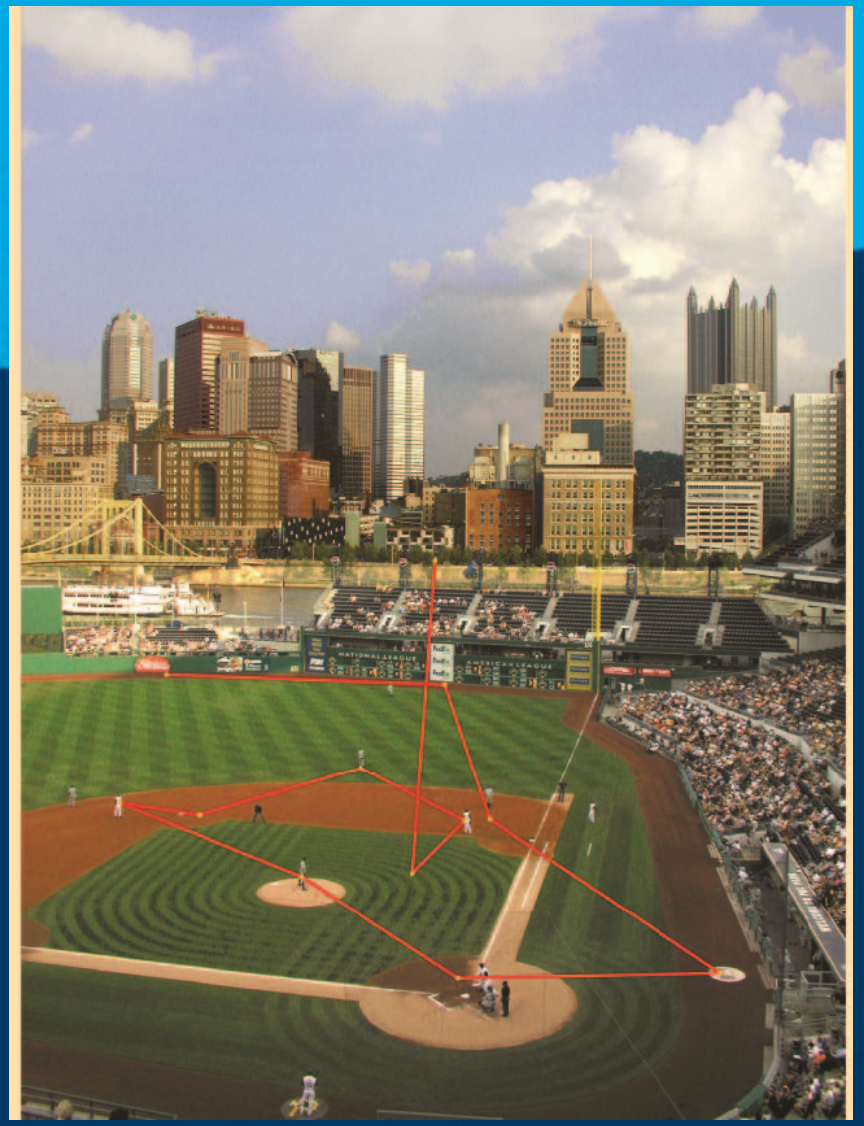


Chapter 6

Visual Attention

Icebreaker: Visual Attention Interview

1. The class will be broken up into pairs of students.
2. Each pair of students will interview each other about the daily tasks they perform each day such as cooking, commuting, or working.
3. Then, each pair will relay information to the rest of the class about daily tasks that require a lot of attention and those that don't.
4. Consider the difference between the tasks that warrant high levels of attention and those that can be done on auto-pilot.

Chapter Objectives (1 of 2)

06.01 Describe early attention experiments using the techniques of dichotic listening, precueing, and visual search.

06.02 Describe how we scan a scene by moving our eyes, and why these eye movements don’t cause us to perceive the scene as smeared.

06.03 Describe four different factors that determine where we look and the experiments that support each factor.

06.04 Describe how attention affects physiological responding.

Chapter Objectives (2 of 2)

06.05 Understand what happens when we don't attend, and when distraction disrupts attention.

06.06 Describe how disorders of attention teach us about basic mechanisms of attention.

06.07 Understand the connection between meditation, attention, and mind-wandering.

06.08 Describe how head-mounted eye tracking has been used to study how infants learn the names of objects.

Scanning a Scene (1 of 2)

Visual scanning – looking from place to place

- Fixation
- Saccadic eye movement

Overt attention involves looking directly at the attended object.

Covert attention refers to attention without looking.

Scanning a Scene (2 of 2)

Kevin Mazur/WireImage/Getty Images

What Directs Our Attention? (1 of 2)

Characteristics of the scene:

- Visual salience - areas of stimuli that attract attention due to their properties
- Color, contrast, and orientation are relevant properties.

Attentional capture

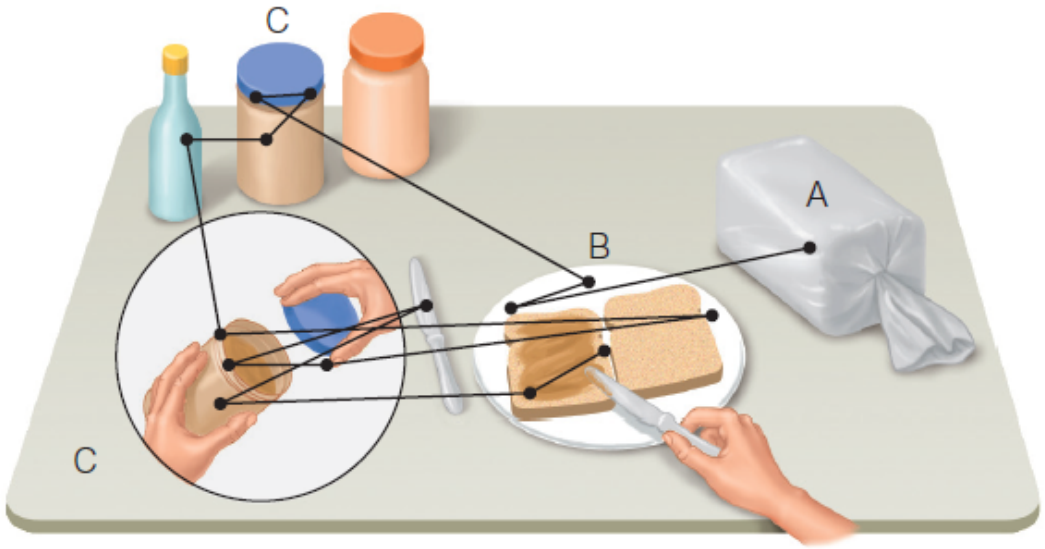
What Directs Our Attention? (2 of 2)

Ales Fevzer/Corbis

Task-Related Knowledge

Determine where people look as they carry out tasks.

The timing of when people look at specific places is determined by the sequence of actions involved in the task.



What Are the Benefits of Attention?

Spatial attention: attention to specific locations

Experiment by Posner et al. (1978)

- Observers looked at a fixation point.
- Precueing with an arrow indicated on which side a stimulus was likely to appear.
- Stimuli appeared that were consistent (valid trial) or inconsistent (invalid trial) with the cue.
- Task was to push button when a target square was seen.

Results of Posner experiment showed that observers responded fastest on valid trials.

Posner believed these results showed that information processing is most efficient where attention is directed.

Attention Speeds Responding

Experiment by Egly et al.

- Observer views two rectangles.
- Cue signals where target may appear.
- Task: to press button when target appeared.
- Results:
  - Fastest reaction time was at targeted position.
  - “Enhancement” effect for non-target was within the target rectangle.

Attention Can Influence Appearance

Experiment by Carrasco et al.

- Observers saw two grating stimuli with either similar or different contrast between the bars.
- Task was to fixate on center point between gratings and indicate orientation of bars with higher contrast.
- Small dot was flashed very quickly on one side before gratings appeared.

Carrasco results:

- When there was a large difference in contrast, the dot had no effect.
- When the contrast was the same, observers were more likely to report that the grating preceded by the dot had higher contrast.
- Thus, the shift of attention led to an effect on perception.

Attention Can Influence Physiological Responding (1 of 2)

O'Craven (1999)

- Subject attended to the house or face shows that attending to the moving or stationary face caused enhanced activity in the FFA and attending to the moving or stationary house caused enhanced activity in the PPA

Datta and DeYoe (2009)

- Attention maps show that directing attention to a specific area of space activates a specific area of the brain.

Womelsdorf (2006)

- Showed that attention can cause a monkey's receptive field to shift toward the place where the attention is directed

Attention Can Influence Physiological Responding (2 of 2)

Attention also causes changes in the relationship between activity in different areas of the brain.

- Local field potential

Bosman and colleagues' research:

- Communication through coherence

Attention and Experiencing a Coherent World

Binding: process by which features are combined to create perception of coherent objects

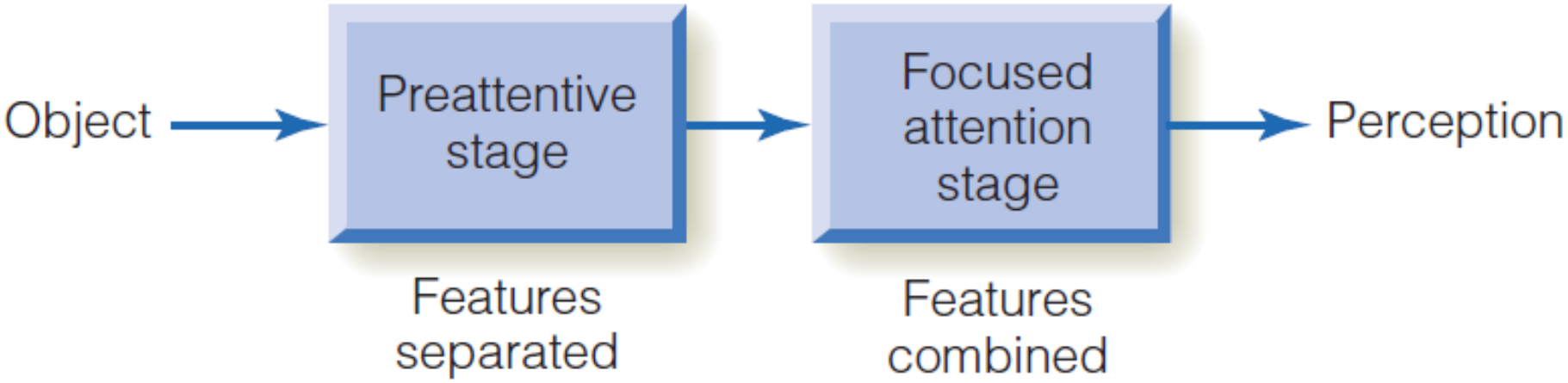
Binding problem: features of objects are processed separately in different areas of the brain

So, how does binding occur?

Feature Integration Theory (1 of 2)

Preattentive stage: features of objects are separated

Focused attention stage: features are bound into a coherent perception



Feature Integration Theory (2 of 2)

Illusory conjunctions: Features that should be associated with an object become incorrectly associated with another.

Experiment by Triesman & Schmidt

- Stimulus was four shapes flanked by two numbers.
- Display flashed briefly, followed by a mask.
- Task was to report numbers first followed by shapes at four locations.

Triesman & Schmidt results:

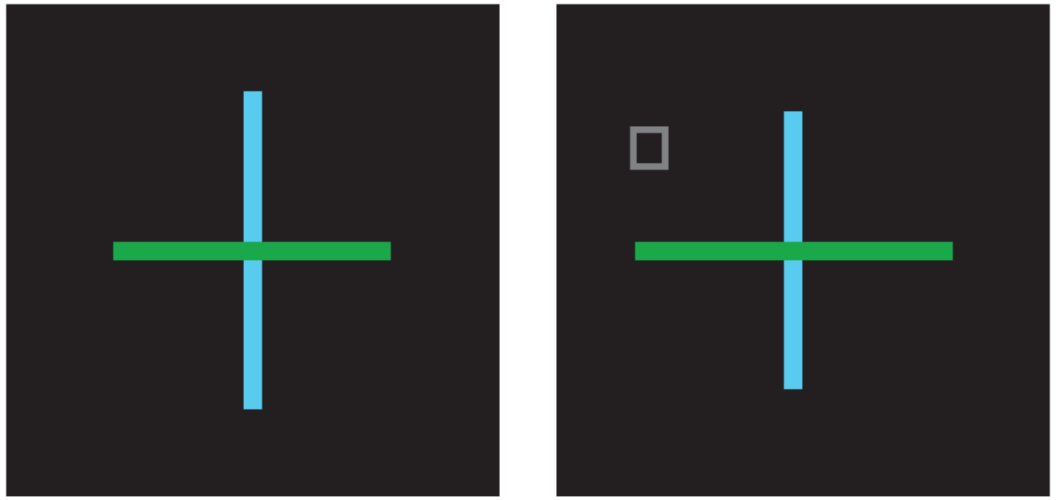
- Incorrect associations of features with objects occurred 18% of the time.
- Asking observers to focus on the target objects eliminated this effect.

Balint's syndrome: Patients with parietal lobe damage show lack of focused attention results in incorrect combinations of features.

What Happens When We Don’t Attend?

Inattentional blindness

- Subjects can be unaware of clearly visible stimuli if they aren’t directing their attention to them.



Change Blindness

- Observers were shown a picture with and without a missing element in an alternating fashion with a blank screen.
- Results showed that the pictures had to alternate several times before the change was detected.
- When a cue is added to show where to attend, observers noticed change more quickly.
- Change blindness also occurs for film shots.
- People are “blind” to the fact that they experience change blindness.
- Real objects in the environment change with some type of movement, which is why we normally don’t experience change blindness.

Is Attention Necessary for Perceiving Scenes?

Li et al. (2002)

- Focus on center of the screen
- Strings of letters flashed in the center of the screen
  - All the same (TTTTT) or one different (TTTLT)
- Scene or colored disc flashed in the periphery
- Three conditions:
  - Central task only: “Were all the letters the same?”
  - Peripheral task only: “Animal?” “Red/green or green/red?”
  - Dual task: Both central and peripheral

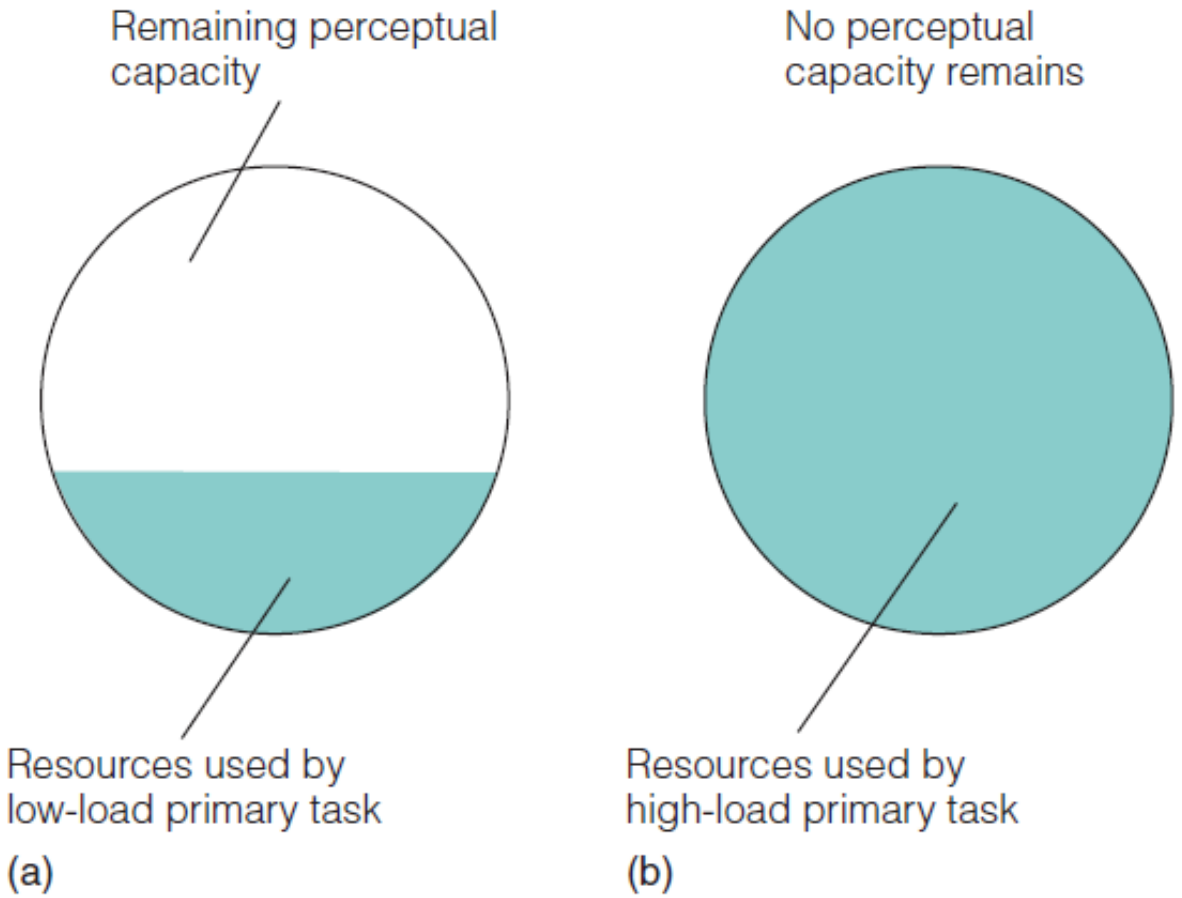
Distraction (1 of 2)

Task-irrelevant stimuli are stimuli that do not provide information relevant to the task.

Forster and Lavie (2008)

- Load theory of attention
- Perceptual capacity
- Perceptual load
- Low-load tasks

Distraction (2 of 2)

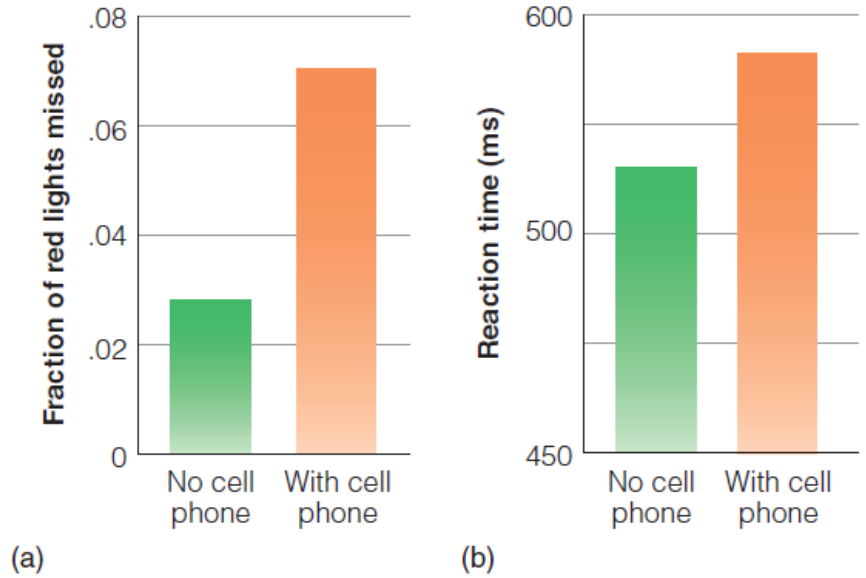


Distracted Driving

Driving requires constant attention.

Strayer and Johnston research (2001) cell phone use and driving

- Anything that distracts attention can degrade driving performance.



Attention and Perceptual Completion

Perceptual completion is the perception of an object as extending behind occluding objects.

Habituation: one stimuli is presented to an infant repeatedly and the infant's looking time is measured.

- Dishabituation is an increase in looking time when a stimulus is changed.

Discussion Questions (3 of 3)

1. Compare and contrast attention and distraction.
2. Describe situations that require attention such as driving or crossing the street?
3. Consider the negative side effects or hazards that can be created by distraction.

Chapter Summary (1 of 2)

Now that the lesson has ended, you should have learned how to:

- Describe early attention experiments using the techniques of dichotic listening, precueing, and visual search.
- Describe how we scan a scene by moving our eyes, and why these eye movements don’t cause us to perceive the scene as smeared.
- Describe four different factors that determine where we look and the experiments that support each factor.
- Describe how attention affects physiological responding.

Chapter Summary (2 of 2)

- Understand what happens when we don’t attend and when distraction disrupts attention.
- Describe how disorders of attention teach us about the basic mechanisms of attention.
- Understand the connection between meditation, attention, and mind-wandering.
- Describe how head-mounted eye tracking has been used to study how infants learn the names of objects.