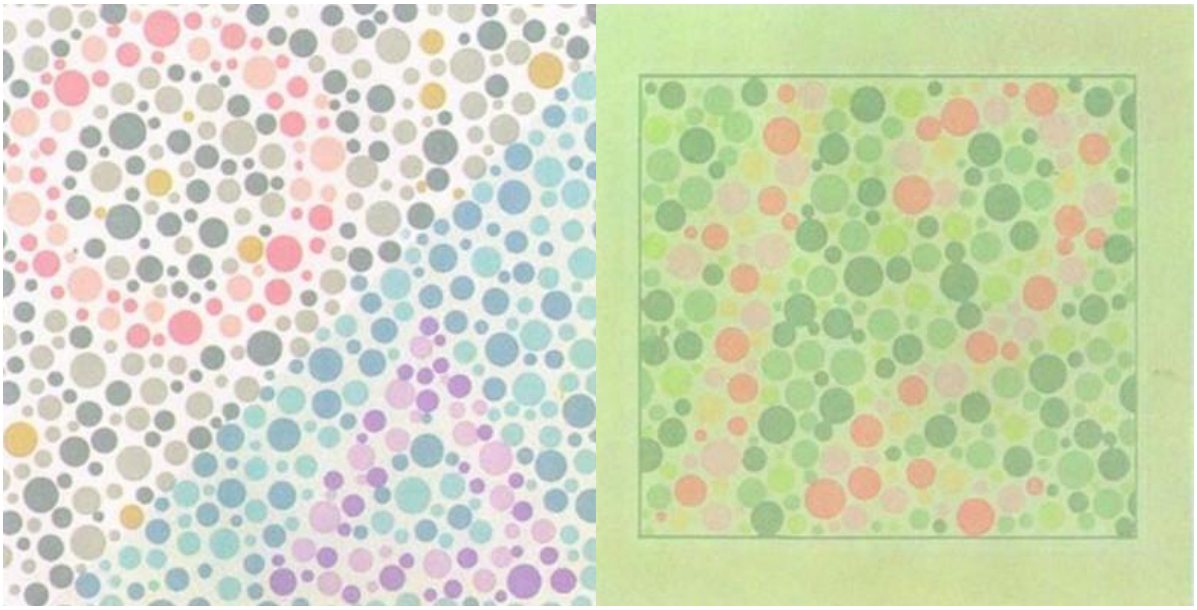












BINOCULAR VISION RESEARCH

Binocular vision (from Latin bini - "two" and Latin oculus - "eye") - the ability to simultaneously clearly see the image of an object with both eyes; In this case, a person sees one image of the object he is looking at. Binocular vision is also called stereoscopic.

Binocular vision is provided in the cortical part of the visual analyzer due to the most complex physiological mechanism of vision - fusion (Latin fusio - fusion), that is, the fusion of visual images that arise separately in each eye (monocular image) into a single combined visual perception.

Rules for conducting research on binocular vision:

1) Place the picture of the apple according to the following parameters: It should be large (about 15 cm in diameter) and located in the center of the monitor.

2) Adjust the brightness of the image. The monitor should not be dim or too bright.

3) You should place at a distance of 40-45 cm from the monitor. In this case, the image is at eye level.

4) Next, you need to stretch your finger up and keep it on the same visual axis with the object (apple).

5) Look at the apple. You should be able to see an object between two fingers. The hands and fingers will appear transparent. Then move your gaze to your finger.

6) You will notice that the apple has split in two.

7) The next step is to look at the apple and close the left eye. You should see a finger to the left of the object. When you close your right eye, you will see a finger to the right of the apple.

Assessment of results

If you see all the images described above (forked apple and forked finger), then you have a stereoscopic vision function.

Note: in case of violations, other images will be visible:

1) one finger is larger than the other

2) only one finger is visible

3) fingers disappear and reappear, and you cannot focus normally

4) the left finger covers the apple, and the right one is very far from it.

Control questions:

1) What is the purpose of the study of binocular vision?

2) What should be the visual acuity for the manifestation of binocular vision?

3) A disease in which binocular vision suffers?

4) What other tests are there to test binocular vision?

5) Record your research results and give an interpretation

## HEARING ACUITY STUDY

In the study of hearing acuity by speech, two principles of regulating the level of stimulus intensity are used: 1. Words are pronounced with different intensities (whispering, colloquial speech, shouting). 2. Words are pronounced at different distances from the subject's ear. In the study of hearing by speech, words from the table of V.I. Voyachek or two-digit numbers are usually used.

Research of hearing by whispering speech. The patient's head is turned so that the ear being examined is facing the investigator, whom the patient should not see. To avoid errors associated with rehearing, the patient presses on the tragus of the unexplored ear, thereby closing the external auditory canal. Normally, a person should hear a whispering speech at a distance of at least 6 m. If the patient does not hear, the researcher, gradually approaching, repeats the words until the patient clearly hears the pronounced numbers and repeats them correctly. This distance (in meters) is entered in the auditory passport. In the case of a sharp decrease in hearing, it is

necessary to conduct a study using the same technique using speaking or shouting (for each ear separately).

Finger test.

Objective: Perform the exercise without overshooting.

Execution method:

1) Position - standing, legs together, arms extended in front of you

2) With your eyes open, hit the tip of your nose with the index finger of your right hand, repeat with your left hand

3) Repeat step 2 with your eyes closed.

Interpretation of the results: If the function of the vestibular apparatus is impaired, a mimic fall will be noted

**Calcaneal knee test.**

Objective: Perform the drill without missing a shot

Execution method:

1) Lying position

2) Reach the knee of the other with the heel of one leg, and then draw it along the front surface of the lower leg to the ankle joint and back up to the knee.

3) Repeat with both legs

Interpretation of the results: If the function of the vestibular apparatus is impaired, there will be a miss due to excessive volume of movement and the heel jumping off the knee and lower leg in one direction or the other.

**Romberg test**

Purpose: To stand in a posture without deviation

Execution method:

1) A standing position with feet together, eyes closed and arms extended straight in front of you.

Interpretation of the results: If the function of the vestibular apparatus is impaired, instability will be noted, in severe cases, a fall.

**Study of pain and tactile sensitivity**

The study of sensitivity is carried out by applying appropriate irritants of the same strength to symmetrical parts of the subject's body: to determine pain sensitivity - with the tip of a needle, tactile - by gently touching it with a blunt end. The subject should close his eyes and note each irritation, for example, counting them aloud. In a number of cases, it is useful to alternate arrhythmically the touch with the sharp and blunt end of the needle, while the subject must say: "sharp", "stupid".

## Temperature Sensitivity Study

Temperature sensitivity is checked in the same way: by applying test tubes with warm and cold water to the skin for a few seconds. However, at home, you can use the handle of a fork or spoon (pre-cooled) and any warm object.

## Deep Sensitivity Research

### Muscular-articular feeling

The study of deep sensitivity is, first of all, the study of muscular-articular feeling. It is produced by passive movements in the joints. The subject, having closed his eyes, must determine the direction of movement of the limb. It starts with the small joints of the fingers or toes, such as the big toe. Slightly squeeze the big toe, thumb and forefinger, and move it up or down. If there are violations, then to clarify their degree, larger joints are also examined.

### Kinesthetic sensitivity

Kinesthetic sensitivity is checked by moving the skin fold (the subject must determine the direction of its movement with his eyes closed).

### Two-dimensional space

Two-dimensional spatial sensitivity is checked by "drawing" the blunt end of a needle on the subject's skin of the simplest figures: a circle, a cross, etc. (grapesthesia).

### Stereognosis

Checking the stereognosis, the subject is asked to determine by touching small objects what is put into his hand (coin, key, ring, etc.).