Overview

Unit IV explains the sensory structures and physical mechanisms by which we take in information from our environment and attempt to make sense of it. Perceptual constancies and depth-perception cues are presented and numerous examples and illustrations aid with understanding. The unit provides detailed anatomy of the eye and ear, and reviews the processes by which the nose, tongue, skin receptors, and body positioning systems pick up sensory stimuli and convert it to electrical information for the brain. A distinction between sensation and perception is made and illustrated numerous times throughout the unit.

Modules

16 Basic Principles of Sensation and Perception
17 Influences on Perception
18 Vision
19 Visual Organization and Interpretation
20 Hearing
21 The Other Senses

Tip #4
Distribute Study Time and Fine Tune Focus

This unit begins by discussing the limitations of attention and the numerous distractions that impede our ability to focus on multiple tasks. Studying is a task that requires significant focus. Learning to focus your attention on the material you need to learn is a key strategy in the toolbox of academic success. You can increase attention to the task at hand by first locating a quiet space that you can dedicate to studying. Make certain to leave your cell phone off and out of sight and your computer off as well. Incoming texts and the lure of the Internet can be too tempting to pass on while studying!

Set a time limit for your first study session, since a shorter time of 20–30 minutes is more productive than a longer time of 1–2 hours. At the end of the first session, step away from the material and treat yourself to either a walk around the block, a healthy snack and a glass of water, or 15 minutes of texting and checking in with friends. Then return to another study session of 30 minutes or so. You will learn in an upcoming unit about distributed practice, a learning strategy that breaks studying into smaller blocks over a longer period of time. Studies have shown us that we learn better and retain more new information when we break studying up into smaller batches over time. Cramming is OUT! Focus, quiet, short repeated study sessions and a small incentive are IN!
Module 16

Basic Principles of Sensation and Perception

Before You Read

Module Summary
Module 16 lays out the difference between sensation and perception and introduces the concepts of top-down and bottom-up processing. Multiple phenomena that influence our ability to attend to stimuli are discussed and studies of multi-tasking and distracted driving are used to drive home the point that human attention is a little-understood and complex process. The principles of thresholds and signal detection, as well as the development of Weber’s Law and sensory adaptation are reviewed.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms
sensation
perception
bottom-up processing
top-down processing
selective attention
inattentational blindness
change blindness
transduction
psychophysics

Key Names
Gustav Fechner
Ernst Weber

While You Read

Answer the following questions/prompts.

16-1

1. How does the unit opening story of Heather Sellers explain why we study sensation and perception in psychology?

   It shows that there is a difference between how we physically see the world and how we cognitively perceive it in our minds. It also shows the impact of sensation and perception on behavior and mental processes. Because Heather cannot recognize faces, she has adapted behaviors, such as smiling to others as she passes them, to avoid making people upset.

2. What is the difference between sensation and perception?

   Sensation is the gathering of sensory information through our various sense receptors, while perception is the making sense of it.
3. Define and give a real-life example of bottom-up processing.
   Bottom-up processing is analysis that begins with the sensory receptors and works up to the brain’s integration of sensory information.
   Answers will vary.

4. Define and give a real-life example of top-down processing.
   Top-down processing is guided by higher-level mental processes, as when we construct perceptions drawing on our experience and expectations.
   Answers will vary.

5. How do the processes of sensation and perception work together when we process from the bottom-up? How about top-down?
   If we see something unfamiliar, we process from the bottom up by taking in specific details of lines, angles, colors, and so on and then perceptual processes help us to understand, categorize, and make schemas for what we are sensing. From the top down, we use preexisting knowledge or expectations to guide our perception and send our senses looking for stimuli that support those expectations.

1. How does selective attention work?
   Your awareness focuses on a specific stimulus and disregards the stimuli around it.

2. How does the cocktail party effect function as an example of selective attention?
   It is the ability to focus on only one voice among many—one stimulus among many stimuli.

3. Discuss the findings and implications of two of the studies on the relationship between attention and accidents.
   a. Truckers were tracked for 18 months with cameras in the cabs of their trucks recording their texting while driving behavior. They were 23 times more likely to have a collision while texting. The United States banned truckers and bus drivers from texting while driving.

   b. The implications of all of these studies is that attention cannot be successfully diverted or separated between tasks—if we are driving, our attention needs to be on driving in order to avoid accidents.
4. What do each of the following phenomena tell us about how humans attend to experiences around them? One has been filled in for you to get you started.

a. pop out:
   
   *Sometimes humans don’t choose to attend to stimuli, it just “pops out,” draws our eye (or ear) and demands our attention.*

b. inattentional blindness:
   
   *Humans tend to focus on some part of our environment so much that other stimuli are not seen.*

c. change blindness:
   
   *Humans fail to notice changes in our environment.*

d. choice blindness:
   
   *We frequently fail to notice when we are presented with something different than what we actually want—we think we have made a choice and will defend that choice, but it may not be any different than the other item we were choosing from.*

6. Many people today claim to be “multitaskers,” capable of processing multiple tasks at one time. Use your knowledge of this section on attention to respond to that claim.

   *Answers will vary, but a strong answer will state that attention cannot truly and fully be split between separate tasks.*

1. What are the three steps basic to our sensory systems?

   1. Receiving sensory information.
   2. Transforming that stimulation into neural impulses.
   3. Delivering the neural information to our brain.

2. Define transduction.

   *Transduction is conversion of one form of energy into another. In sensation, the transforming of stimulus energies, such as sights, sounds, and smells, into neural impulses our brains can interpret.*
3. What does the field of psychophysics research?

Psychophysics researches the physical energy we can detect and its effects on our psychological experiences.

1. How might an eye doctor test for your absolute threshold for observing light?

Answers will vary.

2. Other than stimulus strength, what additional factor determines whether we will detect a sound, sight, taste, touch or smell stimulus? What is meant by that? Give an example.

Our psychological state—our experience, expectations, motivation, and alertness—also determines whether we will detect a stimulus.
A tired mom would hear a faint cry from a baby but not a louder, unimportant sound.

3. What do signal detection theorists try to understand about human sensation? Be sure to elaborate your answer.

They seek to understand why people respond differently to the same stimuli and why the same person’s reactions vary as circumstances vary.

4. The textbook uses an example of detecting a text message to describe signal theory. Give an example from your own life of a stimulus or signal you are more likely to detect (hear, see, smell, and so on) than a friend or parent might be and why you would be more likely to detect it.

Answers will vary.

5. What determines if a signal is subliminal?

Subliminal means you cannot detect the signal 50 percent of the time.
6. How does priming work? Give an example from your own life of a time you have primed someone else or been primed yourself to perceive stimuli in your environment.

   Priming is the activation of often unconscious associations that predisposes people’s perception, memories, or response.

   Answers will vary.

7. What is a difference threshold and why is it important to humans?

   A difference threshold is the point at which you can tell a stimulus has increased or decreased. This is important because we need to detect small differences.

8. What does Weber’s law tell us about human perception?

   To be perceived as different, two stimuli must differ by a constant minimum percentage (rather than a constant amount).

9. If Jenny were lifting 20 pounds and added 2 pounds to her load, she would notice that it was heavier. According to Weber’s law, how much weight would Jenny have to add to 40 pounds of weight to notice the same difference?

   \[ \frac{20}{2} = \frac{40}{x} \]

   Jenny would have to add 4 pounds.

1. Define and give an example from the text of sensory adaptation. Give an example from your own life of sensory adaptation.

   Sensory adaptation is diminished sensitivity as a consequence of constant stimulation. An example from the text is to move your watch up your wrist by an inch—you will only feel it for a few moments.

   Answers will vary.

2. Why can’t a classmate who wears a lot of cologne notice that they are doing so?

   He won’t notice how much cologne he is wearing because of sensory adaptation—the more we are around a stimulus, the less aware we become of it because our nerve cells fire less frequently.

Please do not distribute or post answers online
3. How does sensory adaptation explain why television programming has the power to grab our attention?

Our sense receptors become less active when we are exposed to a constant stimulus. Television programming exposes our eyes and ears to ever-changing stimuli and thus keeps our attention. Quick editing of the image, fluctuations in the volume of commercials or scenes in the show, all keep our receptors firing.

After You Read

Module 16 Review

Answer the following questions to see if you have mastered the basics.

Identify whether each of the situations below represents the use of top-down (T) or bottom-up (B) processing:

B 1. A preschool child gives her father a picture she drew that day and he tries to decide what she has drawn by examining the lines of the picture.

T 2. A literature teacher instructs her students to locate the examples of sexism in the poem she assigns for homework.

T 3. On a long-distance road trip with his family, Joachim occupies himself by reading the license plates from passing cars. When he sees the plate “3DUC8R,” Joachim quickly shouts out “EDUCATOR”!

B 4. An alien visitor to our planet takes detailed notes of “multi-sized boxes moving on four circular wheels” and suggests to his commander that they might be tools of communication on our planet.

T 5. A classmate shows you a hidden image 3D visual puzzle and tells you to find the fish.

Multiple Choice

Circle the correct answer.

1. If you can just notice the difference in brightness between two flashlights when one is using a 10-watt bulb and the other a 15-watt bulb, which of the following bulb wattages could you discriminate from a 100-watt bulb?
   a. 90-watt
   b. 120-watt
   c. 75-watt
   d. 60-watt
   e. 150-watt
   [c]

2. When you enter your new teacher’s classroom for the first time you take note of the ticking of the second hand on his wall clock and find it annoying. After a period of time in the classroom, you realize you are no longer hearing the tick-tick-tick of the clock. This occurrence is best explained by
   a. Weber’s law.
   b. the signal detection theory.
   c. sensory adaptation.
   d. the difference threshold.
   e. the absolute threshold.
   [c]
3. Ming-li’s parents have to go out of town and are leaving her alone in the house for the first time. Being quite nervous, Ming-li is not at all pleased with staying alone. She hears every faint creak, whispered moan, soft whine, and shudder the house makes and is convinced each is an intruder. Her response to these noises is best explained by
   a. the signal detection theory.
   b. priming.
   c. absolute threshold.
   d. transduction.
   e. sensory adaptation.

4. While attending a magic show at your school’s pep assembly, you are amazed at the skill and expertise of the tricks. Whether she makes the school mascot disappear, identifies your secret card from the deck, or arranges for your watch to come off your wrist, you are amazed and in awe of her talent. Your friend, an AP® Psychology student, recognizes that the magician has just made use of
   a. pop-outs.
   b. choice blindness.
   c. change blindness.
   d. inattentional blindness.
   e. transduction.

5. At a very crowded and noisy Homecoming Dance you hear your best friend calling your name from across the room. Your ability to hear your name in this situation is best explained by
   a. sensory adaptation.
   b. the cocktail party effect.
   c. priming.
   d. the difference threshold.
   e. transduction.
Module 17

Influences on Perception

Before You Read

Module Summary

Module 17 explains how our expectations, contexts, emotions and motivation influence our perception. The module also contains a lengthy discussion of extrasensory perception and the conclusions of researchers who have put ESP to the test.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms
- perceptual set
- extrasensory perception
- parapsychology

While You Read

Answer the following questions/prompts.

17-1

1. How does perceptual set relate to top-down processing (Module 16-1)?
   Perceptual set is a a set of mental tendencies and assumptions that greatly affects (top-down) what we perceive.

2. How does the cartoon of the motorcycle officer on page 164 explain perceptual set?
   We expect to see a radar gun when a police officer is pulled over like this, so we act accordingly.
3. Give an example from the text and one from your own life of perceptual set.
   Answers will vary.

4. How do context effects relate to top-down processing (Module 16-1)?
   A brain can work backward in time to allow a later stimulus to determine how we perceive an earlier one.

5. How do our expectations, emotions, and motivations influence our perceptions?
   Hearing sad rather than happy music can predispose people to perceive a sad meaning in spoken homophonic words—for example, mourning rather than morning, die rather than dye.

You have just learned more information about top-down and bottom-up processing. Recall the tip from Unit II, “Make Your Learning Fluid.” Revisit Module 16-1, questions #3 and #4 now and add any additional information you have learned from this module to your response in that module. If you have additional examples to add, do that now.

17-2

1. Describe the relationship between sensation and perception that underlies a belief in ESP.
   Perception can occur without sensation.

2. Cite research from the text that explains the scientific opinion regarding the existence of ESP.
   Most research psychologists and scientists are skeptical that paranormal phenomena exist. For example, in 2010, when a mine collapsed trapping 33 miners, the Chilean government reportedly consulted 4 psychics who told them all the miners were dead—of course, 69 days later, all 33 were rescued.
Module 17 Review

After You Read

Discuss how perceptual set might impact how you perceive each of the following. The first one has been done for you.

1. Moviegoers burst into laughter when a black-leather-clad, large man on a Harley Davidson motorcycle shows up on the screen and begins to sing excerpts from the musical *The Sound of Music.*

   *People assume, stereotypically, that motorcycle riders will not be familiar with musicals so they find it funny when their perception doesn’t match the depiction in the film.*

2. Your friend tells you that he learned all about backward masking of subliminal messages in rock songs and plays a few selections for you. He says you can clearly hear the word “Satan” and “devil” in the music.

   *Once your friend leads you to listen for specific words, then you are more likely to piece together the lyrics in a way that enables you to “hear” the words he suggests. If you had listened to that piece alone without the priming from your friend, you most likely would not have heard “Satan,” and so on.*

3. You have heard advertising touting the nutritional benefits of a name-brand dog food and have purchased it for your puppy. After a few months of having your dog eat it, you tell your friends how healthy and full-of-life your dog seems.

   *You are expecting the name-brand dog food to be more nutritious and healthful for your dog so you will interpret his bounding, playing, and activity level in a way that supports your belief about the food.*

4. You have asked your father repeatedly over the last few months if you can use the car to go meet friends. Despite being denied over and over, you approach him again and ask for the car. Expecting him to say *no* again, you actually hear him say *No* and walk off upset. Your father, puzzled, asks why you are upset that he finally said, “*Yes,* you can use the car.”

   *You are assuming the father will say *No* as before and so are expecting to hear *No.* Because of this, you respond as if he actually did say *No* even though he said *Yes.*

5. Your older brother wants to make a chocolate dessert for your Stepmom’s birthday, and you eagerly offer to help. The recipe calls for unsweetened baker’s chocolate and you decide to trick your 5-year-old stepsister by offering her a taste of the whipped chocolate in the bowl. She excitedly dips her finger in!

   *Most kids are fooled by this trick—expecting and assuming that velvety-rich chocolate substance is sweetened cocoa, they will reach in to taste it only to find it bitter.*

6. A bank robber, using only his thumb and forefinger in his pocket as a weapon, is able to successfully rob multiple banks before he is caught.

   *Expecting that a bank robber will have a gun, and perceiving the thumb and forefinger in the pocket as a gun shape, customers and employees will act as if they are under threat of a real weapon.*
Module 18

Vision

Before You Read

Module Summary

Module 18 provides very thorough coverage of the theories, physiology, and physics of vision. Physical properties of light waves and detailed drawings of the anatomy of the eye and visual processing systems of the brain explain the mechanisms by which we see color, recognize faces, and process visual information.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms
- wavelength
- hue
- intensity
- pupil
- iris
- lens
- retina
- accommodation
- rods

Key Names
- cones
- optic nerve
- blind spot
- fovea
- feature detectors
- parallel processing
- Young-Helmholtz trichromatic
- (three-color) theory
- opponent-process theory

David Hubel
Torsten Wiesel

While You Read

Answer the following questions, and complete the charts and diagrams below.

18-1

1. How large is the portion of light visible to humans related to the spectrum of electromagnetic energy?

A relatively small portion of the electromagnetic spectrum is actually visible to humans. The wavelengths from about 400 to 700 nanometers make up what we call the visible spectrum.

2. What are the two physical characteristics of light and how do they determine our awareness of hue and intensity?

Frequency or wavelength determines hue (or color).
Amplitude or wave height determines intensity (or brightness).
3. Trace the path of light through the eye as it enters the cornea, is transduced into neural energy, and ends in the visual cortex of the occipital lobe. Use Figures 18.3 and 18.4 as well as the information you learned in Module 12-1 to help with your diagram. Additionally, you may find you need some information from the beginning of Module 18-2.

4. Complete the chart below, using your own words to describe the function of each.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>cornea</td>
<td>protects the eye and bends light to provide focus</td>
</tr>
<tr>
<td>pupil</td>
<td>the center of the eye through which light enters</td>
</tr>
<tr>
<td>iris</td>
<td>a ring of muscle tissue that controls the size of the pupil opening</td>
</tr>
<tr>
<td>lens</td>
<td>changes shape to help focus images on the retina</td>
</tr>
</tbody>
</table>

Please do not distribute or post answers online
<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>retina</td>
<td>light-sensitive inner surface of the eye, containing the rods and cones that begin the processing of visual information</td>
</tr>
<tr>
<td>rods</td>
<td>retinal receptors that detect black, white, and gray; necessary for peripheral and twilight vision</td>
</tr>
<tr>
<td>cones</td>
<td>retinal receptors that function in well-lit conditions. Detect fine detail and give rise to color sensations.</td>
</tr>
<tr>
<td>bipolar cells</td>
<td>activate ganglion cells</td>
</tr>
<tr>
<td>ganglion cells</td>
<td>the strands that form the optic nerve</td>
</tr>
<tr>
<td>optic nerve</td>
<td>the nerve that carries neural impulses from the eye to the brain</td>
</tr>
<tr>
<td>blind spot</td>
<td>the point at which the optic nerve leaves the eye, creating a “blind spot” because no receptor nerves are located there</td>
</tr>
<tr>
<td>fovea</td>
<td>the central focal point in the retina, around which the eye's cones cluster</td>
</tr>
</tbody>
</table>

5. Why does human vision have a blind spot?
   The “blind spot” is a section of the retina that does not contain receptor cells (rods and cones) because that is where the optic nerve exits the back of the eye.

6. How does vision in the fovea relate to placement and quantity of rods and cones? How might the experience of nocturnal animals be different from humans with regard to their visual system’s physiology?
   Cones are concentrated near the center of the retina and objects that fall on that portion of the retina are seen more clearly. Rods, which line the perimeter in greater numbers aid in peripheral vision.
   Nocturnal animals have a greater number of rods and are better suited to seeing with minimal light stimulus.

7. Name three ways in which rods and cones differ.
   1. Rods detect black, white and gray; cones give rise to color sensation.
   2. Rods are necessary for peripheral and twilight vision; cones only function in well-lit conditions.
   3. Cones transmit to a single bipolar cell that relays the message directly to the visual cortex; rods share bipolar cells with other rods and send combined messages.
1. Where are feature detectors located, and what is their function? How do feature detectors work together to portray a “whole” image?

Feature detectors are specialized neurons in the occipital lobe’s visual cortex and they receive information from the individual ganglion cells in the retina. They detect specific features—lines, edges, angles, and movements—of an object and pass this neural information along to other cortical areas where it is combined to form a larger picture.

2. Using fMRI scans, how are we able to tell if a person is looking at a “shoe, chair or face?”

This brain activity is so specific that we are able to tell what a person is looking at.

3. How does parallel processing help us analyze a visual scene? How would the four subdimensions mentioned in the text allow you to see and perceive a person walking toward you on the street?

The brain divides the scene into subdimensions—motion, form, depth, color—and works on all aspects simultaneously. Then these perceptions are integrated by different visual teams.

To recognize a person walking toward you on the street, you would assess the person’s speed, gait, and fluidity of movement, along with their distance, shape, and color, and determine if they were friend, foe, stranger, and so on, and understand how to behave toward them.

4. How might parallel processing be related to blindsight (described in Module 13)?

People are able to guess whether sticks are horizontal or vertical even if they can’t actually “see” the sticks—the parallel processing in our mind, or dual processing, sees what the conscious mind cannot.

1. Discuss how the Young-Helmholtz trichromatic theory explains how we see and perceive color. Then discuss how it explains color blindness.

Cones are set to receive three different wavelengths, making them receptive to what we call red, blue, or green. When we stimulate combinations of these cones, we see other colors.

Colorblind is actually an incorrect term—certain cones may not function correctly.

2. Explain how Hering’s opponent-process theory adds to the explanation of how we see and perceive color. Hering’s opponent-process theory states that we have three sets of cones, similar to the Young-Helmholtz theory, but these cones see pairs of colors—red/green, blue/yellow or black/white. In the retina, some neurons are turned “on” by red and “off” by green, and vice-versa. The cones “see” either one or the other of the pairs.
3. Concerning the phenomenon of color blindness,

   a. what is the most common deficiency? **red-green color deficiency**
   
   b. what subgroup of humans is most impacted? **males**
   
   c. what percentage of people are impacted? **1 in 50, or 2%**

4. Why do we see an afterimage when we look away at a white piece of paper after staring at a yellow and green flag, as in Figure 18.12?

   According to Hering’s opponent-process theory, staring at yellow triggers neural firing in the yellow portion of the cone, but when we look away, the blue, repressed neural impulses begin to fire. Green produces a red afterimage and black produces a white afterimage—thus red, white, blue.

---

**Module 18 Review**

Complete the questions below to see if you have mastered the basics.

**Terms**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Definitions**

- A. receptor cells that are concentrated near the center of the retina and detect fine detail and color
- B. protects the eye and bends light to provide focus
- C. the central point in the retina, around which the eye’s cones cluster
- D. the light-sensitive inner surface of the eye containing the receptor cells
- E. carries neural impulses from the eye to the brain
- F. transparent structure behind the pupil that changes shape to help focus images on the retina
- G. the point at which the optic nerve leaves the eye, no receptor cells are located there
- H. receptor cells that detect black, white and grey and are necessary for peripheral and night vision
- I. ring of muscle tissue that forms the colored portion of the eye and controls the size of the pupil opening
- J. adjustable opening in the center of the eye through which light enters

Please do not distribute or post answers online
Multiple-Choice and Short Answer Questions

1. Light waves with lower frequencies around 700 nanometers will produce which colors?
   They will produce reddish hues.

2. Frequency is to amplitude as ________________ is to ________________.

3. Why are cones, rather than rods, better able to detect fine detail?
   - Cones are significantly more numerous than rods.
   - Cones function better than rods in dim light.
   - Cones have a direct connection to bipolar cells, whereas rods share bipolar cells with other rods.
   - Cones are placed throughout the retina whereas rods are primarily concentrated along the fovea.
   - Cones are placed around the blind spot whereas rods are concentrated within the blind spot.

4. In order to focus near and far objects on the retina, the lens changes its shape through a process called
   - parallel processing.
   - feature detecting.
   - transduction.
   - accommodation.
   - after-imaging.

5. The Young-Helmholtz theory suggests that humans perceive color through
   - cones on the retina that contain three different color receptors
   - color receptors that are inhibited or stimulated by pairs of colors
   - the focusing of the light wave along the section of the retina containing the most rods
   - the pulses of electromagnetic energy that produce gamma rays
   - the transduction of infrared waves in the visual cortex

Label the structures of the eye in the diagram below.

Please do not distribute or post answers online
Module 19
Visual Organization and Interpretation

Before You Read

Module Summary
Module 19 reviews Gestalt principles of perceptual organization and discusses how depth cues, both monocular and binocular, are used to perceive the world in three dimensions. The module also introduces the way in which perceptual constancies aid in organization of visual information and the research on restored and restricted vision as it relates to the impact of experience on perception.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms
- gestalt
- retinal disparity
- figure-ground
- monocular cues
- grouping
- phi phenomenon
- depth perception
- perceptual constancy
- visual cliff
- color constancy
- binocular cues
- perceptual adaptation

While You Read

Answer the following questions, and complete the charts and diagrams below.

1. How does the German word gestalt help explain how humans organize their perceptions?

   Gestalt means an organized whole. When given a cluster of sensations, people tend to organize them into a gestalt (form or whole).

2. How does the illustration of the Necker cube in Figure 19.1 illustrate the difference between sensation and perception?

   From a sensation point of view, the Necker cube is nothing more than eight blue circles each containing three converging white lines. When we view them all together, however, we perceive a cube that sometimes reverses direction. The whole (perception) may exceed the sum of its parts (sensation).
3. What is meant by the fundamental truth: *Our brain does more than register information about the world?* (p. 182)

Perception is not just opening a shutter and letting a picture print itself on the brain; we filter incoming information and construct perceptions. Mind matters.

4. Give an example from the text and one from your own life of figure and ground.

Answers will vary.

5. What are three examples of the principles we use to group stimuli? Explain and provide a real-life, nongeometric example of each.

a. **Proximity** is the grouping rule that says we group nearby figures together. For instance, we might see six people standing near each other and assume they are together as a group—the adage, “you are judged by the company you keep” has a ring of the proximity rule to it. If you are near others, you are seen to be with them.

b. **Continuity** is the grouping rule that explains that we perceive smooth, continuous patterns rather than discontinuous patterns. For instance, it makes sense to many students that their former teachers will always be teaching in the same room and look the same and act the same for years to come.

c. **Closure** is the grouping principle that suggests we fill in gaps to create a whole, complete object. For example, when overhearing only a portion of a conversation between friends, we often try to fill in the blanks and assume we know what the rest of the conversation was about.

1. Describe how depth perception helps us organize sensory input.

Depth perception allows us to estimate an object’s distance from us, so we can estimate the distance of an oncoming car or the height of a house.

2. Referring to the work of Gibson and Walk or Campos et al., discuss our general understanding about the age and onset of depth perception in the human species. How does it differ in various animal species?

Humans seem to learn to perceive depth and the onset may be correlated with crawling, as infants who crawl exhibit greater fear of heights. Some newborn animals, however, seem to be born with depth perception.

3. What insight can the visual cliff study give us regarding the nature–nurture debate?

Biology predisposes us to be wary of heights and experience amplifies that fear.
4. How does retinal disparity occur and how does it help us perceive the depth of objects in our environment?

   It occurs because our pupils are approximately 2” apart and thus we see two different images. The difference between those images indicates how close objects in that image are to us.

5. Explain how monocular cues differ from binocular cues. When might we use monocular cues rather than binocular cues?

   Monocular cues (depth cues such as interposition and linear perspective) are available to either eye alone. Binocular cues (depth cues such as retinal disparity) depend on the use of two eyes.

   Monocular cues are used to detect the distance of farther objects, while binocular cues are more important in judging the distance of nearby objects.

6. How does the phi phenomenon create the perception of motion? Give an example of this phenomenon.

   Two adjacent lights blink on and off in quick succession, and we perceive light moving back and forth between them—the stock market ticker tape, a construction sign, Las Vegas marquee lights, and so on.

7. Using Figure 19.5, complete the chart below with the mechanism by which each monocular cue operates and a hand-drawn example of the illusion it creates. Your ability to draw is not essential—even a basic stick figure drawing can convey that you understand the cues.

<table>
<thead>
<tr>
<th>Monocular Depth Cue</th>
<th>How It Helps Us Perceive Depth</th>
<th>Illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>relative height</td>
<td>Objects higher in our field of vision are farther away.</td>
<td>See text page 186 for examples.</td>
</tr>
<tr>
<td>relative motion</td>
<td>As we move, objects that are actually stable may appear to move.</td>
<td></td>
</tr>
<tr>
<td>relative size</td>
<td>If two objects are similar in size, most people assume that the one that casts the smaller retinal image as farther away.</td>
<td></td>
</tr>
<tr>
<td>linear perspective</td>
<td>Parallel lines appear to meet in the distance. The sharper the angle of convergence, the greater the perceived distance.</td>
<td></td>
</tr>
<tr>
<td>interposition</td>
<td>If one object partially blocks our view of another, we perceive it as closer.</td>
<td></td>
</tr>
<tr>
<td>light and shadow</td>
<td>Shading produces a sense of depth consistent with our assumption that light comes from above.</td>
<td></td>
</tr>
</tbody>
</table>
1. Why is perceptual constancy referred to as a top-down process?

Perceptual constancy is referred to as a top-down process because we are looking to perceive an object despite any changes in shape, size, and so on. Taking those changes into account would require bottom-up processing.

2. Complete the chart below. One has been filled in for you as an example.

<table>
<thead>
<tr>
<th>Perceptual Constancy</th>
<th>How It Aids Our Perception of the Sensory Information From Our World</th>
</tr>
</thead>
<tbody>
<tr>
<td>color</td>
<td>We perceive the color of familiar objects (like a red tomato) as constant even if the light passing over them reflects different wavelengths onto our retina. A tomato may look pale pink or black, depending on the light being cast onto it, but we still see it as red.</td>
</tr>
<tr>
<td>brightness</td>
<td>We perceive brightness of an object in relation to objects around it. Comparisons govern our perceptions of brightness. A white paper in a darkened room may look grey, but it still reflects 90% of the light falling on it.</td>
</tr>
<tr>
<td>shape</td>
<td>We perceive the form of familiar objects as constant even while our retinas receive changing images of them. The neurons in the visual cortex learn to associate different views of an object. A door opening seems to be changing shape, but we still perceive it as rectangular.</td>
</tr>
<tr>
<td>size</td>
<td>We perceive the size of familiar objects as constant even though our distance to and from them may change. A person walking toward you is perceived to have a constant size even though the image on the retina suggests the person is growing larger.</td>
</tr>
</tbody>
</table>

3. How do perceptual constancies help us organize our sensations into meaningful perceptions?

Through experience and familiarity we develop constancies that allow our sensory input to be managed in a way that allows us to function. If we lived in a world without perceptual constancies, people would change size in a instant, colors would fluctuate rapidly, shapes would morph before our eyes, and this would create an unsettling world.

19-4

1. Explain how research on restored vision and sensory restriction helps us understand the importance of experience on perception.

We need experience not only to develop perceptual constancies as discussed earlier, but also for cortical neurons to grow, allowing for feature detection.

2. What is meant by a “critical period,” and how does the research on sensory restriction stress its importance?

There seems to be a critical period—a specific developmental time—when normal sensory and perceptual development occurs. If this period is bypassed or circumvented, the ability scheduled to develop does not do so. Inhibiting infant kittens and monkeys from developing visual processes resulted in their inability to distinguish a circle from a square.

Please do not distribute or post answers online
3. How does the concept of perceptual adaptation inform our understanding of how humans perceive the sensations in our environment?

We adapt to the sensations in our environment if they are altered.

4. What evidence does the text provide to suggest that we can adapt to new ways of interacting with the world?

By donning distortion goggles that offset our visual field degrees to the left or right, we soon adapt and can throw or catch a ball with that misinformation accounted for.

---

After You Read

Module 19 Review

Answer the following questions to see if you have mastered the basics.

Use this story to answer questions 1–3. Maria is enrolled in a research project to determine how humans perceive depth. She is shown a set of 3 images and is asked to describe locations of people and objects in the images. Maria will be using a variety of monocular cues to detect depth in the images and respond to the researcher. Using the list of monocular cues below, discuss which are providing Maria with the information she needs to detect depth in each of the images and how it is functioning. Be sure to also discuss the “how” of your answer.

<table>
<thead>
<tr>
<th>relative height</th>
<th>relative size</th>
<th>relative motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>interposition</td>
<td>linear perspective</td>
<td>light and shadow</td>
</tr>
</tbody>
</table>

1. Maria is shown the circle and square below. How would she describe the relationship of the square to the circle?

   The circle is in front of the square. The monocular cue of interposition tells us that if one object partially blocks our view of another, we perceive it as closer. The circle is closer to us than the square.

2. Maria is shown the two 3 ½ inch cups on a table below. How would she use two cues to describe the relationship of cup A to cup B?

   Relative size: Assuming that both cups are the same size, the one that casts the smaller retinal image (cup B) is farther away.

   Relative height: We assume that the line of the table that is higher in our field of vision to be farther away, so cup B is farther away.

Please do not distribute or post answers online
3. Maria is shown a long hallway of student lockers and is asked to imagine she was standing at Point A and then again at Point B while her friend remained at Point A. How would she describe her position in the hallway in relation to her friend in both instances?

Maria at Point B is farther away than at Point A from her friend. This is due to linear perspective--parallel lines appear to meet in the distance.

4. How would you discriminate figure from ground in the following instances?

   a. You are looking for a classmate in the cafeteria at lunch and remember she was wearing a red sweatshirt.
      Make your classmate the figure and separate her face and form from the rest of the students.

   b. You are listening intently for sounds that your newborn baby brother is upset.
      Target the cries from the baby and separate them from the regular household sounds.

   c. You are trying to identify the musical instruments used in a particular piece of music.
      Pull one instrument at a time out of the group and follow just that sound and make the rest of the sounds background.

   d. You are trying to identify leaf types for your botany class.
      Look for particular shapes, colors, and features as figure and make the rest ground as you identify each new leaf.

   e. You are hoping to run into the boy you want to ask to Homecoming as you walk through the crowded halls during passing period.
      Make his face the figure and the rest of the faces you pass the ground.
Module 20
Hearing

Before You Read

Module Summary

Module 20 is a thorough discussion of the theories and physics of audition. The physical characteristics of sound waves and the mechanisms by which the structures of the ear process sound are explained in great detail. A distinction between types of hearing loss and an explanation of how we locate directionality of sound conclude the module.

Before beginning the module, take a moment to read each of the following terms and names you will encounter. You may wish to make vocabulary cards for each.

Key Terms
- audition
- frequency
- pitch
- middle ear
- cochlea
- inner ear
- sensorineural hearing loss
- conduction hearing loss
- cochlear implant
- place theory
- frequency theory

While You Read

Answer the following questions, and complete the chart below.

1. Discuss why David Myers’ story of his mother’s (and his own) hearing loss helps us to understand why we study audition in a psychology class?
   Answers will vary but should have some indication of the effect of audition on behavior—that by losing hearing we can become isolated and human connections become difficult.

2. Define the two physical characteristics of sound, and identify how they determine our awareness of loudness and pitch.
   Wavelength (or frequency) determines how we hear pitch—high notes or low notes. Amplitude (or wave height) determines how we hear loudness.
3. Using Figure 20.1, trace the path of sound waves through the ear beginning with the outer ear and ending with the auditory cortex of the temporal lobe.

4. Complete the chart below, using your own words to describe the function of each structure.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>eardrum (tympanic membrane)</td>
<td>a tight membrane that picks up sound waves from the auditory canal causing it to vibrate and pass the vibrations to the ossicles</td>
</tr>
<tr>
<td>oval window</td>
<td>amplify and relay the vibrations from the eardrum and thru the oval window to transmit them to the cochlea</td>
</tr>
<tr>
<td>outer membrane of the cochlea</td>
<td>the membrane of the cochlea that picks up vibrations from the ossicles, causing the fluid that fills the cochlea to vibrate</td>
</tr>
</tbody>
</table>
5. Distinguish between sensorineural hearing loss and conduction hearing loss.

Sensorineural hearing loss is caused by damage to the cochlea’s receptor cells or to the auditory nerves. Conduction hearing loss is caused by damage to the mechanical system that conducts sound waves to the cochlea.

6. How might the different issues involved in hearing loss impact the treatment of each of these respective issues?

The only way to restore hearing for people with sensorineural hearing loss is with a cochlear implant.

7. Consider Figure 20.2 and a typical day in your life. Estimate the highest decibel and source of sound you are exposed to on a daily basis.

Answers will vary.

8. In what way do the limitations of cochlear implants add to the explanation of the critical period theory discussed in Module 19-4?

They will not enable normal hearing in adults if their brain never learned to process sound during childhood.
1. How does von Helmholtz’s place theory explain how we discriminate pitch?
   We hear different pitches because different sound waves trigger activity at different places along the cochlea’s basilar membrane.

2. How does the frequency theory suggest an alternative to the explanation of how we discriminate pitch?
   The brain reads pitch by monitoring the frequency of neural impulses traveling up the auditory nerve. If a sound wave has a frequency of 100 waves per second, then 100 pulses per second travel up the auditory nerve.

3. Describe how the volley principle addresses the limitations of neural firing when explaining how we hear pitch.
   Neural cells can alternate firing and can fire in rapid succession to achieve a combined frequency above 1000 waves per second.

1. How might the placement of our ears alongside our head make it difficult to hear sounds coming from certain locations? Explain.
   We have stereophonic ears—3D hearing—the ear closer to the sound stimulus receives a more intense sound slightly sooner. Sometimes it is difficult to locate sound direction when sound waves are fast and our ears are only 6” apart.

2. How might our ability to locate sounds be different if we had one ear above our nose, as suggested by David Myers?
   We might lose the ability to sense direction of sound.

3. Discuss how the physical characteristics of sound, along with our own body’s anatomy, works to help us determine directionality of sound.
   Sound moves fast and our ears are 6” apart and we can still tell the just noticeable difference between two sounds, which allows us to detect direction.
Module 20 Review

Complete the questions below to see if you have mastered the basics.

1. Frequency is to pitch as ________ is to ________.  
   a. amplitude; loudness  
   b. wavelength; amplitude  
   c. loudness; wavelength  
   d. sound; light  
   e. height; length

2. An older man diagnosed with sensorineural hearing loss most likely  
   a. has a fracture in the bones of the middle ear.  
   b. has a perforation on the eardrum.  
   c. has wax buildup in the auditory canal.  
   d. has spent too much time listening to high decibel sounds.  
   e. has an ear infection.

3. What is the correct path of sound through the ear to the brain?  
   a. stirrup, cochlea, basilar membrane, auditory nerve, auditory canal, eardrum  
   b. auditory canal, eardrum, the bones of the middle ear, cochlea, basilar membrane  
   c. eardrum, cochlea, auditory nerve, anvil, auditory canal  
   d. auditory canal, basilar membrane, cochlea, oval window, hammer  
   e. eardrum, auditory nerve, basilar membrane, oval window, the bones of the middle ear

4. The best explanation for how we understand and process the high pitch of a violin, with a frequency of more than 100 waves per second, comes from  
   a. Helmholtz's place theory.  
   b. the frequency theory.  
   c. the volley principle.  
   d. the transduction model.  
   e. Brown's stereophonic theory.

5. Lashawna is exposed to a short wavelength with a tall/great amplitude. It is likely that she is perceiving  
   a. a bright fuschia color.  
   b. a loud bass guitar.  
   c. a dusky green color.  
   d. a soft cello.  
   e. a very loud piccolo.
Module 21
The Other Senses

Before You Read

Module Summary

Module 21 concludes Unit IV with a review of the remaining senses of smell, taste, touch, and body positioning. Mechanisms by which each receives and conveys information to our brain about stimuli in our environment as well as the manner in which they interact makes up the majority of the module. A brief discussion of the gate-control theory and pain management techniques rounds out the module.

Before beginning the module, take a moment to read each of the following terms you will encounter. You may wish to make vocabulary cards for each.

Key Terms
- gate-control theory
- kinesthesia
- vestibular sense
- sensory interaction
- embodied cognition

While You Read

Answer the following questions, and complete the charts and diagrams below.

21-1

1. What has research shown about the essential nature of touch?

   Touch is essential to development. Infant rats deprived of their mother’s grooming produce less growth hormone and have a lower metabolic rate. Infant monkeys not allowed to touch their mothers become desperately unhappy.

2. What are the four basic sensations skin can detect?

   Skin can detect pressure, warmth, cold, and pain.
3. Which of the skin sensations has identifiable receptors?

Pain has identifiable receptors.

1. How does Melzack and Wall’s gate-control theory serve as a model for how we feel and block pain signals?

The spinal cord contains small nerve fibers that conduct most pain signals and larger fibers that conduct most other signals. They theorized that the spinal cord contains a neurological “gate” that opens and closes to allow pain signals through or to block pain signals.

2. Based on the information in the text about Ashlyn Blocker, what might be the benefits of experiencing pain?

People who can experience pain benefit from knowing when you have exceeded the limits of your body—when injuries need attention—when your behaviors are harmful.

3. Describe the effect of endorphins on pain.

Pain diminishes when endorphins are released.

4. How might the experience of pain be involved with the phantom limb syndrome?

When the brain misinterprets the spontaneous central nervous system activity that occurs in the absence of normal sensory input, this pain is a phantom limb sensation.

5. What are the biopsychosocial influences on pain?

Answers will vary but should reflect knowledge of Figure 21.3.

6. What have placebo studies revealed about the psychological aspects of pain?

Much of pain is psychological—when given a placebo to relieve pain, in one study, people reported feeling less pain immediately.

7. What roles do acupuncture and virtual reality seem to play in pain relief?

People seem to be able to be distracted from pain with virtual reality, and acupuncture studies have shown that pain is reduced even when people just think they are receiving acupuncture.
1. Why do evolutionary psychologists see taste as adaptive?
   - Pleasureful tastes attracted our ancestors to energy- or protein-rich foods that enabled their survival. Aversive tastes deterred them from new foods that might be toxic.

2. What life experiences and choices impact the receptivity of taste buds?
   - Given small amounts of new foods, infants and children will eventually begin to accept them.

3. Discuss the psychological influences on taste. How can our taste buds occasionally be fooled?
   - Expectations of a food being vegetarian or not, expensive or not, and such can fool our taste buds.

4. What is an evolutionary explanation for olfactory signals not processing first through the thalamus, as with other senses?
   - Smell may have been so important to survival that a direct line to the olfactory bulb would have ensured a faster response to threats.

5. In what way are smells connected with memories and emotions?
   - Smells are connected to memories and when exposed to a particular smell, such as suntan lotion, we can immediately recall great memories of the beach.

1. Distinguish kinesthesia from your vestibular sense.
   - Kinesthesia is the sense of position and movement of body parts, whereas the vestibular sense monitors your head’s position and movement.

2. For which tasks might the kinesthetic system be most useful? When might the vestibular sense be most useful?
   - The kinesthetic system would be most useful for tasks involving position and balance like walking, dancing, or athletic activities such as gymnastics. The vestibular sense monitors the head’s position and movement and would also be useful in dancing or athletic activities.
1. In what ways can the sense of smell change the perception of taste? Describe two additional examples of sensory interaction that you have experienced.

The sense of smell changes the perception of taste by enhancing or decreasing it. As mentioned in the text, the smell of strawberry makes people perceive a drink as sweeter.

Personal examples will vary but should discuss the sensory interaction of any of the senses.

2. How does the McGurk effect illustrate how senses interact?

What we see and what we hear may disagree and we may instead perceive a third option after bottom-up processing.

3. Give an example of how our bodily sensations and states can influence our cognitive perceptions and judgments.

Holding a heavy rather than light clipboard makes job candidates seem more important, for example. (any example from the bullets in this section would apply here).

Module 21 Review

Circle the correct answers below to see if you have mastered the basics.

1. Which of the following senses receives information from the environment and does not pass signals through the thalamus to process?
   a. taste
   b. vision
   c. hearing
   d. smell
   e. body positioning

2. Which of the following sensations are detectable by skin?
   a. touch
   b. warmth
   c. cold
   d. pain
   e. all of the above

3. Your toddler refuses to eat the spinach and brussel sprouts that the rest of the family eats for dinner. The theory that over many generations, your toddler inherited the aversion to these bitter tastes would most likely be suggested by
   a. a cognitivist.
   b. an evolutionary psychologist.
   c. a behaviorist.
   d. a humanist.
   e. a psychoanalyst.

Please do not distribute or post answers online
4. In order to receive a 10 on balance beam, the Olympic gymnast is best served by a highly functioning
   a. vestibular sense.
   b. kinesthetic nervous system.
   c. sense of smell.
   d. transduction.
   e. ganglion cell.

5. Which of the following is true about pain?
   a. No single stimulus produces pain.
   b. Pain diminishes when neurotransmitters such as endorphins are released.
   c. The brain can create pain.
   d. We edit our memories of pain.
   e. All of the above are true.

✓ Check Yourself

Now that you have mastered the basics, work through the problems below to see if you can synthesize, evaluate, and analyze what you have learned.

Two psychologists are discussing the processes and theories of sensation. One psychologist is adamant that the trichromatic theory of vision, the place theory of audition, and the kinesthetic system are the most useful in explaining human behavior. His companion believes strongly that the opponent-process theory of vision, the frequency theory of audition, and the vestibular system are the most useful in explaining human behavior.

Using your knowledge of Unit IV and specific terminology, make the case for each psychologist’s argument, explaining the theories and their application to human behavior.

The complete answer will explain each of the four theories and two systems using terminology from the Unit.
Check Yourself

Now that you have mastered the basics, work through the problems below to see if you can *synthesize, evaluate, and analyze* what you have learned.

Rodrigo is asleep in his home when a potential intruder begins to break into Rodrigo’s home. Discuss how the following would impact Rodrigo’s discovery of the potential intruder:

• **signal detection theory:**
  Rodrigo’s ability to detect break in noises (shattering glass, bumping, doors opening, footsteps, and so on) would depend on his psychological state—his experience (had he lived through a previous break in?), his expectations (does he live in a neighborhood with high rates of break ins?), his motivation (is he sleeping? distracted? busy?), and his level of alertness (does he have earphones in? is the television on loudly?).

• **visual receptors:**
  Rodrigo’s ability to detect the intruder’s presence might depend on the health of his visual receptors, the rods and cones. If the house is dark, Rodrigo’s rods would have to do the detecting; he would need a lighted house to see better with his cones.

• **auditory receptors:**
  Rodrigo’s ability to detect the intruder might depend on the health of his auditory receptors—the hair cells on the basilar membrane. If he has sensorinueral hearing loss he may have damaged hair cells and not be able to receive the sounds and process the intruder.

• **interposition:**
  Rodrigo’s monocular cue of interposition will help him detect if the intruder is in front of or behind furniture or a door opening and he will be able to detect depth and how far away the intruder might be from him.

• **perceptual set:**
  Rodrigo will see what he expects to see, so if he assumes it is an intruder because he lives in a rough neighborhood or has suffered previous break ins, he may tackle the person, only to find out it is his son coming home late from a school function.

Please do not distribute or post answers online
Before You Move On

Use the checklist below to verify your understanding of the unit’s main points.

Do I know the basic principles of sensory transduction?
- absolute threshold
- difference threshold
- signal detection theory
- sensory adaptation

Do I know the physical nature and mechanisms of light and sound waves?

Can I identify the structures and functions of the eye, nose, ears, tongue, skin and kinesthetic and vestibular systems?

Do I know the brain structures involved in vision, audition, gustation, olfaction, touch and body position?

Do I know the characteristics of the two types of hearing loss?

Do I know the Gestalt principles of grouping sensory input?

Do I understand the ways in which binocular and monocular cues are involved in depth perception?

Do I understand how psychological, biological and socio-cultural influences can impact sensation and perception?

Do I understand the mechanisms and differences between top-down and bottom-up processing? Can I further point out examples of both in everyday situations?

Do I understand the power and limitations of attention?

Can I challenge common beliefs in ESP with concrete scientific arguments?

Do I know the historical researchers that influenced the study of sensation and perception?
- Fechner
- Hubel
- Weber
- Wiesel
- Helmoltz
- Hering