

## **Sensory Physiology**

### **Purpose**

The purpose of this is to understand the components of sensation. It is also to understand the basic auditory and visual tests and to know the different light conditions in which rods and cones work the best.

### **Procedures**

In every experiment, there are procedures that need to be followed carefully.

#### *A-1: Two-point discrimination*

In this part of the experiment, the two caliper pinpoints were applied closely together on the palm of the hand while the eyes were closed. Next, the pins were moved 1 mm apart then reapplied on the skin. The procedure was repeated until two discriminate points were discriminated. This procedure was repeated to different areas as well such as palm of the hand, back of the hand, fingertip, outer edge of the lips, and the back of the neck.

#### *A-2: Accommodation of thermoreceptors*

In this experiment, the left fingers were placed in 15°C water while the right fingers were placed in warm water which is about 37°C. Both hands were immersed for about 2 minutes. After 2 minutes, the hands were removed and were both placed in 25°C water.

### *6/7-B: Olfactory adaptation*

In this experiment, the left nostrils were blocked. After that, the bottle of camphor oil was uncorked and held and was placed under the nose until the scent of the camphor could no longer be detected. Then the camphor was removed and replaced with bottle of cloves for a little bit and then the peppermint oil was placed under the nose. The smell of cloves and peppermint oil were distinguished. After that, the bottle of camphor was held under the nose once again until the smell was no longer detected. After recording the adaptation time, the left nostrils were unblocked to see if the camphor is detected.

### *C-1: Tuning fork tests*

In this part of the experiment, Rinne's test was performed to check if there is damage to the middle ear. First, the left ear was covered by the hand, in order to test the right ear. The vibrating tuning fork was held to the right mastoid process. After the sound disappeared, the fork was moved near to the external auditory canal. The reappearance of the sound indicates that there was no middle ear damage. The procedure was repeated to test the left ear.

### *C-2: Audiometry*

In this experiment, an audiometer was used in order for this experiment to be done. The experiment was conducted in pairs. The person who underwent the test put on the earphones. The red earphone was on the right ear and the blue earphone was on the left ear. The person administered the test selected random frequencies and the ear to which the frequencies were applied. At the start of the test, the decibel level was set to zero and the tone will be applied. The decibel level was increased one notch at a time until the subject raises their hand indicating the

ear in which the sound was heard. The audiogram was marked with a red pen for right ear and a blue pen for left ear. The test was conducted at the frequencies of 50, 1000, and 2000 Hz.

#### *E-1: Demonstration of the blind spot*

The left eye was covered while the right eye was focused on the center of the cross on the paper. The page was brought closer to the eye until the spot disappeared. The distance was measured from the eyes to the page.

#### *E-2: The Snellen Test*

The person doing the test stood 20 feet away from the Snellen test chart and attempted to read the line designated “20”. If the person cannot read the line, attempt line 30,40,50,70,100, or 200 until a line is legible. The experiment was attempted with the left eye with the right eye covered.

#### *E-3: Astigmatism*

The person taking the test stood about 8 to 10 inches away from the radial astigmatism eye chart to fill the field of vision of the subject. The right eye was told to focus on the lines in the vertical plane. If a blur appeared in the lateral lines that means that the subject has astigmatism in that plane of their eye. The results were recorded, and the procedures were repeated with the left eye.

#### *E-5: Perimetry*

The subject was seated, and the perimeter board was placed in front of the subject with the right eye at the edge of the semicircle. The left eye was covered, while the right eye was staring at the center line. Next, the partner introduced several different colored blocks into the

subject's field of vision. The subject had to identify the blocks by color and make sure that the eye did not take away from the center of the chart or even uncover the left eye. The partner recorded the degree to which the colors were discriminated on the perimetry score sheet. The procedures for each block were repeated for vertical perimetry charts.

## Results

### *A-1: Two point discrimination*

<b>Location</b>	<b>1<sup>st</sup> attempt</b>	<b>2<sup>nd</sup> attempt</b>	<b>3<sup>rd</sup> attempt</b>	<b>4<sup>th</sup> attempt</b>	<b>5<sup>th</sup> attempt</b>	<b>6<sup>th</sup> attempt</b>
<b>A. Palm of the hand (2 mm)</b>	Yes	Yes	Yes	Yes	No	No
<b>B. Back of the hand (3mm)</b>	Yes	Yes	No	Yes	No	Yes
<b>C. Fingertip (2mm)</b>	Yes	Yes	Yes	Yes	No	Yes
<b>D. Outer edge of the lips (2mm)</b>	Yes	Yes	Yes	Yes	Yes	No
<b>E. Back of the neck (3mm)</b>	Yes	Yes	No	Yes	No	No

### *A-2: Accommodation of thermoreceptors*

<b>Temperature</b>	<b>Sensation</b>
<b>Left Fingers in 15°C water</b>	A little cold but tolerable
<b>Right Fingers in 37°C water</b>	Warm
<b>Both fingers after 2 mins in 25°C water</b>	Left finger: The water from before was colder. Right finger: The water from before was warmer.

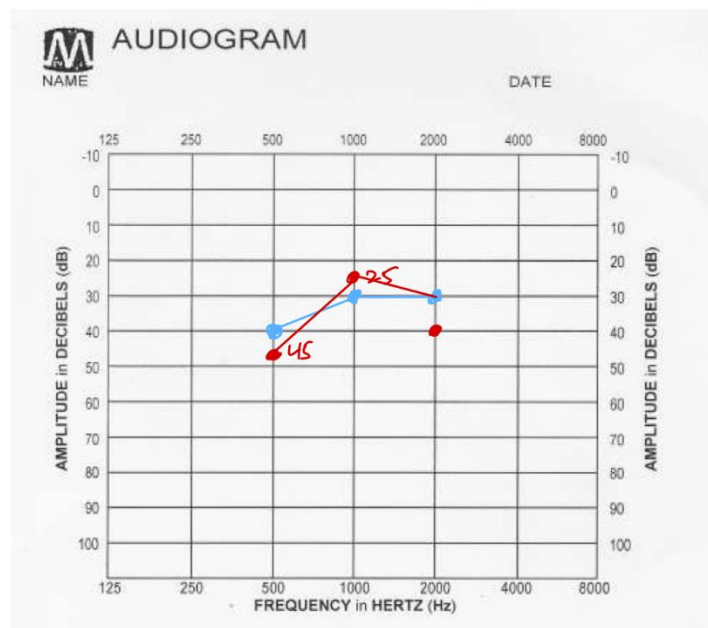
6/7-B: Olfactory adaptation

Substance	Adaptation time
Camphor oil	3 mins and 25 secs
Camphor oil (2 <sup>nd</sup> time)	3 mins and 05 secs
Observations	
Camphor oil	Very strong smell
Peppermint and cloves	Strong but not as strong as the camphor

6/7-C: Auditory measurements

Right ear	No middle ear damage
Left ear	No middle ear damage

C-2: Audiometry



	<b>Right</b>	<b>Left</b>
<b>Hertz</b>	500 Hz – 45	500 Hz – 40
<b>Hertz</b>	1000 Hz - 25	1000 Hz – 30
<b>Hertz</b>	2000 Hz - 40	2000 Hz - 30
<b>Total</b>	110	100
<b>Average</b>	37	33
<b>-26</b>	11	7
<b>Percent Impairment</b>	11x1.5% = 16.5%	7x1.5% = 10.5%
<b>Biaural Impairment</b>	11.42%	

*E-1: Demonstration of the blind spot*

	<b>Distance (in)</b>
<b>Spot disappearance</b>	3 in

*E-2: The Snellen test*

$$\text{Visual acuity} = \frac{\text{Distance you read the letters}}{\text{Lowest line read clearly at 20 feet}} = \frac{20}{40}$$

*E-3: Astigmatism*

<b>Eye</b>	<b>Have/No Astigmatism</b>
<b>Right eye</b>	No astigmatism
<b>Left eye</b>	No astigmatism

### *E-5: Perimetry*

<b>Horizontal</b>	
<b>Red</b>	55
<b>Green</b>	45
<b>Blue</b>	41
<b>Vertical</b>	
<b>Red</b>	43
<b>Green</b>	42
<b>Blue</b>	44

### **Discussion**

For the first experiment which is the two-point discrimination, we got some interesting results. If we are going to look at the table, we can see that most of the 1<sup>st</sup> to 3<sup>rd</sup> attempt the subject can guess the caliper correctly but for the 4<sup>th</sup> to 6<sup>th</sup> attempt the subject either fails or guesses with doubts. It might be because our receptors trick us, especially when we are used to the sensation it is hard to feel what is on our skin. In the second experiment which is the accommodation of thermoreceptors, it was very interesting experience because after putting both of your hands from the cold and slightly warmer water to the 25°C water it felt like the hand from the warm water felt warmer and the hand from the cold water felt like it was colder. It is because the thermoreceptors are signaling the brain that makes it confused. The third experiment was olfactory adaptation. This is about how our chemoreceptors can adapt to certain smells after we get used to the smell. In the table, it took about 3 minutes to get used to the smell of camphor

but until place the peppermint and cloves. After removing the finger covering the left nostril, the smell of the camphor was still there but only a little bit. The fourth experiment is to check if you have ear damage. In this experiment, the subject had no middle ear damage in both ears. In the fifth experiment, it is to measure the hearing acuity. The percent impairment gathered in the experiment for the right ear is 16.5% while for the left ear it is 10.5%. This means that the left ear is better than the right ear. The binaural impairment gathered in the experiment was 11.42%. The sixth experiment is the determination of the eye's blind spot. The result gathered in the experiment is interesting. After slowly bringing the page closer to the subject's eye the spot disappeared from her point of view at 3 inches. This happens when there are no light receptors in the eye. The next is the Snellen test, which uses a standardized eye chart to evaluate visual acuity. The result gathered was 20/40m which is not bad but also has some problems that comes with it. The eighth experiment is to determine if the subject has astigmatism. Based on the results gathered the subject has no astigmatism for both right and left eye. The last experiment was perimetry. It is to prove that the arrangement of the rods and cones in the retina is not random. The results gathered from the subject are red: 55, green: 45, and blue: 41 for horizontal while for vertical the results are red: 43, green: 42, and blue: 44.

## **Conclusion**

In conclusion, we can see that most of the 1<sup>st</sup> to 3<sup>rd</sup> attempt the subject can guess the caliper correctly but for the 4<sup>th</sup> to 6<sup>th</sup> attempt the subject either uncertain or fails. In the 2<sup>nd</sup> experiment we can conclude that the thermoreceptors can feel both cold and hot so when we touch room temperature water from the hot and cold water it will signal both feeling causing our brain to be confused. Also, in this experiment we can conclude that our chemoreceptors can adapt to certain smells after we get used to the smell just like what we did in the olfactory



adaptation using the camphor oil, cloves, and peppermint. Also, the experiment helped us to see that the subject has no astigmatism and has an eyesight of 20/40. We also saw how to measure the blind test in our eyes and why we can see the image when it is near. We also got the percent impairment gathered in the experiment for the right ear and that is 16.5% while for the left ear it is at 10.5%. Lastly, we proved that the arrangement of the rods and cones in the retina is not random. The results gathered were red: 55, green: 45, and blue: 41 for horizontal while for vertical the results are red: 43, green: 42, and blue: 44.