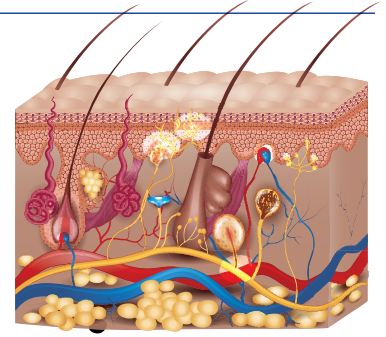


Cutaneous 2-Point Discrimination

The skin is the largest organ in the human body. Various receptors in the skin detect different stimuli. **Mechanoreceptors** respond to skin stretch, cold, changes in texture, and deep pressure. **Thermoreceptors** sense changes in temperature, and highly specialized **nociceptors** respond to intense stimuli that can trigger reflex withdrawal and pain.

You have probably noticed that cutaneous receptors are not equally distributed throughout the skin. Some places on your body are more sensitive than others. This activity explores the density of mechanoreceptors in the skin on the hand.

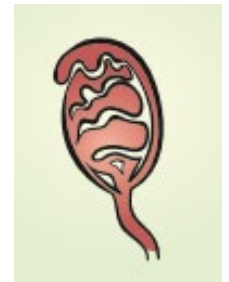


Essential Question

How does the density of cutaneous receptors vary on the human hand?

Background

The integration of responses from cutaneous receptors by the brain and spinal cord results in perception of the type and location of sensation. Stimulation of separate nerves 5 to 6 cm apart on the back are often perceived as one touch by the central nervous system. The tongue can distinguish touches as close as 1 mm, and fingertips can discriminate touches 2.5 mm apart.



Mechanoreceptors detect pressure

Materials

Carolina® 2-Point Discriminator (per pair of students)

Procedure

1. Place the test subject's hand palm-up and motionless on the desk. Subjects should keep their eyes closed for the duration of the activity.
2. Set the 2-point discriminator to the closed position, with the pointer at 0 mm.
3. Touch the subject's fingertip and ask if 1 or 2 points are felt.
4. Open the 2-point discriminator to the 2-mm mark and touch the subject's fingertip again. Record the number of points felt.
5. Repeat this process until the subject can discriminate 2 distinct points. Record the final distance between points for the fingertip.
6. Repeat the procedure for the palm of the hand and back of the hand.
7. Switch roles and repeat the entire procedure for fingertip, palm, and the back of the hand.

continued

Questions

1. How did the level of discrimination vary by location?
2. Based on the distance between points, which part of the hand has the highest density of receptors?
3. What do you think is a reason for the variation in receptor density on the hand?
4. Identify another area of the human body that you think would have a high density of cutaneous mechanoreceptors, and describe your rationale for the choice.