

Lab #6 and #7 Sensory Physiology

Purpose: To observe basic principles of human sensory physiology

Procedures:

A – 1: Two – point discrimination

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

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

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 to determine if the camphor is detected.
5. Interpret these results.

C – 1: Tuning Fork Tests

Rinne's test (checks for middle ear damage)

1. plug your left ear with cotton or hold your hand over it and test the right ear.
2. Hold the handle of a vibrating tuning fork to the right mastoid process.
3. When the sound disappears, move the fork near the external auditory canal.
4. Reappearance of the sound indicates no middle ear damage.
5. Repeat the test with your left ear
6. Record the results for each ear.

Weber's test (checks for nerve or conduction deafness)

1. Hold the handle of a vibrating fork (512 Hz) to the bridge of your nose.
2. Lateralization of sound to one ear indicates deafness.
 - a. Lateralization to poor ear indicates conduction deafness
 - b. Lateralization to better ear indicates nerve deafness.

C – 2: Audiometry

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

$$\text{Binaural impairment} = (\% \text{ impairment of good ear} \times 5) + (\% \text{ impairment of bad ear}) / 6$$
6. Record the results of these calculations

E – 1: Demonstration of the blind spot

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 the 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: Snellen test

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:

Visual acuity = Distance you read the letters / Lowest line read clearly at 20 feet

E – 3: Astigmatism

1. Stand approximately 8–10 inches away from the radial astigmatism eye chart so that it fills your field of vision. Cover your left eye.
2. Focus on the lines in the vertical plane with your right eye.
3. If a blur appears in the lateral lines or the lines converge into one, you have an astigmatism in this plane of your eye.
4. Record the results of this test and repeat with the left eye.

E – 4: Color vision

Negative after-images

1. Stare at different colored objects provided by your lab instructor for 30 seconds each, and then shift your glance to a white sheet of paper. These may include but not be limited to colored squares on white paper, stripes of various colors against white paper, colored flags or scenic views.
2. Record the negative after-images seen for each color. Were you able to predict any of these?

Color-blindness test

1. Obtain the Ichikawa colorblindness charts.
2. Attempt to read the numbers of each pattern on the test panels. (There are some “practice” panels before the actual test panels begin.)
3. After the first 10 test panels, if your score indicates color blindness, continue with the next five test panels to determine which color deficiency exists.
4. Record your results on the worksheet on page 46

E – 5: Perimetry

1. Seat yourself before the perimeter board with your right eye at the edge of the semicircle. Cover your left eye. Stare at the centerline.
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 scoresheet 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 regard to cone placement in your retina.

Results

A – 1:

- a. Palm of hand 4 mm
 - b. Back of hand 3 mm
 - c. Fingertip 3 mm
 - d. Outer edge of the lips 3 mm
 - e. Back of neck 5 mm
- I noticed the thicker the skin, the harder it was to distinguish the two points.

A – 2:

My left fingers in 15° C water felt very cold. My fingers began to hurt after around 15 seconds, and they went numb at around 1 minute. My right fingers in 37° C water felt hot. My fingers did not burn, but it felt like they were getting burnt. My fingers began to adapt to the water at 1 minute, they began to feel warm rather than hot. The immediate sensation I felt in my left fingers (cold water) in 25° C water was a warm sensation. It was a relieving and comfortable feeling. The immediate sensation I felt after I placed my right fingers (warm water) in the 25° C water was a cold sensation. My warm fingers felt uncomfortable and cold even though the water was at room temperature.

6/7 – B:

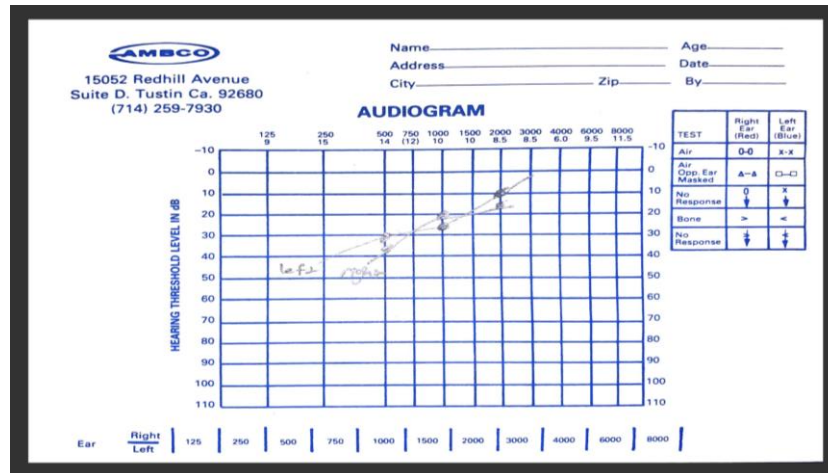
35 seconds - could not smell the camphor

1:15 - could not smell the peppermint and cloves

C – 1:

1.
 - No middle ear damage in right ear.
 - No middle ear damage in left ear.
2. Weber's test did not need to be performed due to no middle ear damage.

C – 2:



E – 1:

- The distance from my eye to the page was 8 inches.
- Everyone has a spot in their retina where the optic nerve connects. In this area there are no light-sensitive cells so this part of your retina cannot see.

E – 2:

- Right eye: 20/30
- Left eye: 20/30
- With these results it is determined that I am nearsighted (myopia).

E – 3:

- My results for this activity were that I did not have astigmatism in my left and right eye.

E – 4:

1.
 - I was able to predict that the afterimage seen on a blank piece of white paper was indeed going to show the image I was staring at.
2.
 - The Ichikawa color blind test determined that I do not have color blindness.

E – 5:

Flag from left

- Red: 83°
- Green: 69°
- Blue: 88°

Flag from right

- Red: 86°
- Green: 85°
- Blue: 82°

Flag from above

- Red: 30°
- Green: 32°
- Blue: 33°

Flag from below

- Red: 65°
- Green: 80°
- Blue: 81°

Discussion: Each activity in this lab was designed to help us measure the capabilities of our sensory system. There are many types of receptor cells, each of which responds to a specific kind of environmental stimulus. The Cutaneous, olfactory, auditory, proprioceptive, and visual systems were examined in these exercises. The strength with which a specific sensation was perceived depended on the rate that impulses were delivered to an interpretation center. The stronger sensations resulted from higher frequencies of nerve impulse arrival. This phenomenon is known as intensity coding, and is frequency, not amplitude dependent.

Conclusion: In conclusion, we were able to familiarize ourselves with sensory physiology. We learned about how our blind spot works, how to determine color blindness, how our sense of smell can adapt to different odors, how astigmatism works, how I have myopia. Overall, this lab experiment was a great way for me to learn about my senses and how each work.