TWO-POINT DISCRIMINATION

Human skin contains a variety of receptors for sensation, each triggered by a specific stimulus including touch, light pressure, deep pressure, pain, hot and cold (see attached diagram). These receptors are not distributed evenly at different areas of the body; the distribution of touch receptors can be assessed by a simple experiment.

MATERIALS
per pair

Compass with a pencil
Toothpicks
Tape
Rulers
Two-person teams

TO DO AND NOTICE

Tape a toothpick to the compass point and the pencil so that they protrude at least 2 cm from the ends of the compass point and pencil. (We are using toothpicks instead of compass points/pencil points to avoid injury).

One person will be the subject, the other the experimenter. Roles will be reversed at the end of the activity.

The experimenter sets the distance between the toothpicks at either 5 mm, 10 mm or 15 mm or 20 mm. Do not reveal this distance to the subject. Choose a body surface to test, such as the back of the hand, palm, arm, elbow, knee, etc.

The subject closes their eyes. The experimenter will <u>gently</u> but firmly touch the toothpick tips to the subject's skin, being careful that both toothpick points touch the skin simultaneously.

The subject will say whether they feel one distinct point of contact or two. Repeat at several areas over the surface chosen, and other surfaces. Record your results on the data sheet provided.

Alter the distance separating the compass points and repeat. You may wish to alter the distance until you find the difference that you can discriminate one from two points at various body parts.

This activity can be repeated on multiple body surfaces to map the differences in distribution of sense receptors across various body surfaces.

WHAT'S GOING ON?

The sense of touch is triggered by the stimulation of specific touch receptors. To discriminate two distinct points of touch, at least one touch

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receptor must remain unstimulated between two adjacent stimulated receptors. For example, if there are three touch receptors in a row and all three are being stimulated, the touch would be perceived as only one point. If the middle receptor was not stimulated and the lateral two were stimulated, the two lateral receptors would send two distinct signals and the sensation of touch would be perceived as two distinct spots being touched.

Since touch receptors are distributed sparsely on some body areas, such as backs, knees and elbows, and densely on other areas such as the palms of the hands and lips, the distance needed to discriminate between two tiny point sources of touch may be large on some body areas and small on other parts.

A traditional model or diagram called a homunculus represents body parts as large where there are many touch receptors, and much smaller where there are fewer touch receptors. These representations feature large hands, feet, faces and lips.

The portion of the brain called the somatic sensory cortex can be represented as a miniature map of a human lain across it; areas of the body with larger numbers of touch receptors take up larger areas of the somatic sensory cortex than body parts with fewer sensory receptors. Impulses from the body's receptors for pain, coldness and light touch travel to this area of the brain for interpretation.

SO WHAT?

This test is one actually used by neurologists in assessment of nervous systemfunction.

Receptors in the skin. All of the tactile receptors are actually modified dendrites.

Density of receptors (approximate) per square centimeter:

Palmar surface of the fingertips: 60 pain, 100 touch receptors

Back of finger: 100 pain, 9 touch receptors

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TWO POINT DISCRIMINATION DISCOVERIES

	5 mm 1 or 2 points?	10mm 1 or two points?	15mm 1 or 2 points?	20mm 1 or 2 points?
Fingertip				
Palm				
Inner Arm				
Knee (cap)				
Knee (behind)				
Other:				
Other:				
Other:				
Other:				

Feel free to try other distances between the points, just record what you did!

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