LABORATORY6/7–SENSORY PHYSIOLOGY

Purpose:

The purpose of this lab is to understand the fundamental principles of human sensory physiology. We will explore various aspects of the sensory systems, including cutaneous sensation, olfactory adaptation, auditory measurements, equilibrium, and visual measurements. By conducting a series of exercises, we aim to gain insights into how our nervous system processes environmental stimuli and translates them into perceived sensations. Through these experiments, we will examine the capabilities of our sensory systems and learn how factors such as receptor types, adaptation, and intensity coding play crucial roles in sensory perception.

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.

1.Place your left fingers in 15C water and your right fingers in warm water (37C) andrecord the sensation of each. Keep your hands immersed for 2 minutes.

2.After two minutes, describe the sensation in each hand.

3.Remove hands and promptly place them both in 25C 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

6/7-C: Auditory measurements C-1 & C-2

.C-1: Tuning fork testsThese 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.
1.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%.

6/7-E: Visual measurements E1,E2,&E3

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 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 = Distance you read the letters 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.

Results:

6/7-A: Tests of cutaneous sensation

	1st Person	**2nd Person**
A.palm of hand	10mm	7mm

B, back of hand	10mm	10mm
C. fingertip	3mm	3mm
D. outer edge of the lips	3mm	4mm
E. back of neck	10mm	2mm

A-2: Accommodation of thermoreceptors

Cold 15C	Room Temperature 25C	Hot 37C
Left hand 2 mins lapse Results: Hand that was in the cold water felt hot when being put in the room temperature water	Both hands in the middle after 2 mins	Right Hand 2 mins lapse Results: Hand that was in the hot water felt cold when being put in the room temperature water

6/7-B:Olfactory adaptation

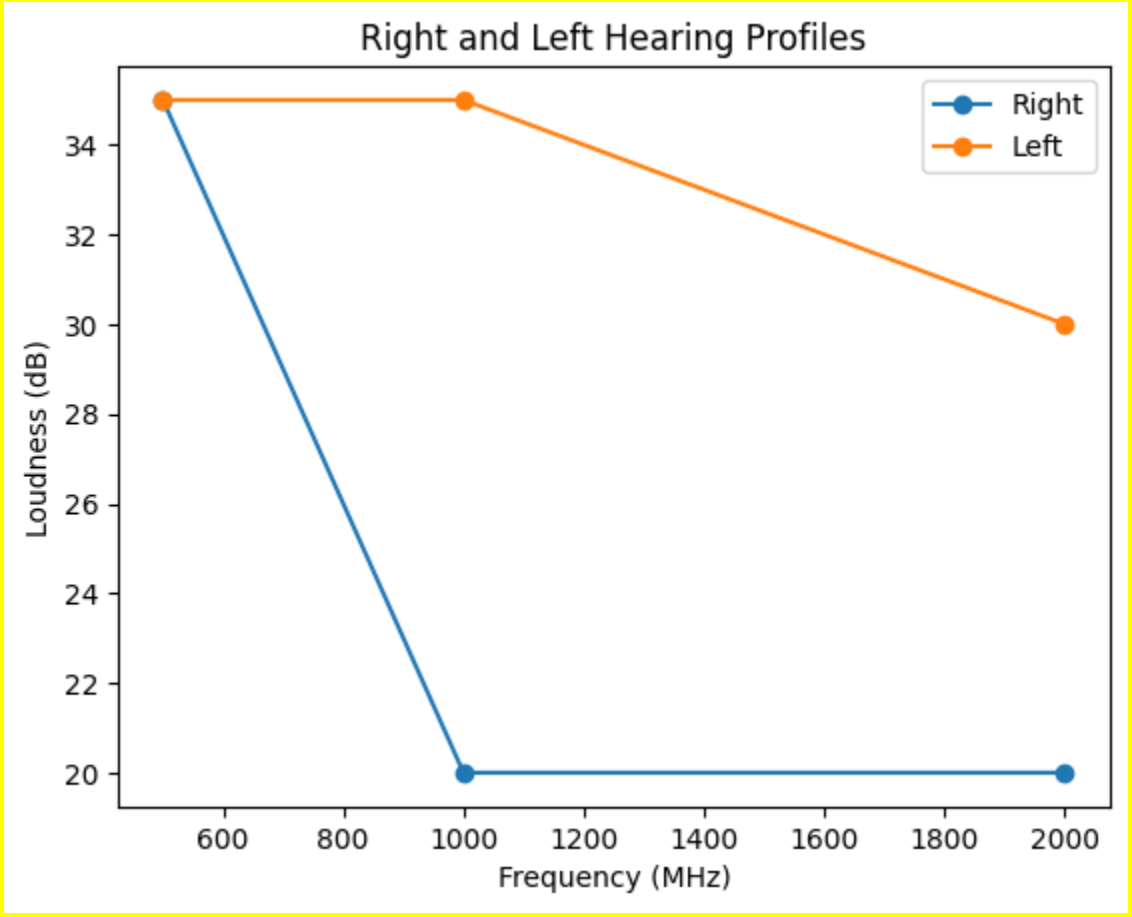
Secs it took to no longer detect camphor oil	18 Seconds
Secs it took to no longer detect camphor oil after distinguishing the smell of cloves and peppermint oil	5 Seconds

6/7-C: Auditory measurements C-1 & C-2

Turning fork test

- Reappearance of sound in left ear - positive
- Reappearance of sound in right ear- positive
  Therefore there is no middle ear damage

C-2



6/7-E: Visual measurements E1,E2,&E3

E1

Results : 16cm is the distance at which the spot disappeared

E2- The Snellen test

Atzi Results: 20/30 Nearsightedness(myopia)

Ana Results: 20/30 Nearsightedness(myopia)

E3 Astigmatism

Right eye: positive for astigmatism

Left eye: positive for astigmatism

Blur appeared in the lateral lines

Discussion:

In this laboratory experiment, we explored different aspects of human sensory physiology, focusing on the five main sensory systems: cutaneous sensation, olfactory adaptation, auditory measurements, equilibrium, and visual measurements.In the first part of the experiment, we conducted tests of cutaneous sensation. The two-point discrimination test revealed that our ability to distinguish two distinct points on the skin surface varied depending on the location, with the fingertips being the most sensitive. This demonstrates that receptor density differs across the body, affecting our tactile sensitivity.We also investigated olfactory adaptation, which involves the loss of sensitivity to a specific odorant over time. Our results showed that individuals adapted to the smell of camphor oil at different rates, highlighting the subjective nature of olfactory adaptation.Auditory measurements were another crucial aspect of our experiment. We performed Rinne's and Weber's tests to assess middle ear and nerve deafness, respectively. These tests provided insights into the functionality of the auditory system and helped identify potential hearing impairments.Equilibrium was explored by observing nystagmus, a reflex eye movement that occurs when the semicircular canals are rotated. This demonstrated how the inner ear plays a role in tracking moving targets and maintaining balance. Finally, we evaluated visual measurements, including the blind spot, Snellen test for visual acuity, and tests for astigmatism and color blindness. These tests allowed us to assess the quality of our vision and detect any visual abnormalities

Conclusion:

-Understand the three components of sensation.
-Understand the ultimate role of the
interpretation centers.
-Know the basic types of receptors and how they operate.
-Understand the role of accommodation or sensory adaptation.
- Understand the mechanism of intensity coding.
- Understand the effect of receptor location on sensory perception.
- Understand the basic auditory tests.
- Understand the basic visual tests.
- Understand the different light conditions in which rods and cones work best.
-Understand the role of rods in dim-light vision.