

Investigation of skin sensitivity

Skin (surface) sensitivity means a perception by tactile receptors (touch and pressure), thermic receptors (cold and warm) and algescic receptors (pain) distributed in the skin.

In testing of skin sensitivity we can investigate the density of distribution of individual receptors, i.e. their number per unit of the skin surface, by exposure to overthreshold stimuli. There are 2 warm, 13 cold, 25 tactile and 200 pain receptors per 1 cm² of the skin in average. Value of the absolute tactile threshold is not the same on all areas of the body – the smallest is on the tip of the tongue and on the nose, little bigger is on the lips, on the finger-tips and on the forehead. Compared to the tip of the tongue, the tactile threshold is about 5-times bigger on the dorsum of the hand, about 25-times bigger on the back and about 120-times bigger on the sole of the foot.

Tactile sensitivity:

Adequate stimuli for tactile perception are dull touch and light pressure. The investigated person feels the touch only on the places, where tactile receptors are distributed (touch points). In investigation of tactile sensitivity we can use *discrimination sensitivity*, i.e. the ability to distinguish two simultaneous tactile stimuli as two by „simultaneous space threshold“. This ability depends on the distribution of tactile receptors in the skin as well as on the central nervous mechanisms.

Thermic sensitivity:

Adequate stimulus for thermic receptors is the change of the skin temperature. Surface (skin) temperature depends on the temperature of the environment and on the place of measurement. For example, in the temperature of environment of 20 °C is the skin temperature on the hands about 28 °C, while in temperature of environment of 35 °C is the temperature of the skin on the hands about 31 °C. The investigated person identifies objects with the same temperature as skin as indifferent (not warm, nor cold). Skin has „zero“ physiological temperature. Objects with higher temperature than skin are identified as warm, objects with lower temperature than skin are identified as cold.

Algescic sensitivity (sensitivity to the pain):

Adequate stimulus may be of various modality – sting, intensive thermic or chemical stimuli etc.

Materials and needs

Weber's esteziometer (compasses with two equal pikes), Frey's fiber (thick artificial fiber attached on the stick), metallic sticks, water bath of 50 °C, vessel with icy water, injection needles or sterile pins, 3 rubber stamps with area of 1.0 cm², 2.25 cm² and 9.0 cm² divided into 100 smaller squares, neckerchief, 3 vessels with water of temperatures 15 °C, 25 °C and 35 °C.

Methods

Investigation of tactile sensitivity

Using a smallest stamp, stamp a palmar side of the third phalanx. In problems to distinguish small squares of the stamp, use the stamp with bigger area (2.25 cm²) and calculate the result to 1 cm². Press the biggest stamp to your exercise book to notice the results of investigation. Wrap the eyes of investigated person with neckerchief to eliminate the visual control of investigation by investigated person. Then using Frey's fiber touch the skin in each small square with equal pressure. Investigated person announces the feeling touch to investigator and he notices the results to the big square in the exercise book (as +). By the same way,

investigate the tactile sensitivity on the dorsum of the hand, on palmar side of the forearm or on the dorsum.

Investigation of discrimination sensitivity

Investigate the skin sensitivity with two pikes of Weber's estezimeter simultaneously. Investigated person announces one or two touches. Increase the distance between two pikes so that the investigated person feels two touches. Then gradually decrease the distance since the person feels the application of two touches just as one touch. Read the „simultaneous space threshold“.

Investigation of thermic sensitivity

Use the methods for investigation of tactile sensitivity also for investigation of thermic sensitivity. Since the density of distribution of thermoreceptors is relatively small, use the stamp with middle area (2.25 cm^2) and calculate the result to 1 cm^2 . Thermic stimulus (cold, warm) is applied by metallic stick or estezimeter, placed every minute into the vessel with ice or into the vessel with water of $50 \text{ }^\circ\text{C}$. Then change irregularly the application of cold and warm and ask the investigated person to differentiate the thermic stimuli (not the feeling touch!).

Weber's trial

Investigated person dips a left hand into the vessel with water of $15 \text{ }^\circ\text{C}$ and a right hand into the vessel with water of $35 \text{ }^\circ\text{C}$ for 5 min. Then, investigated person dips both hands into the vessel with water of $25 \text{ }^\circ\text{C}$. Water on the left hand seems to be warm and on the right hand cold.

Investigation of algesic sensitivity

Use the methods for investigation of tactile sensitivity also for investigation of algesic sensitivity. As painful stimulus, light stab with injection needle or sterile pin is used. To find if the investigated person feels well the pain, change the touch with pike and head of the pin. Investigation is done in small (1 cm^2) or middle stamp (2.25 cm^2).

Investigate and compare the density of distribution of skin receptors and „simultaneous space threshold“ on the fingertips, on the dorsum of the hand and on the palmar side of the forearm. Compare the density of distribution of individual skin receptors (tactile, thermic, algesic receptors) in the above mentioned areas of the skin.