Mariah Hall

Bio 125

Tuesday Lab

9/26/2023

Laboratory 6/7 Sensory Physiology Report

Purpose: The purpose of this lab is to understand and learn how sensation occurs. It teaches us about the interactions of the three basic components of the nervous system. The receptors create impulses in response to specific environmental stimuli, sensory neurons relay the impulses through the afferent pathways to the CNS and then to the interpretation centers of the cerebral cortex to transform the impulses into perceived sensations. During this lab were able to test our many types of receptors and measure our capabilities.

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.

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.

1. 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 distinguish two distinct points.
2. Record this distance between pins at which your partner can discriminate two separate caliper points.
3. Compare results obtained from the following areas: a. palm of hand. Back of hands. Fingertips. Outer edge of the lips. Back of neck.
4. Have your partner repeat this experiment on your skin.

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.

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.

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

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 the most reliable results.

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 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.

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, and2000 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 biaural impairment perform the following calculation: Biaural impairment = (% impairment of good x 5) + (% impairment of bad ear)

6. Record the results of these calculations.

6/7-D: Equilibrium-Demonstration of Nystagmus. Nystagmus, the slow drift of the eyes in one direction followed by a rapid movement back to the opposite direction, is a reflex that allows moving targets to be tracked. Nystagmus is under the control of the semicircular canals. When the semicircular canals are rotated in one direction, the cupula of the crista ampullar is reflected in the opposite direction by the inertia of the endolymph and the eyes slowly drift in the direction opposite the movement, then, suddenly snap towards this direction. Nystagmus following body rotation will be demonstrated.

1.A student volunteer will be seated on a swivel stool with his/her head bent 30°forward.

2.The instructor will spin the student rapidly to the right for 10 turns.

3.The instructor will suddenly stop turning the student and have the student look straight ahead.

4.Observe and note the subsequent movement of the student's eyes

5.Explain these eye movements in terms of direction of endolymph movement.

6. These procedures will be repeated with a second student spun to the left.

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

1.Cover your left eye and focus the right eye on the center of the cross below.

2.Slowlybring 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: 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.

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

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 page46

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 with one eye.

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 to which the colors were discriminated on the perimetry scoresheet on page47.

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:

6/7-A: Test of cutaneous sensation

A-1: Two-point discrimination

a. Palm of hand- 7mm
b. Back of hand- 12mm
c. Fingertips- 5mm
d. Outer edge of lips- Skipped.
e. Back of neck 12mm

A-2: Accommodation of thermoreceptors.

After having one hand in the 15-degree Celsius my hand began to go numb after two minutes of being submerged. In the 37-degree Celsius water my hand didn't feel any different.

When I removed both hand from each temperature and placed them both into the 25-degree Celsius the one that had placed in the ice water began to feel warm and the one that was placed in the warm water felt cold.

6/7 **B: Olfactory adaptation**

Adaptation time#1- 1min 15 seconds

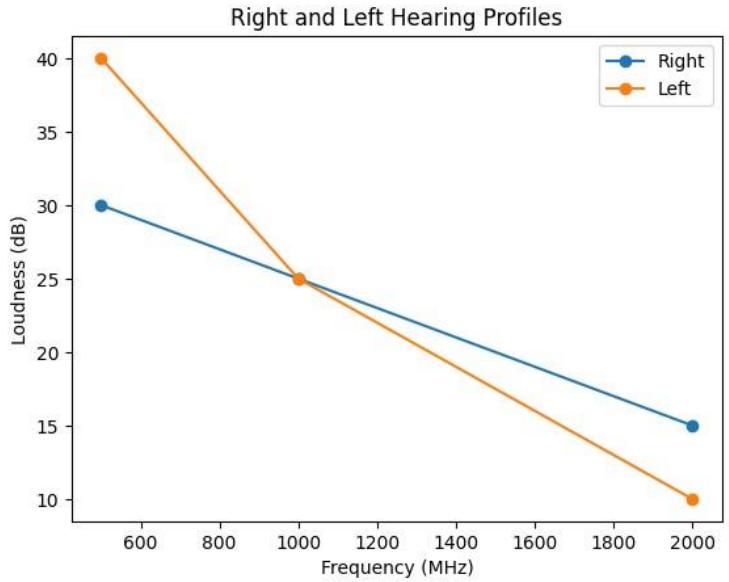
Adaptation time#2- 45 seconds

6/7 -C: Auditory measurements

C-1 Tuning for test.

After following the procedures to this portion of the lab, no middle ear damage was noted to my Right and Left ear.

C-2 Audiometry



6/7-D: Equilibrium- **Demonstration of Nystagmus**

-During this portion of the lab, the student that was spun in the chair never experienced the subsequent movement of her eye therefore not being able to experience Nystagmus.

6/7-E: Visual measurements

E-1: Demonstration of the blind spot

The blind spot was deemed at 1 ft. I was unable to visualize the cross or circle printed on the page.

E-2: The Snellen test

R eye without glasses- 20/50

L eye without glasses- 20/200

E-3: Astigmatism

I have astigmatism present in both my left and right eye. But my left eye is worse.

E-4: Color Vision

Color-Blindness Test Score Sheet

Screening Series

Plate No.	Normal	R-G Defect
5	57	35

6	5	2
7	3	5
8	15	17
9	74	21
10	2	X
11	6	X
12	97	X
13	45	X
14	5	X

Classification series

Plate No.	Normal	R-G Defect
15	57	35
16	5	2
17	3	5
18	15	17
19	74	21

I was able to identify all the numbers correctly, I am not colorblind.

E-5: Perimetry Mapping

Blue-30 degrees

Green-50 degrees

Red- 55 degrees

My lab partner and I completely misread these directions and did not perform this experiment correctly.

Discussion: This was an extremely long lab; I feel like the first day of the lab my mind wasn't completely focused on some of the experiments because that was also our test week. However, during the second day of this lab it was fun to let loose and really see how different our senses work in comparison to our lab partner. I really enjoy the olfactory adaptation portion and audiometry part. I didn't enjoy the vision parts at all because I wear glasses and my eyesight is terrible. I do wish some of these experiments had better directions because there was an experiment that my partner and I did completely wrong.

Conclusion:

-Cutaneous receptors are a type of sensory receptor found in the skin. In the two-point discrimination test we learned that each area of our body differs in receptor density, therefore it's easier to distinguish the two points on the fingertips in comparison to the back of the neck.

-Accommodation or sensory adaptation occurs when receptors generate fewer impulses during constant stimulation.

-Olfactory adaptation- the longer were exposed to a smell the more we adapt to it and eventually become “nose blind” to it.

-Environmental sounds stimulate the auditory receptors, the cochlea, via vibrations of the stapes. The vibrations produce displacement waves that travel.

- Sight is the most important of the senses.

-Colorblindness can happen when one or more of the color cone cells are absent, not working or detect a different color than normal.

-Blind spot is the spot where your optic nerve connects to your retina has no light sensitive cells.

-Snellen test determines clarity of vision.

- Any defects in the anatomy of the eye can cause vision deficits.