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Human Physiology
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Lab Report #6/7- Sensory Physiology

Purpose

The purpose of these labs is to be able to understand how environmental stimuli lead to sensations in the body. Also to understand how receptors generate impulses and how those impulses are then taken by sensory neurons to the central nervous system, where finally they are interpreted and translated into sensations that we can perceive. Another purpose is to understand the limitations that certain aspects of sensations have, such as blind spots or ear damage.

Procedure

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 between 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.Finger tip
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 thermoreceptors.

1.Place your left fingers in 15C water and your right fingers in warm water (37C) and record 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.

B-1: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

1.Rinne's test(checks for middle ear damage)Procedure
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

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 page44.
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 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:
Binaural impairment =(% impairment of good x 5) + (% 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 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

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 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, continuewith 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. Don't 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 against on the perimeter scoresheet on page 47.
4.Repeat these procedures for each block for both the horizontal and vertical perimeter 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

Length(in mm) needed in order to feel two points

	A. palm of hand	**B.back of hand**	**C.Finger tips**	**D.back of neck**
Juan				
Diana				

A. 10mm B. 12mm C. 3mm D. 11mm	A. 10mm B. 16mm C. 5mm D. 12mm

A-2: Accommodation of thermoreceptors.

1.Initial dip in the water- (15℃)-Cold Burn (37℃)-Warm

2.After two minutes- -Cold/numbness -Warm

3. After removing hands and placing in 25℃ water

(15℃)- Feels warm after placing in water

(37℃)- Feels cooler after placing in water

B-1:Olfactory adaptation

Adaptation time-Initial= 22.68 seconds

After smelling cloves and peppermint oil=9.35 seconds

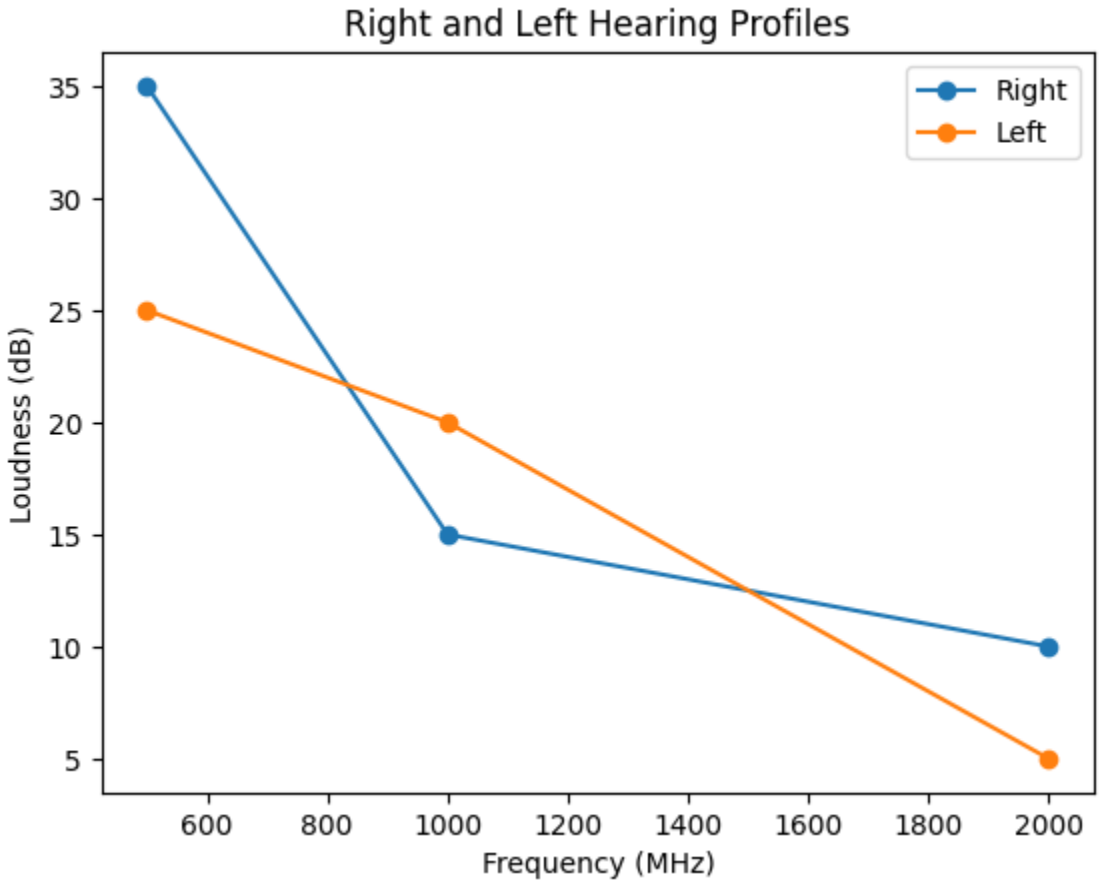
C-1: Tuning fork tests

No middle ear damage is present.

C-2: Audiometry

Right Ear	35 dB	15 dB	10dB	Avrg: 20
Left Ear	25 db	20 dB	5 dB	Avrg: 17

Left Ear: $20 - 26 = -6$ **Right Ear:** $17 - 26 = -9$ → **no percent impairment because negative**



Average Right after subtraction: -6.0
Percent Impairment Right: Not impaired %
Average Left after subtraction: -9.333333333333332
Percent Impairment Left: Not impaired %

E-1: Demonstration of the blind spot

Distance from eye to page until blind spot is hit = 9 inches

E-2: The Snellen test

Normal eye sight→ $\frac{20}{20}$

E-3: Astigmatism

Normal, nothing to record.

E-4: Color vision

1.Negative After-images

The image that appeared as a cyan color with pink in between when it originally was pink under normal light conditions.

2.Color-blindness test

Normal, nothing to record, no color blindness detected according to test

E-5: Perimetry

Flag from Left ● Red 90° ● Green 90° ● Blue 90°	Flag from Above ● Red 65° ● Green 70° ● Blue 60°
Flag from Right ● Red 90° ● Green 90° ● Blue 85°	Flag from below ● Red 80° ● Green 80° ● Blue 80°

Discussion

A-1: Two-point discrimination

I believe the results show that sensation can be felt more accurately on the palms and fingertips of one's hands. I believe sensation can be felt the most on the fingertips and palms because it is what is used to interact with the world on a daily basis, there is most likely more sensory neurons because those two parts are constantly touching whatever it is we interact with. The ones with the larger measurements when it comes to two point discrimination is the back of the hand and neck, this is because these are rarely used to interpret sensation since they are on the backs of the hands and neck, and therefore do not need as many sensory neurons.

A-2: Accommodation of thermoreceptors.

The results for this experiment were interesting. After placing both hands from the cold and hot water into the normal 25℃ water, I felt my cold hands feel warmer and my warm hands felt cooler despite them being in the same temperature. I believe this is because of sensory adaptations. After being exposed to cold/warm water for 2 minutes, your thermoreceptors get used the temperature but when you quickly change them both to room-temperature water they quickly try to adapt, but since they are used to the water they were in the sort of "get confused" per se and that is what you experience when you feel the cold hand suddenly feel really warm and the warm hand feel cold.

B-1:Olfactory adaptation

At the beginning of the test it took 22.68 seconds until my nose adapted to the smell and it dissipated, after smelling the peppermint and cloves the camphor took only 9.35 seconds to dissipate. Ibel ive this sh0ws that my nose had adapted to the strong smell, since in the beginning it had not yet been exposed to the smell it took longer for it to adapt, but after smelling two other strong scents and smelling the camphor once more, it still knew how to adapt hence the lower adaptation time of 9.35 seconds.

C-1: Tuning fork tests

Nothing to discuss, the test came out normal and no middle ear damage was detected while performing the test. I can say it was surprising to find out that I haven't damaged my ears after years of blasting music in my ears.

C-2: Audiometry

The difference was not greater than 26 dB, therefore we can conclude that there is no percent impairment in any of my ears.

E-1: Demonstration of the blind spot

The results for this experiment were unexpected, after getting close enough to the page (9 inches away) I was no longer able to see the dot on the side . I believe there is a lack of vision at this

point because the optic nerve fibers are passing through the back of your retina inside your eye and therefore and not receiving light, leading to a blind spot

E-2: The Snellen test

Nothing to discuss, the test came out to 20/20 vision, meaning normal. I mean it was nice to get it confirmed that my eyesight still has yet to deteriorate after having to stare at a laptop all day so that's cool.

E-3: Astigmatism

Nothing to discuss, the test came out normal and no astigmatism was detected while performing the test. This feels like cheating but I legit have nothing to discuss, it all came out handy dandy :).

E-4: Color vision

1.Negative After-images

When staring at the images given under intense light I would see a negative after image. When looking at an image of pink dots with blank space in between I saw a negative after image where the pink had turned into a cyan type of color and the inbetween had turned pink.

2.Color-blindness test

No color blindness detected. Again I swear I'm not being lazy there's just simply nothing to discuss because it all came out normal :(

E-5: Perimetry

Looks like everything is normal, all within 90-85° except for when i was flagged from above, in these i got a range of 60-70° which is considered somewhat inferior, i believe this just displays that i don't have as good of field of vision when approaching from above.

<u>Conclusion (not all were included because some had normal results)</u>

A-1: Two-point discrimination

Two points can be better discriminated against in areas that are used in day-to-day interactions, so the palms and fingertips are where you feel the sensation the most accurately as opposed to the back of the neck/hand.

A-2: Accommodation of thermoreceptors.

Sensory adaptations are the reason for the change in temperature sensation. The hand that was in the cold entered with desensitized cold thermoreceptors and active warm thermoreceptors because it got used to the cold water so therefore the heat transferred into the cold hand activating the t warm thermoreceptors and giving us the sensation of a different temperature.

B-1:Olfactory adaptation

Just like how thermoreceptors have adaptability, so does the olfactory system. Since in the initial test of smelling the camphor we had a greater time(23 Seconds) and after smelling other strong scents we had a shorter time(9 seconds) until adaptation, we can conclude that the olfactory system can adapt to strong scents and almost make you blind to them, possibly even remembering the smell and making you blind to it even faster.

C-2: Audiometry

Since the numbers for the average decibels was less than 26 we can conclude that there are no impairments present.

E-1: Demonstration of the blind spot

Optic nerve fibers are passing through the back of your retina inside your eye and since the nerve passes through the back of the eye there are no cells receiving light and therefore causes the blindspot we experience at a close distance.

E-4: Color vision

1.Negative After-images

Since we are shining a really bright light onto the page I believe that the rods and cones in our retinas get overwhelmed and sort of become desensitized to the colors of the image, it's this desensitization that leads to the appearance of a negative after image.