Visual imagery
Ch 10

Learning Objective Topics

• Imageless Thought Debate
• Imagery vs. Perception
• Imagery and the brain
• Cognitive Maps
Visual Imagery

- Historical question: Imageless-thought debate
- Is thinking possible without images?
- Can we even study imagery?

Imagery and the Cognitive Revolution

- Paivio (1963, 1965)
  - Memory for words that evoke mental images is better than those that do not
  - Paired associates task
  - Conceptual-peg hypothesis: nouns hang on mental images
  - How does this apply to the dual coding theory of memory?
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Visual Imagery

- Is imagery different from perception?
  - Do they share the same mechanisms?
Kosslyn’s Expmts

• Mental scanning
  • Mentally search for another part of boat
  • How long to mentally travel between 2 points on a map

Try it: Mental Scanning

• Partners:
  • Imagine a map of the U.S.
  • Mentally focus on the locations of Pennsylvania, Florida, and California.
  • Imagine a dot moving from Pennsylvania to Florida. Note how long it takes to imagine this movement.
  • Imagine the dot moving from Pennsylvania to California. Again, note how long it takes to imagine the movement.
Kosslyn’s Expmts

- Size in visual field
  - Can you see detail on animal depending on small/large image
- Mental-walk task
  - Move to object; when does image overflow?

Conclusion: Spatial correspondence between perception and imagery

Let’s Try It!

- Reaction times:
  - Imagine an elephant and a cat standing beside each other
  - Does the elephant have tusks?
  - Does the cat have whiskers?

- Imagine a rabbit and a ladybug standing beside each other
  - Does the ladybug have antennae?
  - Does the rabbit have a pink nose?
Kosslyn vs. Pylyshyn

**Spatial/Depictive Representation (Kosslyn)**
- Imagery is represented by spatial mechanisms
- Imagery is similar to perception

**Propositional Representation (Pylyshyn)**
- Spatial representation is an epiphenomenon
  - Accompanies real mechanism but is not actually a part of it
- Imagery is propositional - Can be represented by language
  - Tacit knowledge: Unconsciously use knowledge to make judgment

Demonstration

- Write a description of an object (don’t name it)
- Trade with partner.
- Trade back and draw your picture
- How do the descriptions differ as far as the information that they contain?
- How do the concepts of propositional representations and depictive representations apply to this demonstration?
Response to Tacit-Knowledge Explanation

- Finke & Pinker (1982): Does arrow point to a dot?
  - Took longer for dots farther away (support for imagery)

Why is this not tacit knowledge?

Imagery influenced by perception

- Perky (1910)
Perception influence by imagery

- Farah (1985)

Imagery vs. Perception

- What are the similarities vs. differences?
- Can we develop a comprehensive theory, model, or statement to encompass both the overlap and separation between imagery and perception?
- What is learned about the importance of imagery in human cognition?
- How would our thinking change if we could not form mental pictures?
- Would our perception change if we could not form mental pictures?
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Imagery and the Brain

- What can we conclude from this?

Activity in striate cortex
LeBihan et al., (1993)
fMRI Evidence

- Ganis and coworkers (2004)
- Perception > Imagery
  - Complete overlap of activation by perception and imagery in front of the brain
  - Differences near back of the brain – visual receiving areas
- What can we conclude?

TMS

- What does it do?
- Why do we need it for the imagery debate?
Imagery and the Brain

- Kosslyn and coworkers (1999)
  - TMS to visual area of brain during perception and imagery task
  - Response time slower for both
  - Brain activity in visual area of brain is necessary for both perception and imagery

- What can we conclude?

M.G.S.

- Part of right occipital lobe removed
- Mental walk task: how far before overflowed
  - Before surgery: 15 ft
  - After surgery: 35 ft
- Also had deficits in perception.
- What can we conclude?
Dissociations between Imagery and Perception

- Guariglia and coworkers (1993)
  - Brain-damaged patient- occipito-parietal
  - Can perceive
  - Neglect for Imagery (imagery only on one side)
- R.M.
  - Damage to occipital and parietal lobes
  - Could draw accurate pictures of objects in front of him
  - Could not draw accurate pictures of objects from memory (using imagery)
  - Is this a double dissociation?
  - What would we conclude if we only had these two cases?

Dissociations between Imagery and Perception

- C.K.
  - Inability to name pictures of objects, even his own drawings, in front of him
  - Could draw objects in great detail from memory (using imagery)
  - Is this a double dissociation?
  - What would we conclude from this evidence?
How can we make sense of this?

• Maybe mechanisms partially overlap

• Perception: bottom-up – needs both “Higher” and “lower” visual centers

• Imagery: top-down – needs just “higher” visual centers

• Higher = top down processing/interpretation – what brain areas?
• Lower = bottom up – “visual receiving area” – what brain areas?
• Blindsight

• Explain this chart to your neighbor
• Why doesn’t it work for M.G.S. (removing part of visual cortex – decreased image size)?
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Cognitive maps

- How far is it to the library from here?
- Cognitive map:
  - Mental representation of the environment
- Research questions
  - How do we create mental maps from verbal descriptions?
  - How do we represent visuo-spatial information?
  - Are the cognitive maps accurate, and if not what typical errors do we make?
You are at the Jefferson Plaza Hotel, where you have just taken the escalator from the first to the second floor. You will be meeting someone for dinner in a few minutes. You now stand next to the top of the escalator, where you have a view of the first floor as well as the second floor. You first look directly to your left where you see a shimmering indoor fountain about 10 yards beyond a carpeted walkway. Though you cannot see beyond the low stone wall that surrounds it, you suppose that its bottom is littered with nickels and pennies that the hotel guests have tossed in. The view down onto the first floor allows you to see that directly below you is a darkened, candle-lit tavern. It looks very plush, and every table you see seems to be filled with well-dressed patrons. Looking directly behind you, you see through the window of the hotel’s barbershop. You see an older gentleman, whose chest is covered by a white sheet, being shaved by a much younger man. You next look straight ahead of you, where you see a quaint little gift shop just on the other side of the escalator. You’re a sucker for little ceramic statues, and you squint your eyes to try to read the hours of operation posted on the store’s entrance. Hanging from the high ceiling directly above you, you see a giant banner welcoming the Elks convention to the hotel. It is made from white lettering sewn onto a blue background, and it looks to you to be about 25 feet long.

Answer the following

Now imagine you have turned to face the barbershop.

1. What is above your head?
2. What is below your feet?
3. What is ahead of you?
4. What is behind you?
5. What is to your right?
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Creating a mental map

• Franklin & Tversky (1990)
  • Presented 10 scenes each with 5 objects
  • Specify objects in several locations
  • DV: how long to respond to question

• Results:
  • Fastest to answer “above” or “below”
  • Little longer to answer “ahead” or “behind”
  • Slowest to answer “left” or “right”

• Conclusions:
  • Knowledge vs. imagery
  • Mental models have biases to “up” or “down”
Relative position

• Which city is farther west – San Diego, CA or Reno, NV?
• Which city is farther north – Philadelphia, PA or Rome, Italy?