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Laboratory 6/7 – Sensory Physiology

19 September 2023

Purpose – Sensation, the monitoring of environmental stimuli, involves the interaction of three basic components of the nervous system. Receptors generate impulses in response to specific environmental stimuli, sensory neurons relay these impulses through afferent pathways to the central nervous system (CNS) and interpretation centers of the cerebral cortex translate these impulses into perceived sensations. Cutaneous receptors are tactile and thermal receptors of the skin, olfactory receptors are chemical receptors of the nose, gustatory receptors are chemical receptors of the tongue, photoreceptors are mechanical receptors (hair cells) of the ear, proprioceptors are mechanical receptors of the ear and body (equilibrium), and photoreceptors are light receptors (rods and cones) of the eye (sight). Stronger sensations result from higher frequencies of nerve impulse arrival. This phenomenon is known as intensity coding, and is frequency, not amplitude, dependent. The purpose of laboratory 6/7 sensory physiology was to perform a series of exercises that measure the capabilities of your sensory systems. Cutaneous, olfactory, auditory, proprioceptive, and visual systems will be examined to observe basic principles of human sensory physiology.

Procedures – There were many procedures and experiments done for laboratory 6/7 which were super easy and quick. These experiments helped us understand the 3 components of sensation, understand the ultimate role of the interpretation centers, know the basic type of receptors and how they operate, and the accommodation or sensory adaptation. For laboratory 6/7 A-1 is the two-point discrimination, we must be able to distinguish 2 distinct points on the skin surface. For experiment A-1 we started off with our partners eyes closed; we applied 2 caliper pinpoints as closely together as possible on our partners skin which was the palm of their hand. Once we apply the pins, we remove them each time and move them 1 millimeter apart. We reapplied the calipers on our partner's skin. We repeated this procedure on the back of the hand, fingertip, outer edge of the lips, and back of the neck until our partner could discriminate 2 distinct points. Once our partner discriminated the 2 points, we record the distance between the pins. For A-2: accommodation of thermoreceptors occurs when receptors generate fewer impulses during constant stimulation. For this experiment we placed our left fingers in 15 Celsius water and our right fingers in warm water (37C) for 2 minutes and recorded the sensation of each hand. After 2 minutes had passed, we described the sensation in each hand. We removed our hands and placed them both in 25 Celsius water and described the immediate sensation in each hand. In experiment 6/7- B: olfactory and adaptation, we started off by getting a bottle of camphor oil, cloves, and peppermint. We covered our left nostril and held the bottle of camphor oil under our nose until we could no longer detect the camphor. Do not consciously sniff the contents of the vial. Once you remove the camphor you, we placed the bottles of cloves then the peppermint oil under our nose. We had to distinguish the smells of cloves and peppermint oil. We held the bottle of camphor oil under our nose again until the smell was no longer recognized and recorded the adaptation time. Now unblock the left nostril and determine if the camphor is detected and record the results and times. Experiment 6/7 – C: auditory measurements. Sound is measured in

terms of amplitude (decibels – dB) and frequency (Hertz - Hz). Experiment C-1: tuning fork test utilizes the principle of bone conduction to directly vibrate the cochlear hair cells. The Rinne's test checks for middle ear damage. We first started by plugging our left ear with our hand and we tested it. You hold the handle of the vibrating tuning fork to the right mastoid process, when the sound disappears, move the fork near the external auditory canal. Reappearance of the sound indicates no middle ear damage. Repeat the test with your left ear as well and record the results for each ear. The weber's test is to check for nerve or conduction deafness and is only performed if there is middle ear damage that was detected by Rinne's test. You hold the handle of the vibrating tuning fork to the bridge of your nose and lateralize of sound to one ear indicated deafness. Lateralize to poor ear indicates conduction deafness and lateralize to better ear indicates nerve deafness. C-2: Audiometry is an audiometer measuring 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 several frequencies. In this experiment you go into a quiet room and the audiometer tests will be conducted in pairs. The average values are obtained for each ear for the frequencies of 500 Hz, 1000 Hz, and 2000 Hz, you then subtract 26 dB from each average. If the difference is greater than 26, multiply this number by 1.5% which equals the percent impairment of each ear. To determine the percent if biaural impairment perform the following calculations which is (% impairment of good x 5) + (%impairment of bar ear) / 6 and record the results of the calculations. 6/7-D: Equilibrium – Demonstration of Nystagmus which is under the control of the semicircular canals. When the semicircular canals are rotated in one direction, the cupula of the crista ampullaris is deflected in the opposite direction by the inertia of the endolymph and the eyes slowly drift in the opposite directions. In this experiment we started off by having a student sit on a swivel stool with her head bent 30 degrees forward. She will be spun 10 times rapidly. Once we stop spinning her, she will look straight ahead and observe and note the subsequent movement of her eyes. Explain these eye movements in terms of the direction of endolymph movement. 6/7-D: Visual measurement, in this experiment you cover your left eye and focus the right eye on the center of the cross on your paper, slowly bring the page closer to your eye until the spot disappears. Have your partner measure the distance from the eye to the page. The image of the spot is now superimposed of the optic nerve and explains the lack of vision at this point. E-2: The Snellen test is the ability to discriminate fine detail is known as visual activity. The Snellen test uses a standardized eye chart to evaluate visual acuity. In this experiment you stand 20 feet away from the Snellen chart and cover your left eye. Attempt to read the line designated "20", if you cannot read line 20 attempt line 30, 40, 50, 70, 100 or 200 until the line is legible. Keep performing these attempts with your left eye. The Snellen chart is analyzed by (distance you read the letters/ lowest line read clearly at 20 feet). E-3: Astigmatism is an abnormal curvature of the cornea that may produce a blurred image of the retina known as astigmatism. In this experiment you stand 8-10 inches away from the radial astigmatism eye chart so that it fills your field of vision and cover your left eye. Focus on the lines in the vertical plane with your right eye. If a blur appears in the lateral lines or the lines cover into one, you have an astigmatism in the plane of your eye. Record the result of this test and repeat with your left eye. E-4: Color vision, 1. Negative after-images, you 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, strips of various colors against white paper, colored flags, or scenic view. Record the negative after image seen for each color. 2. Color blindness test you obtain the Ichikawa color blindness charts and attempt to read the numbers of each pattern on the test panels. 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. E-5: perimetry, in this experiment seat yourself before the perimeter board with your right eye at the edge of the semicircle. Cover your left eye and stare at the center line. Your partner will introduce several different colored blocks into your field of vision. Identify these blocks by the color. Do not take your eye from the center of the chart or uncover the left eye. Your partner will record the degree at which the colors were discriminated on the perimetry score sheet. Repeat these procedures for each block or both the horizonal and vertical perimetry charts. Record the data.

Results –

A-1: Two-point discrimination

Palm of hand	9 millimeters
Back of hand	12 millimeters
Finger tip	3 millimeters
Outer edge of lip	29 millimeters
Back of neck	22 millimeters

A-2: Accommodation of thermoreceptors

After 2 minutes of placing my hand in cold water, my hand started to go numb and in water my hand felt like a warm temperature. After removing my hands and promptly placing them both in 25 Celsius water I felt the hand that was in 15 Celsius water fell warmer in the 25 Celsius water and the hand that was in the warmer water (37 Celsius) felt cold after placing it in the 25 Celsius water since the water was colder.

6/7-B: Olfactory adaptation

Camphor	26 seconds
Cloves	21 seconds
Mint	29 seconds

C-1: Tuning fork tests

Right ear	No damage detected
Left ear	No damage detected

6/7-D: Equilibrium- Demonstration of Nystagmus

The student got spun by Mr. Oak 10 times and when she stopped and stared straight ahead her eyes didn't move form side to side.

E-1: demonstration of the blind spot

- After covering my left eye and focusing the right eye on the center of the cross below and slowly brining the page closer to my right eye until the dot disappeared, the measurement between the page and my face was 12 centimeters and this happened because my brain was filling the circle spot with a blank.

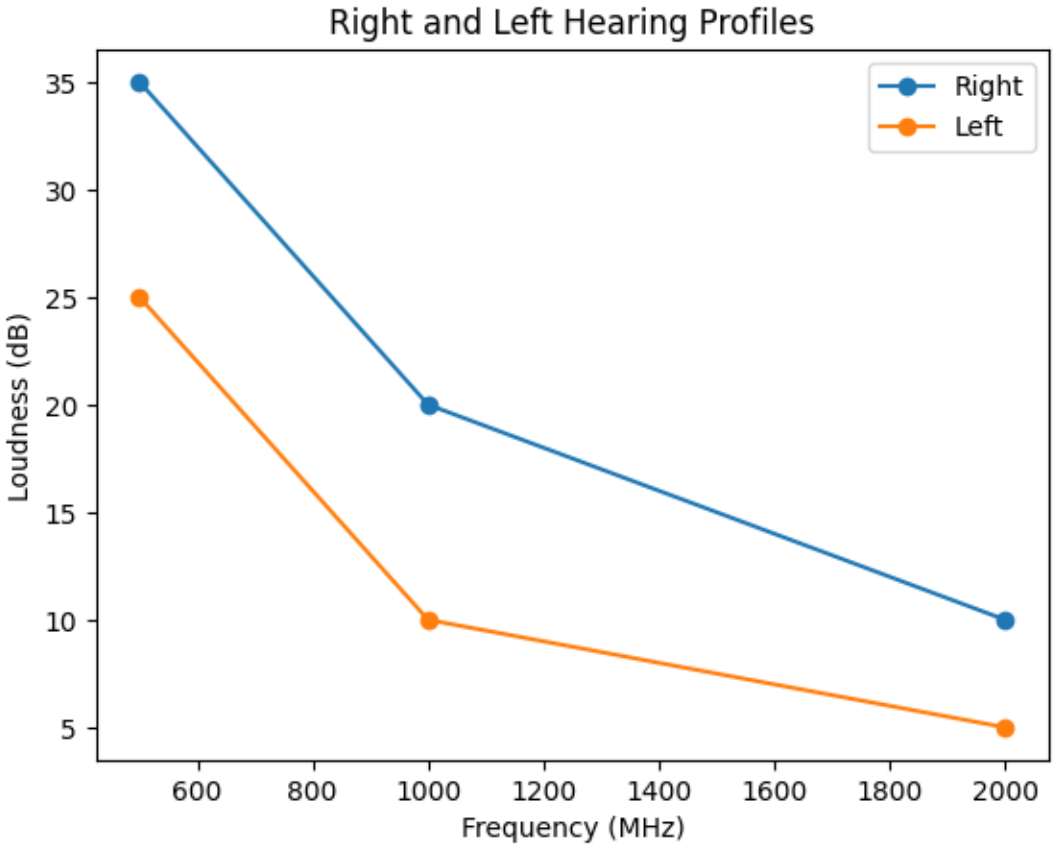
E-2: The Snellen test

Nearsighted vision	20/30
Normla vision	20/20
Farsightedness vision	20/15

E-3: Astigmatism

Right eye	No astigmatism
Left eye	No astigmatism

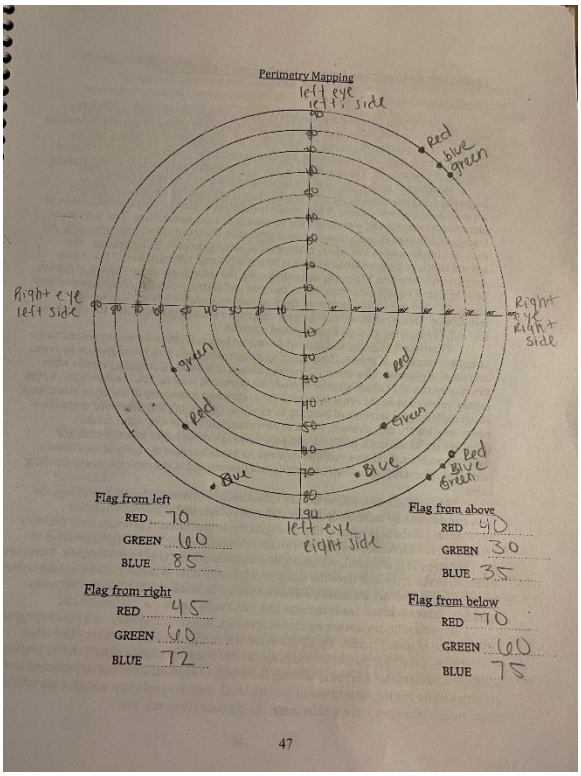
C-2: Audiometry



Average Right after subtraction: -4.333333333333332
Percent Impairment Right: Not impaired %
Average Left after subtraction: -12.666666666666666
Percent Impairment Left: Not impaired %
CodeText

E-4: Color vision
For the color vision test the one with the pink dots worked for me and the building one didn't work.

E-5: Perimetry



Discussion – Laboratory 6/7 was filled with very interesting and fun experiments. It had many experiments to try out which took quite a while to finish but my favorite ones were the auditory one and all the vision ones. I like to always test my vision and sound even if it's for fun. All the laboratory results were very different to each other. The Answers for all experiments made a lot of sense but the one that confused me a little was the end of the audiometry one was we had to calculate our hearing and if we had any ear damage. The one was we had to put our hands in water was a fun feeling because putting your hand in extremely cold water and then putting them in cold water but feeling it warmer is a weird sensation. I had tried these experiments in my previous physiology class, which was a little easier for me this time because they were explained better and had a lot of help from Mr. Oak. I think these experiments are helping a lot to understand the lecture. I think the lab reports an extra help to my grade and learning. I feel like

these experiments could have gone wrong at some point if you didn't measure some of the experiments correctly or didn't follow the steps. It is very important for you to follow each step of the experiment if you want to get an accurate answer. I really enjoy doing these lab reports because we get hands-on learning.

Conclusion – All in all, laboratory 6/7 Sensory physiology was full of very fun experiments. We performed a series of exercises that measure the capabilities of your sensory systems. Cutaneous, olfactory, auditory, proprioceptive, and visual systems will be examined to observe basic principles of human sensory physiology. Cutaneous receptors are tactile and thermal receptors of the skin, olfactory receptors are chemical receptors of the nose, gustatory receptors are chemical receptors of the tongue, photoreceptors are mechanical receptors (hair cells) of the ear, proprioceptors are mechanical receptors of the ear and body (equilibrium), and photoreceptors are light receptors (rods and cones) of the eye (sight). Stronger sensations result from higher frequencies of nerve impulse arrival. This phenomenon is known as intensity coding, and is frequency, not amplitude, dependent. I really enjoyed conducting this experiment with my two partners and would do these experiments again if I ever come across them.