Visual Imagery

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Questions about Imagery

What is the relation between imagery and perception?

How are images represented?

How can we use images to improve memory performance?

How are images used for long-term retention?

Dual Coding Hypothesis
(Paivio)
• Imagery Code
• Verbal Code

Relevant evidence:
• Memory for abstract and concrete words
• Time required to encode in each system
• Effects of speed of presentation on code used
How are images related to perception?

Analog code
- Proposes that images are closely related to perception and perceptual processes
- Images are analogous to our perception of physical objects

Propositional code
- Proposes that images are closely related to language and language-like abstract coding
- Abstract representations with no physical resemblance to the objects stored

Evidence relating images and perceptual processes
- Mental rotation
- Representation of physical distances
- Representation of shape
- Effects of interpretation and other knowledge
- Brain imaging and case studies

Mental Chronometry
- Shepard (Rotation of letters)

Time required to mentally rotate image is reflected in reaction time to respond in this task
Mental rotation of objects
(Shépard & Metzler, 1971)

Rotating objects in the picture plane or the depth plane

Scanning Mental Images
Kosslyn (1978)
Mental Travel
Effects of distance
Effects of complexity
   Imagined impediments
   Number of intervening cities on a route
Reaction time increases with distance “traveled”

Properties of Images
Imagine an elephant that completely fills each of these squares

Time to create each image
Effects of image size on access to detail information

Are images coded differently than other memories?
Problems with demand characteristics of imagery tasks
Experimenter expectancy effects
Propositional versus Analog Codes as the basis for imagery
• Differences between pictures in the world and images in memory
• Role of inferences in images: the case for propositional codes
Cognitive Maps

Are maps mental images (pictures) or are they more abstract representations?

Relevant evidence:
- Effects of heuristic processes on mental maps
  - 90° angle heuristic
  - Alignment heuristic
  - Rotation heuristic

90° Angle Heuristic
(and other spatial distortions)

Alignment Heuristic

Influence of verbal processing and other knowledge on cognitive maps

Interpretation of regularization errors
Creation of maps from verbal descriptions
Influence of non-visual and non-spatial knowledge on cognitive maps
- Numbers of cities represented on a road
- Landmark effects
  - Travel to a landmark seems shorter than travel from the landmark to another location
Brain & Imagery: Evidence from Case Studies

Removing part of visual cortex reduced the size of images patient M.G.S. could construct. Reduced “capacity” for visual-spatial representations (Farah et al., 1993)

Damage to perceptual areas also damages related visual coding (e.g., use of color in images)

Unilateral neglect cases (left parietal damage)

Imagery and Brain: Shared brain areas & activity

Ganis, Thompson, & Kosslyn (2004)

Imagery is not identical to perception

Evidence based on dissociations

Normal perception but impaired imagery

R.M.: damage to occipital and parietal lobes; intact sensory processing but unable to draw images from memory (Farah et al., 1988)

Normal imagery but impaired perception

C. K.: unable to recognize images or objects, but able to draw images from memory (Behrmann et al., 1994)
Using Images to Improve Memory

Method of Loci
Method of Loci
• Memorize a walk through a familiar place
• Visit specific locations (loci) in the same sequence on the imaginary walk
• Associate new information with each location on the walk
• Take the walk and retrieve each thing to be remembered as you visit each location
Common technique used by poets, storytellers, and orators in ancient times

Pegword Technique
Like method of loci, but an ordered list of words is used instead of a series of physical locations
Importance of the use of imagery to connect new information to the peg words
Sample Pegword System

One is a BUN    Six is STICKS
Two is a SHOE   Seven is HEAVEN
Three is a TREE Eight is a GATE
Four is a DOOR  Nine is a LINE
Five is a HIVE Ten is a HEN

Non-Imagery Mnemonics

Acronyms: First letter represents a word in a to-be-remembered sequence
- ROY G. BIV (colors of the rainbow)
- RICE (treatment for a sprain)

Meaningful sentences where first letter of each word represents to-be-remembered information
- Every Good Boy Deserves Favor (Music notes on a Treble Clef Staff)
- On Old Olympus’ Towering Tops, A Finn And German Vault And Hop (12 cranial nerves)

Must images be bizarre to be effective?

Wollen, Weber, & Lowry (1972) presented 4 types of images to use as mnemonic aids
- 2 separate images that were not bizarre
- 2 separate images that were bizarre
- 2 interacting images that were not bizarre
- 2 interacting images that were bizarre

Interacting images (those that form a unit or chunk) improved memory
Bizarreness alone did not improve the ability to recall
What do mnemonic systems tell us about “ordinary” memory function?

Importance of organization
Importance of deep, meaningful encoding
Mnemonic associations are self-generated
Interactive images illustrate the value of chunking
Encoding includes association with a reliable retrieval cue that will be available at test