

Lab 6/7: Sensory Physiology

Purpose: How many types of receptor cells respond to a specific kind of environmental stimulus.

Procedure:

6/7-A: Tests of cutaneous sensation

A-1: Two-point discrimination

The ability to distinguish two distinct points on the skin surface will be recorded.

Procedure

1. With your partner's eyes closed, apply two caliper pinpoints as closely together as possible on your partner's skin on the palm of his/her hand.
2. Remove the pins and move them 1 millimeter apart. Reapply the caliper points to your partner's skin. Repeat this procedure until your partner can discriminate two distinct points.
3. Record this distance between pins at which your partner can discriminate two separate caliper points.
4. Compare results obtained from the following areas:
 - a. palm of hand
 - b. back of hand
 - c. fingertip
 - d. outer edge of the lips
 - e. back of neck
5. Have your partner repeat this experiment on your skin.
6. Interpret the results you have obtained.

A-2: Accommodation of thermoreceptors.

Accommodation, or sensory adaptation, occurs when receptors generate fewer impulses during constant stimulation. Accommodation of cutaneous thermoreceptors will be recorded.

Procedure

1. Place your left fingers in 15°C water and your right fingers in warm water (37° C) and record the sensation of each. Keep hands immersed for 2 minutes.
2. After two minutes, describe the sensation in each hand.
3. Remove hands and promptly place them both in 25° C water. Describe the immediate sensation in each hand.

6/7-B: Olfactory adaptation

The adaptation of olfactory chemoreceptors will be timed.

Procedure

1. Block your left nostril. Uncork and hold the bottle of camphor oil under your nose until you can no longer detect the camphor. Do not consciously sniff the contents of the vial! Record the adaptation time.
2. Remove the camphor and place the bottles of cloves, then peppermint oil under your nose. Distinguish the smells of cloves and peppermint oil.
3. Uncork and hold the bottle of camphor under your nose again until the smell is no longer recognized. Record this second adaptation time
4. Unblock your left nostril determine if the camphor is detected.
5. Interpret these results.

C-2: Audiometry

An audiometer measures hearing acuity by presenting pure tones to the subject's ear through a set of color-coded earphones (red = right ear, blue = left ear). The intensity required to first perceive the signal is recorded for each ear at a number of frequencies. The presentation of signals should be randomized. The results are plotted on an audiogram to determine individual hearing acuity compared to normal values.

Procedure

1. In a quiet room, the instructor will demonstrate the proper method of operating the audiometer.
2. Audiometry tests will be conducted in pairs. Each student will take his/her partner's audiogram.
3. Record your results on the worksheet on page 44.
4. Analyze the audiograms in the following way:
 - a. Average the values obtained for each ear for the frequencies of 500 Hz, 1000 Hz, and 2000 Hz.
 - b. Subtract 26 dB from each average.
 - c. If the difference is greater than 26, multiply this number by 1.5%. This equals the percent impairment of each ear.

Example:	<u>Hz</u>	<u>Right ear</u>	<u>Left ear</u>
	500	10	20
	1000	15	30
	2000	<u>10</u>	<u>40</u>
	Total	35	90
	Average =	12	30
		<u>- 26</u>	<u>- 26</u>
		0	4

Percent impairment:

$$\text{Right ear} = 0 \times 1.5\% = 0.0\%$$

$$\text{Left ear} = 4 \times 1.5\% = 6.0\%$$

5. To determine the percent of biaural impairment perform the following calculation:

$$\text{Biaural impairment} = \frac{(\% \text{ impairment of good ear} \times 5) + (\% \text{ impairment of bad ear})}{6}$$

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6. Record the results of these calculations.

E-1: Demonstration of the blind spot

Procedure

1. Cover your left eye and focus the right eye on the center of the cross below.
2. Slowly bring the page closer to your eye until the spot disappears.



3. Have your partner measure this distance from your eye to the page.
4. The image of the spot is now superimposed on the optic nerve. Explain the lack of vision at this point.

E-2: The Snellen test

The ability to discriminate fine detail is known as visual acuity. The Snellen test uses a standardized eye chart to evaluate visual acuity. You will be using one of several versions of this eye chart in the form of the wall chart in the laboratory.

Procedure

1. Stand 20 feet away from the Snellen chart. Cover your left eye.
2. Attempt to read the line designated "20".
3. If you cannot read line 20, attempt line 30, 40, 50, 70, 100 or 200 until a line is legible. Perform these attempts with your left eye, covering your right eye.
4. The Snellen chart is analyzed in the following way:

$$\text{Visual acuity} = \frac{\text{Distance you read the letters}}{\text{Lowest line read clearly at 20 feet}}$$

Examples:

Nearsightedness (myopia) = 20/30

Normal = 20/20

Farsightedness (hyperopia) = 30/20

E-5: Perimetry

The arrangement of rods and cones in the retina is not at random. Using objects of different colors, you will map the locations of the cones in your retina for one eye.

Procedure

1. Seat yourself before the perimeter board with your right eye at the edge of the semicircle. Cover your left eye. Stare at the center line.
2. Your lab partner will introduce several different colored blocks into your field of vision. Identify these blocks by color. Do not take your eye from the center of the chart or uncover your left eye.
3. Your partner will record the degree at which the colors were discriminated on the perimetry score sheet on page 47.
4. Repeat these procedures for each block for both the horizontal and vertical perimetry charts. Record the data and connect the same colored dots to form an outline of cone placement of your right eye on your data sheet.
5. Explain these results in regards to cone placement in your retina.

Results:

A1

Area	Justin	Josh	Bri	Jesica
Palm	7mm	8mm	8mm	4mm
Hand	11mm	13mm	22mm	7mm
Fingertip	3mm	2mm	5mm	3mm
Lips	4mm	3mm	7mm	4mm
Neck	25mm	15mm	13mm	7mm

A2

Bri: Hot to cold hand was immediately cold. Cold to hot hand felt numb.

Josh: Hot to cold hand was immediately cold. Cold to hot hand felt numb.

Justin: Hot to cold hand was immediately cold. Cold to hot hand felt warm/hot.

6/7 B

	Justin	Josh
Camphor	29s	19s
Post Pep.	41s	47s

C2

	Justin		Josh	
	Left	Right	Left	Right
500Hz	40dB	30dB	30dB	35dB
1000Hz	25dB	35dB	25dB	20dB
2000Hz	20dB	25dB	10dB	10dB

E1

	Justin	Josh	Bri
Distance	7in	10in	8in

E2

Justin: 20/20

Josh: 20/15

Bri: 20/50

E5

	Justin	Josh	Bri
Blue	72°	74°	82°
Green	75°	80°	86°
Red	85°	85°	90°

Discussion: The most interesting activity for me was A1: Two point Discrimination.

Knowing that the caliper is two pronged and only being able to feel it as one was an interesting thought that was tough to wrap my head around. Going from the fingertip where I sensed the two prongs easily to the back of my neck where it took a long time for me to realize, just showed me the difference in concentration of these receptors.

Conclusion: There are many different ways in order to test different types of receptors you have in your body. Through the many different activities in this lab, we now feel how receptors perceive temperature, pressure, light, sound, and even smell.