

Testing Sensory Receptors for Touch

Problem

What factors affect a person's ability to detect gentle pressure on skin?

Introduction

Your skin is the boundary between your body and the physical world that surrounds you. So it probably is not surprising that your skin contains many different sensory receptors. Some of those receptors detect changes in temperature. Others respond to tissue injury or damage. Still others are mechanoreceptors that respond when you touch an object or when an object touches you. The receptors for touch are more concentrated in some areas of your skin than in others.

In this lab, you will use a bent paper clip to infer the relative concentration, or density, of receptors for touch in three different areas of your skin. When the density is high, you should be able to sense two touches that are close together. When the density is low, it will be harder to distinguish two touches that are close together.

Skills Focus

Measure, Analyze Data, Draw Conclusions

Materials

- bent paper clips
- metric ruler

Pre-Lab Questions

1. **Predict** Which area will have the highest density of receptors for gentle pressure—your fingertips, the back of your hand, or your forearm?

2. **Control Variables** Why must you have your eyes closed while your partner touches your skin with the bent paper clip?

3. **Predict** Will you and your partner have the same density of touch receptors in a given area of skin? Give a reason for your prediction.

Procedure

You will be working with a partner. Your partner will test your skin and record your data. You will test your partner's skin and record your partner's data.

1. Practice gently touching the ends of your paper clip to your arm. Note the difference in the sensation when you use both ends of the clip and when you use only one end. **CAUTION:** Do not apply enough pressure to pierce the skin.
2. Squeeze your partner's paper clip until the ends are 2 cm apart. Then use Steps 3–5 to test the skin on the back of your partner's hand. Choose an area in the center of your partner's hand.
3. Make sure your partner's eyes are closed. Touch the paper clip to the back of your partner's hand 6 times— 3 times with two ends and 3 times with one end. Mix up the two-end and one-end touches so that your partner will not recognize a pattern. After each touch, ask whether your partner felt one end or two. Record the responses in Data Table 1.
4. Decrease the distance between the ends of the paper clip to 1.0 cm and repeat Step 3. Record the responses in Data Table 1.
5. Repeat Step 4 with the distance between the ends at 0.5 cm.

Data Table 1: Back of Hand						
	2 cm		1.0 cm		0.5 cm	
Touch	Ends Used	Ends Felt	Ends Used	Ends Felt	Ends Used	Ends Felt
1						
2						
3						
4						
5						
6						

6. Use the procedure in Steps 2–5 to test the skin on the tip of your partner's index finger. Record the responses in Data Table 2.

Data Table 2: Fingertip						
	2 cm		1.0 cm		0.5 cm	
Touch	Ends Used	Ends Felt	Ends Used	Ends Felt	Ends Used	Ends Felt
1						
2						
3						
4						
5						
6						

7. Repeat the procedure for your partner's forearm. Pick a location halfway between the wrist and the elbow. Record the responses in Data Table 3. Then, return the paper clip to your teacher.

Data Table 3: Forearm						
	2 cm		1.0 cm		0.5 cm	
Touch	Ends Used	Ends Felt	Ends Used	Ends Felt	Ends Used	Ends Felt
1						
2						
3						
4						
5						
6						

8. What was the shortest distance at which your partner could detect two ends of the clip at least three times?

Back of hand: _____ Fingertip: _____ Forearm: _____

9. What was the shortest distance at which you could detect two ends of the clip at least three times?

Back of hand: _____ Fingertip: _____ Forearm: _____

Analyze and Conclude

1. **Evaluate** Do your results support the prediction you made in Pre-Lab Question 1 about which area of skin would have the highest density of sense receptors? Explain.

2. **Form a Hypothesis** Why do you think that humans have a higher density of receptors for touch in some areas of skin than in other areas?

3. **Evaluate** Do your results and those of your partner support the prediction you made in Pre-Lab Question 3? Explain.

4. **Form a Hypothesis** What factors could account for variation in sensitivity to touch from one person to another?

5. **Form a Hypothesis** How might activities such as playing a guitar, laying bricks, preparing food, or playing video games affect a person's sensitivity to touch?
