Name: _____
Lab day of week: _____

Human Senses

Adapted from Schmidt, et al. 2006. Life All Around Us.

Touch - Cutaneous Senses

Objectives

- Temperature: Can a single small patch of skin detect both hot and cold?
- Touch: Are small patches of skin equally able to sense touch?
- Pressure: Are different parts of our hand equally able to sense pressure?
- Identification: Can you identify various objects with only touch?

Temperature

Materials: A warm probe (from water above 50°C) and a cold probe (from ice).

Instructions

1. Place the grid stamp on the back of your partner's hand.
2. Touch the probes to at least 10 different spots on the grid of your partner's hand, and test whether your partner can correctly identify whether it is the hot or the cold probe.

Touch

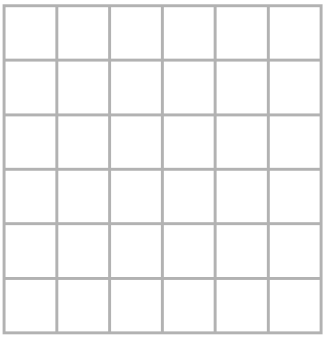
Materials: A fine bristle or hair.

Instructions

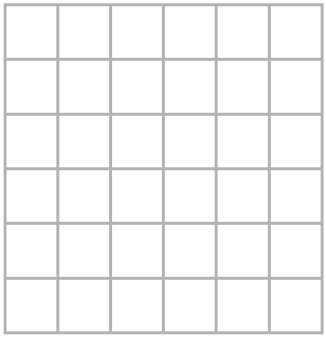
Use the bristle to touch different spots on the grid, and record where your partner can feel the touch.

Data

Temperature results



Touch results



Pressure

Materials: A hair, and onion skin paper.

Instructions:

1. Place a hair on a flat, smooth surface. Cover the hair with 12 sheets of onion paper.
2. Try to feel the hair with your index finger. If you cannot feel the hair, remove a sheet of paper from the stack and try again. Repeat until you can feel the hair.
3. Record the maximum number of sheets through which you can feel the hair, with your index finger, your knuckle, and the edge of your palm.

Index finger: _____ Knuckle: _____ Edge of palm: _____

Identification

Materials: Blindfolds.

Instructions:

1. Have one member of your group collect about a dozen small objects from within the room. These can be your own belongings, or you may borrow items from within lab as long as you put them away afterwards.
2. Place the objects on your lab bench and have your remaining group members try to identify the objects, without speaking to each other.
3. Once everyone has had a chance to feel the objects, have the group members take turns identifying one object at a time.

Two-point Touch

Objectives
Determine the distance between touch receptors on the skin's surface.

Materials
Dividers (or bent paper clips)
Millimeter ruler

Instructions
Use the dividers to determine the minimum separation your partner can accurately detect as two separate points.
Suggestions:

- Be gentle! Consider tilting the dividers to one side.
- Have your partner close their eyes.
- Start with the divider points to 10mm apart.
- Touch the dividers to your partner's skin, and test whether they can detect two separate points.
- Try to trick your partner.
- Move the points closer together until your partner cannot distinguish two separate points anymore.
- Do two trials and average the values.

Data: Your minimum distance of accurate two-point discrimination (mm)

Trial	Fingertip	Back of hands	Forearm	Back of neck
1				
2				
Average (mm)				

Sensory Adaptation

Objectives
Determine whether sensation is consistent over time.

Instructions

1. Rest your arm on your table, with palm face-up. Balance a coin on your fingertip. Keep your finger as still as possible. Note how long it takes until the coin-weight sensation stops.
2. Stack two more coins on top of the original, and again note how long it takes until the sensation stops.

Length of sensation with one coin: _____

Length of sensation with stack of coins: _____

Olfaction

Objectives
Test your ability to identify various smells.
Determine whether the sense of smell also involves sensory adaptation.

Instructions
Put on blindfolds, and try to identify the smelly objects.
With a partner, try to think of an example that illustrates sensory adaptation to smell.

Taste

Objectives: Determine whether our tongue has evenly-distributed taste receptors with equal abilities.

Instructions

1. For each taste, dip a clean cotton swab into a solution, and touch the tip of your tongue, then the sides, and then the back of your tongue. Discard the swab.
2. Test yourself on sweetness, sourness, saltiness, and bitterness.
3. Draw your tongue, and map the overall distribution of receptors as you perceived them. It may help to use symbols.

Proprioception

Objectives: Determine whether you can detect the position of your body parts.

Instructions

1. Have your partner place a pen or pencil on your desk while you watch. Close your eyes. Raise your right hand above your head. With your arm extended, lower your hand and touch the pen or pencil with your pointed index finger. Keep your eyes closed and do the same with your left hand.

Right hand	Left hand
□ Touched directly	□ Touched directly
□ Barely missed	□ Barely missed
□ Missed by a few centimeters	□ Missed by a few centimeters
□ Way off	□ Way off

2. As a separate test, write the word "biology" with your eyes open, and then again with your eyes closed.

_____

Sight

Objectives

- Find your blind spot.
- Test your visual acuity.
- Detect astigmatism.
- Detect color-blindness.

Blind spot

1. Close your left eye and stare at the "+" symbol. Hold this page at arm's length. Notice that without looking directly at the dot, it is still visible.
2. Now slowly bring the page toward you as you stare at the "+." The dot will disappear as the light rays being reflected from it fall on your blind spot.
3. Measure the distance the page is from your eye when the dot disappears. Distance: _____
4. Now turn the page upside down and repeat with your right eye closed. Distance: _____

Acuity

Do not remove any contacts. If you can read what someone with normal vision can read at 20 feet, you have 20/20 vision. (The top number is how far away you have to be, and the bottom number is how far away someone with normal vision has to be. 20/15 is therefore excellent vision, 20/20 is often called "normal" or "perfect," 20/70 prohibits driving, and 20/200 while wearing corrective lenses is "legally blind." Also, glasses prescriptions can approach -30 and still correct people's vision!)

Stand 20 feet from the chart, and close one eye. Have your partner stand close to the chart to check your accuracy. The last line you read correctly is your visual acuity.

Acuity: Left eye: _____ Right eye: _____

Astigmatism

Find the poster with radiating lines. Stand 10 feet away, and cover one eye. If some lines look darker or sharper, you may have astigmatism. This is a genetic condition caused by an irregular cornea or lens, and is simplest to correct with glasses or contact lenses.

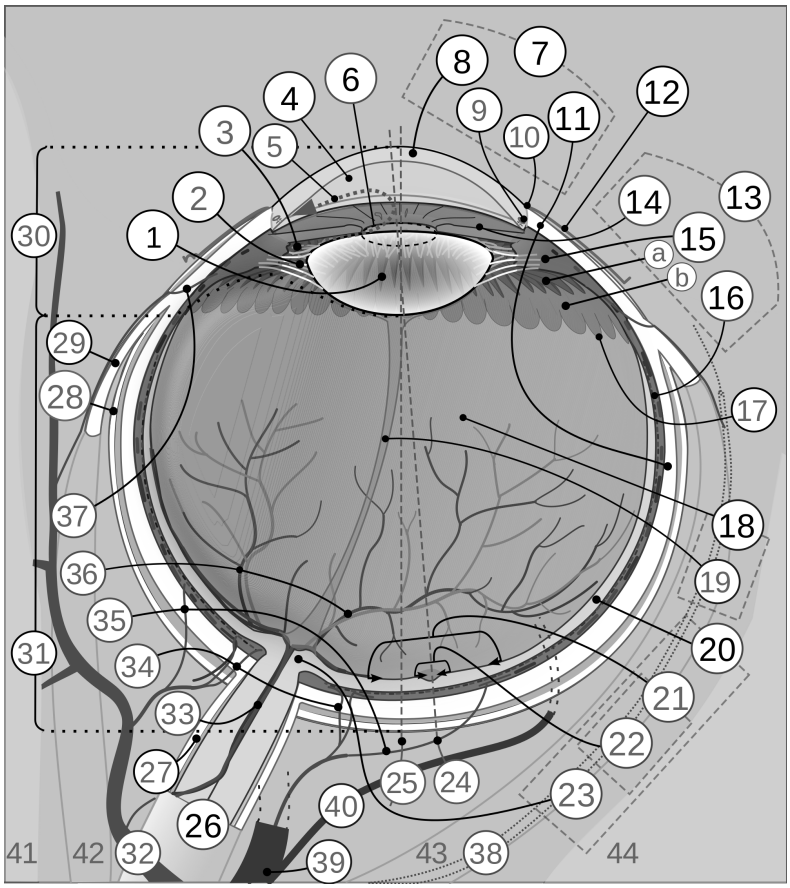
Do you have astigmatism? _____

Color

Examine the color-blindness testing book with your partner to determine whether you are color-blind. (Note: There are several kinds of color-blindness, including those that make it difficult to distinguish red from green, blue from yellow, or sometimes any color at all.)

Do you have color-blindness? _____

Anatomy (Figure from commons.wikimedia.org.)
Locate the sclera, cornea, choroid, iris, pupil, retina, optic nerve, fovea centralis, lens, suspensory ligaments, aqueous humor, and vitreous humor.



Dissection
Find the following:

- fat
- sclera
- cornea
- iris
- pupil
- lens
- optic nerve
- suspensory ligaments
- aqueous humor
- vitreous humor
- retina
- blind spot
- choroid
- tapetum lucidum (not in human beings)

Hearing and Balance

Hearing

1. Find a quiet location. Have your partner close their eyes, and plug their left ear.
2. Start with the ticking watch far away, and determine the greatest distance that the ticking can be heard with the right ear.
3. Now do the same test on their left ear. Compare your results with others who used the same watch.

Distance from right ear: _____ Distance from left ear: _____

Balance

1. Your ear is involved with balance. Test yourself by standing on one foot (with your eyes closed) for 30 seconds.
2. Now, move away from tables and chairs, and spin around rapidly five times.
3. Immediately after spinning, close your eyes, and stand on one foot.

Which was more difficult? □ Before spinning □ After spinning

Lab 14 Assignment

1. Turn in this completed lab.
2. Can a single small patch of skin detect both hot and cold?
3. (a) Were different parts of your hand equally able to sense pressure?

(b) If a competitor had equal sensitivity on all parts of their hand, would they have a survival advantage over you? Why or why not?

4. Why could you not always detect two points of stimulation during the two-point discrimination test?
5. Why do you think you got the results you did for the coins on your fingertip?
6. What example did you come up with to illustrate sensory adaptation to smell?
7. What did you learn about your tongue?
8. What might be a situation where proprioception is important to an organism's survival?
9. How might amusement park rides utilize knowledge of inner-ear physiology to make more exciting rides?
10. The sheep eye has a structure called the tapetum lucidum. What is the function of this structure?

Note: Be prepared to be outdoors during next week's lab.