

Sensory Physiology
Biol 2402 Lab
General Sensations & Special Senses: Vision
Hearing, Equilibrium, Olfaction and Taste
Marieb Ex 23, 24, 25, 26

Ziser, Marieb 2004

Modifications to instructions in lab manual:

General Sensation; Ex 23

Activity: Plotting the Relative Density and Location of Touch and Temperature Receptors:

Touch at least 20 different, random spots within the marked area and record the presence of the specific sensation in the table on your data sheet
Von Frey's hairs are broom straws

Activity: Determining 2-point Threshold

the esthesiometer is the 2-pointed ecg calipers in blue case

Activity: Testing Tactile Localization:

Record your results on the table on your data sheet

Activity: Demonstrating the Phenomenon of Referred Pain:

Record your results in the table on your data sheet

Special Senses: Vision; Ex 24

Activity: Demonstrating the Blind Spot:

The "dot" needs to be on the lateral side of the eye being tested. Report results in centimeters

Activity: Testing Visual Acuity:

You should be 20 feet from the Snellen chart
If you wear contact lenses, you do not need to record "uncorrected" values

Activity: Testing for Astigmatism:

You should be 10 feet from the astigmatism chart

Activity: Testing For Color Blindness:

[DO NOT LOOK AT BOOKLET UNTIL AFTER TEST]

the booklets are on the side counter

Record the numbers you actually see *immediately* when looking at each of the Ishihara plates in the table below. If you cannot read a number place an "x" in the box. After both you and your partner have taken the test then look in the pamphlet and record the number that "normal" subjects should see. Then use the booklet or sheet to interpret your results

Activity: Mapping Rods and Cones:

Use the colored discs as described in text to determine the roughly circular field of view for each of the different colors on the board. Do at least 8 tests for each color and each eye. Then use the appropriate colored markers or pencils to make a rough copy, below, of each of the diagrams you made on the board:

do both the left and the right eyes

Activity: Depth Perception Testing

This exercise is not in the lab manual, follow the procedure below:

- 1. Have the subject sit comfortably in a chair facing the instrument about 8 feet away from the opening;**
adjust the chair to a height at which the subject can only see the two vertical rods, but not the top or bottom inside of the box.
- 2. Initially adjust the vertical rods so that they are furthest apart**
- 3. Give the adjustment strings to the subject and, with both eyes open, ask them to try to align the two**
rods so that they are directly across from each other. Repeat the process two more times and average the results on your data sheet. When you average, ignore any negative signs.
- 4. Repeat the process with the right eye closed, then with the left eye closed and record the results on the**
data sheet
- 5. Have the subject put on a pair of sunglasses and with both eyes open, repeat the test again and record**
the results on the data sheet

Activity: Demonstrating Reflex Activity of Intrinsic and Extrinsic Eye Muscles:

You already did some of these tests in the “Reflex Lab” You can just re-record the results here or perform each test as described.

Activity: Conducting an Ophthalmoscopic Examination:

Ophthalmoscopes are on the side counter

Special Senses: Hearing and Equilibrium; Ex 25

Activity: Conducting Laboratory Tests of Hearing:

use a rubber mallet or the heel of your hand to vibrate the tuning forks; DO NOT HIT THEM ON THE COUNTERS

c. Frequency Range

Substitute the following tuning forks:

| | | |
|---------------------|---------------|------------------|
| <i>low freq.</i> | <i>75-100</i> | <i>use: 128</i> |
| <i>medium freq.</i> | <i>1000</i> | <i>use: 1024</i> |
| <i>high freq.</i> | <i>4-5000</i> | <i>use: 4096</i> |

e. Rinne Test for Comparing Bone and Air Conduction Hearing

Record the results of your tests (+/-) as described in manual

f. Audiometer Test

[skip]

Activity: Conducting Laboratory Tests on Equilibrium:

For these equilibrium tests you can work in groups of 3 or 4.

Special Senses: Olfaction and Taste; Ex 26

Activity: Plotting Taste Bud Distribution:

Changes:

Substitute epsom salt solution for quinine

*Use a swab for each solution and touch the tip, center, side and back of tongue quickly then indicate the **ONE** Location where each of the four solutions can be tasted **most** readily or **most** strongly on the tongue by placing an "x" in the table on your data sheet*

Activity: Examining the Combined Effects of Smell, Texture, and Temperature on Taste:

a. Effects of smell and texture

Each food will be tested first by texture only, then by taste and texture, then using texture, taste and smell.

A positive result occurs when the subject can correctly identify the food.

Record positive results from these tests by placing a "+" in the appropriate boxes in the table on your data sheet. When you can correctly identify the food, stop and move on to the next food to be tested

Activity: Assessing the Importance of Taste and Olfaction in Odor Identification:

Attempt to identify the common substances available with and without your sense of smell. Record your results in the table on your data sheet

Activity: Assessing the Importance of Taste and Olfaction in Odor Identification:

Testing area is on the side counter

Attempt to identify the common substances available with and without your sense of smell. Record your results in the table below:

Name: _____

Lab Partner: _____

Group: _____

Due Date: _____

Sensory Physiology Data Sheet

General Sensations

Biol 2402: Ex 23

Ziser, 2004

General Sensation

Activity: Plotting the Relative Density and Location of Touch and Temperature Receptors:

| Receptor Type | # Spots Tested | # Spots testing positive | % Positive |
|---------------|----------------|--------------------------|------------|
| Touch | | | |
| Heat | | | |
| Cold | | | |

How would you *expect* the percent positive of each receptor relate to the actual number of receptors of each present in this experiment?

Which of the three types of receptors appear to be most abundant? _____

On the basis of your observations and class results, what conclusions can you draw about the distribution and numbers of receptors on the skin for touch, heat and cold? How does the density of touch receptors compare with that of heat and cold receptors?

Activity: Determining Two Point Threshold:

Record your results on the table below:

| Body Area Tested | Two Point Threshold (mm) |
|------------------------|--------------------------|
| Face | |
| Back of Hand | |
| Palm of Hand | |
| Fingertips | |
| Lips | |
| Back of Neck | |
| Ventral Forearm | |

Which area was *most sensitive* to the test? _____

Which area was *least sensitive* to the test? _____

Are these the results you expected? Explain:

Activity: Testing Tactile Localization:

| Body Area Tested | Error (mm) Test One | Error (mm) Test Two | Error (mm) Test Three | Average Error (mm) |
|-------------------------|--------------------------------|--------------------------------|----------------------------------|---------------------------|
| palm of hand | | | | |
| fingertip | | | | |
| ventral forearm | | | | |
| back of hand | | | | |
| back of neck | | | | |

Which area had the smallest error: _____ Which area had the largest error: _____

Explain your results:

Activity: Demonstrating Adaptation of Touch Receptors:

Describe what happened:

- a. duration for 1 coin:

- b. duration for coin after moving it:

- c. duration after adding 3 more coins:

Are the same receptors being stimulated with the 4 coins as for 1 coin?, Explain

Explain your results of the 'hair bending' test:

Activity: Demonstrating Adaptation of Temperature Receptors:

Describe what happened:

- a. sensation when first immersed:

- b. sensation after 1 minute:

- c. sensation after right immersed:

- d. sensation when L in ice, R in warm water after 2 minutes:

- e. sensation when both hands immediately immersed in room temperature water:

Activity: Demonstrating the Phenomenon of Referred Pain:

| Time of observation | Quality of Sensation | Location of Sensation |
|----------------------------|-----------------------------|------------------------------|
| on immersion | | |
| after 1 minute | | |
| after 2 minutes | | |

What exactly is **referred pain**?

How does the localization of this referred pain correspond to the areas served by the ulnar nerve?

Special Senses: Vision

The normal range of results for many vision tests are age related. For that reason please record the age of the person being tested with the results of each test

Activity: Demonstrating the Blind Spot:

Distance (cm) at which dot disappears: Age: _____ Left Eye: _____ Right Eye: _____

What is occurring when the 'dot' disappears?

Is the distance the same or different for each eye? Explain:

Activity: Demonstrating Afterimages:

Describe what you "saw" after you closed your eyes, Explain?

Activity: Determining Near Point Accomodation:

Near point (cm): Age: _____ Left Eye: _____ Right Eye: _____

What specifically is occurring at closer distances?

Activity: Testing Visual Acuity:

Visual Acuity:

Uncorrected: Age: _____ Left Eye: _____ Right Eye: _____ Both Eyes: _____

Corrected: Left Eye: _____ Right Eye: _____ Both Eyes: _____

What exactly do the two numbers in an acuity test mean; i.e., **interpret** the values for your uncorrected vision:

Is your corrected or uncorrected vision for both eyes any better or worse than for individual eyes? Explain.

Activity: Testing for Astigmatism:

Is astigmatism present (Yes/No): Age: _____ Right Eye: _____ Left Eye: _____

Activity: Testing For Color Blindness:

| Ishihara plate number | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | | 12 | 13 | 14 |
|-----------------------|---|---|---|---|---|---|---|---|---|----|----|--|----|----|----|
| number seen | | | | | | | | | | | | | | | |
| “normal” number seen | | | | | | | | | | | | | | | |

Use the booklet or information sheet to **interpret** your results:

Activity: Mapping Rods and Cones:

Use the appropriate colored markers or pencils to make a rough copy, below, of each of the diagrams you made on the board:

Left Eye Maps

Right Eye Maps

Were there differences in size or shape of the fields produced for rods versus those produced for cones?

Did the fields produced by the three different kinds of cones differ significantly from each other?

Did the maps produced from your right eye differ significantly from those from your left eye?

What do these results indicate about the various color fields :

Activity: Tests for Binocular Vision:

Was it as easy to dunk the pencil with one eye closed as with both eyes open? Explain.

What is the advantage of binocular vision?

Activity: Depth Perception Testing

| Experimental Treatment | + or - Difference in millimeters | | | |
|------------------------|----------------------------------|---------|---------|---------|
| | Test #1 | Test #2 | Test #3 | Average |
| both eyes | | | | |
| right eye | | | | |
| left eye | | | | |
| with sunglasses | | | | |

Explain any differences between your average results:

Activity: Demonstrating Reflex Activity of Intrinsic and Extrinsic Eye Muscles:

Explain your results of the Photopupillary Reflex test:

Explain your results of the Accommodation Pupillary Reflex test:

Explain your results of the Convergence Reflex test:

Activity: Conducting an Ophthalmoscopic Examination:

Briefly describe what you see (*Be careful not to illuminate the eye too long*). Were you able to see the optic disc? Retinal blood vessels? Macula?

What exactly are the following phenomena and what causes them:

Blind Spot

Afterimages

Color Blindness

Special Senses: Hearing and Equilibrium; Ex 25

Activity: Conducting Laboratory Tests of Hearing:

a. Hearing Acuity –distance(cm) at which sound becomes inaudible Left Ear: _____ Right Ear: _____

b. Sound Localization

At which location was the sound **most easily** located: _____

At which location was the sound **least easily** located: _____

Explain:

c. Frequency Range

Which of the three frequencies (L,M,H) was heard most clearly: _____

least clearly: _____

Explain why:

d. Weber Test

How does the loudness of the tone compare in the two ears?

Interpret your results:

e. Rinne Test for Comparing Bone and Air Conduction Hearing

air conduction(bone 1st then air): Left Ear: _____ Right Ear: _____

bone conduction (air 1st then bone): Left Ear: _____ Right Ear: _____

Interpret your results:

Explain why a person with conduction deafness hears the tuning fork better when it rests against the mastoid process than when it is held close to the ear.

Activity: Conducting Laboratory Tests on Equilibrium:

a. Balance Tests

- i. Did you exhibit any of the following after the test: wobbling? _____
dizziness? _____
was nystagmus present? _____
- ii. Picking up coins – any difficulties?

What kinds of interactions involving balance and coordination must occur to be successful in this task?

b. Barnay Test

Describe the results and explain their cause:

c. Romberg Test

Describe the results and explain their cause:

back to blackboard – eyes open

back to blackboard – eyes closed

side to blackboard – eyes open

side to blackboard – eyes closed

d. Role of Vision in Maintaining Equilibrium

Describe the results and explain their cause:

Special Senses: Olfaction and Taste; Ex 26

Activity: Stimulating Taste Buds:

Record the time (sec) it takes to taste the sugar on dry tongue: time: _____

Why couldn't you taste the sugar immediately?

Activity: Plotting Taste Bud Distribution:

| Location | sucrose (sweet) | acetic acid (sour) | epsom salt (bitter) | NaCl (salty) |
|-----------------------|----------------------------|-------------------------------|--------------------------------|-------------------------|
| Tip | | | | |
| Sides | | | | |
| Center | | | | |
| Back | | | | |
| couldn't taste | | | | |

Summarize your findings about the densest locations of the four types of taste buds:

Activity: Examining the Combined Effects of Smell, Texture, and Temperature on Taste:

a. Effects of smell and texture

| Food | by Texture only | Chewing with nostrils pinched | Chewing with nostrils open | Could not identify |
|---------------|----------------------------|--|---------------------------------------|-------------------------------|
| Cheese | | | | |

| | | | | |
|----------------------------------|--|--|--|--|
| Apple | | | | |
| Raw Potato | | | | |
| Banana | | | | |
| Dried Prunes | | | | |
| Raw Carrot | | | | |
| Hard cooked egg white | | | | |

Interpret your results; what role did texture, taste and smell play in identifying each of the foods.

b. Effect of Olfactory Stimulation

- i. Could you distinguish a specific flavor #1 on a dried tongue, no nostrils:

- ii. Was it easier to identify flavor #1 on tongue with nostrils open:

- iii. Sensation while placing flavor #2 on tongue while holding flavor #3 in front of nostril:

- iv. Which sense seemed to be more important to properly identify the substances tested?

c. Effect of Temperature

What were the results of this test? Was there a difference in the ability to identify a food on a cold tongue? Explain:

Activity: Assessing the Importance of Taste and Olfaction in Odor Identification:

| | Identification without smell | Identification with smell | other observations |
|----------|-------------------------------------|----------------------------------|---------------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |

Which method gave the best identification results?

What can you conclude about the effectiveness of the senses of taste and olfaction in identifying odors?

Activity: Demonstrating Olfactory Adaptation:

Time required for odor to disappear
with one nostril closed: Left Nostril: _____ Right Nostril: _____

Time required for second odor to disappear
with 'adapted' nostril: Left Nostril: _____ Right Nostril: _____

Describe and explain the results of your experiment.