Valencia, Diana

Lab 6/7-Sensory Physiology Report

Purpose: The purpose of this lab is to learn how each receptor in our body works by carrying out some exercises that measure the capacity of the sensory system. It will also teach us how sensory neurons are connected to the CNS, and how cerebral cortex convert the impulses into sensations.

Procedures:

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. back of neck
5. Have your partner repeat this experiment on your skin.
6. Interpret the results you have obtained.

A-2: Accommodation of thermo receptors.

Accommodation, or sensory adaptation, occurs when receptors generate fewer impulses during constant stimulation. Accommodation of cutaneous thermo receptors 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. 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.

6/7-C: Auditory measurements

Sound is measured in terms of amplitude (decibels–dB) and frequency (Hertz–Hz).Tuning fork tests and an audiometer will be used to evaluate auditory function.

C-1: Tuning fork tests
These tests utilize the principle of bone conduction to directly vibrate the cochlear hair cells. They should be done in a quiet room for most reliable results.
Procedure: 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.

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.

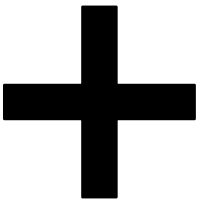
Example: Hz	Right ear	Left ear
500	10	20
1000	15	30
2000	10	40
Total:	35	90
Average:	12	30
	-26	-26
	0	4

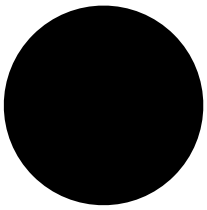
Percent impairment:
- Right ear = 0 x 1.5% = 0.0%
- Left ear = 4 x 1.5% = 6.0%

5. To determine the percent of biaural impairment perform the following calculation:
   - Biaural impairment $= \frac{(\%\text{ impairment of good ear} \times 5) + (\%\text{ impairment of bad ear})}{6}$
6. Record the results of these calculations.

6/7-E: Visual measurements
The sense of sight is the most important of the senses. As such, a number of standardized tests have been developed to evaluate visual functions.

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:
   - 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-3: Astigmatism

An abnormal curvature of the cornea may produce a blurred image on the retina known as an astigmatism.

Procedure:

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

Cones contain visual pigments that respond to specific wavelengths of light to produce nervous impulses pertaining to color. The next two tests will explore different aspects of color vision.

1. Negative After-images

- Staring at an image of specific color for too long will "bleach out" visual pigments of that color. Glancing at a white surface will reveal an image of complementary color to the original. *NOTE: This test will be done first as a class, then may be repeated on an individual basis.*

  Procedure:

  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?

2. Color-blindness test

Color blindness is a genetic abnormality that is carried by the X chromosome.(See page45.)The most common form is red-green color blindness, wherein one or the other pigment or sometimes both from the respective cone is in small amounts or lacking altogether. Several versions of the test for color blindness are available.In this laboratory, you will be using the Ichikawa color blindness charts.

Procedure:

1. Obtain the Ichikawa color blindness 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

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:

A-1: Two-point discrimination

Caliper Points	Diana	Juan
a. Palm of hand	**10 mm**	**10 mm**
b. Back of hand	16 mm	12 mm
c. Fingertip	5 mm	3 mm
d. Back of neck	12 mm	11 mm

A-2: Accommodation of thermo receptors.

Temperature	Fingers	Sensations
15°C (cold)	Left Fingers	Fingers were in so much pain, like a stabbing pain
37°C (warm)	Right Fingers	Burning sensations
25°C (after 2 minutes place both hands inside this water)	Both hands	15°C= hand that was placed in this temperature feels warms 37°C= hand that was placed in this temperature feels cold

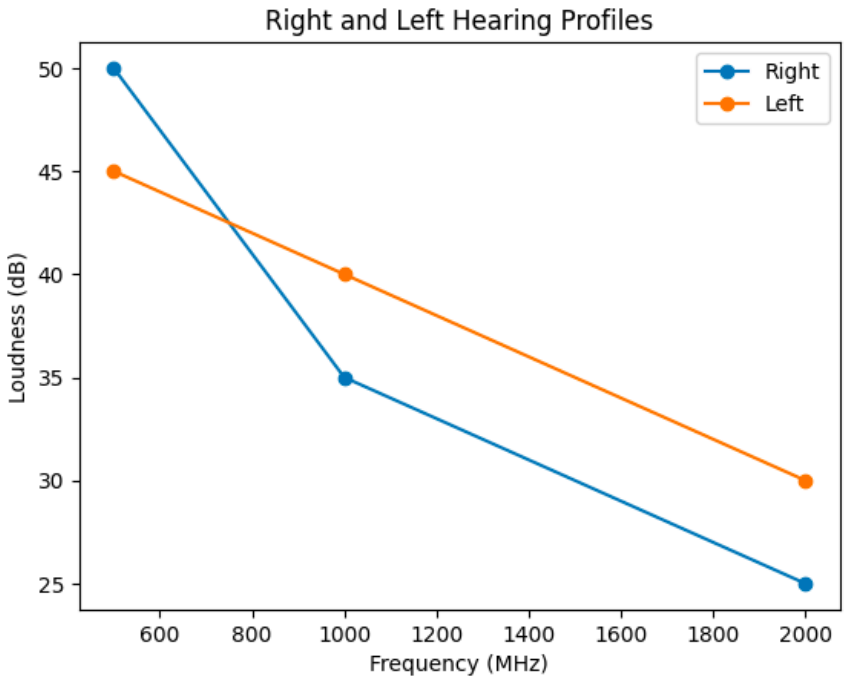
6/7-B: Olfactory adaptation

Adaption Time- Initial	After smelling cloves and peppermint oil
15.75 seconds	7.03 seconds

C-1: Tuning fork tests

No middle ear damage was detected.

C-2: Audiometry:



Average Right after subtraction:	10.66
Percent Impairment Right:	15.9%
Average Left after subtraction:	12.3
Percent Impairment Left:	18.5%

E-1: Demonstration of the blind spot
Distance from eye to page until blind spot is hit = 8 inches

E-2: The Snellen test
Normal=20/20

E-3: Astigmatism

Eye	Astigmatism Level
Left eye	5
Right Eye	5

E-4: Color vision
The image that with the red circle & the black dot, appeared as a black circle with a red dot under the light.

2. Color-blindness test
No color blindness was detected.

E-5: Perimetry

Color	Flag from left	Flag from right	flag from above	Flag from below
Red	90	85	30	60
Green	90	95	45	70
Blue	80	90	55	60

Discussions:
A-1: Two-point discrimination:
I believe that these result show that sensation can be felt more accurately on the palm & fingertips because it is what we use to interact with the world. As opposed to the back the hand, and neck which are rarely used to interpret sensation.

A-2: Accommodation of thermo receptors.
The main idea of this experiment was to teach us how our body can accommodate to any temperature. When I had my fingers in the cold water, the bones of my fingers were in so much pain. During the 2 minutes, I had to take my hand out of the cold water because it felt like my fingers were being stabbed. The hot water was much more tolerable. When it was time to place both in the 25°C water the hand that was in the 15°C felt warm, and the hand that was in the 37°C felt cold.

6/7-B: Olfactory adaptation:
When I initially placed the bottle of camphor oil under my nose, it took 15.75 seconds until I could no longer detect the camphor. After placing the peppermint oil & bottle of cloves under my nose it took 7.03 seconds for my nose to adapt to the camphor oil. I believed this happened because I had already previously smelled it, so my nose was able to adjust to the smell right away.

C-1: Tuning fork tests:
Luckily, the result for this experiment were straight forward, I have no middle ear damage. This test is used to assess vibrating sensation and hearing.

C-2: Audiometry:
This experiment, was a very interesting one, because I learned that the percent impairment of my Right ear is 15.9% & an 18.5% on my left ear. A 16% to 25% is considered slight hearing loss. A normal hearing loss range is between -10% to 15%.

E-1: *Demonstration of the blind spot*
While conducting this experiment, I learned that my blind spot is at 8 inches away from eyes. Blind spots are also knows as physiological blind spot, this area has no light detecting cells on the optic disc. That mean no vision is detected, and that is out blind spot.

E-2: *The Snellen test*
The result for this experiment were straight forward. My vision is normal 20/20.

E-3: Astigmatism
My result for this experiment were a level 5 astigmatism on both eyes. According to advancedfamilyeyecare.com .75 and 2 is considered normal, between 2 and 4 is moderate, and a person with a 4 and up is considered to have significant astigmatism.

E-4: Color vision
The image that with the red circle & the black dot, appeared as a black circle with a red dot under the light. I believe that our eyes are able to predict how the image will look under the light because you stare at it for too long your brain just remembers it.

2. Color-blindness test
This experiment was also very interesting because I was able to learn how some people see differently. I don't have color blindness, but after completing this experiment I learned that it is very difficult for those that do.

E-5: Perimetry
Perimetry test are important because they help doctors detect any defects, and locate the problem.

Conclusion:
In this lab we were able to learn the basic types of receptor and they work. We also learned, how our body adapts to the changes in the temperature. Some of us were able to learn is we have any hearing impairment or problems with our eyesight. These experiments taught us the important role of the CNS, and how different parts of out body respond to different sensations.