

9.65 April 5, 2004 Visual Knowledge HANDOUT

Note: Quiz 2, covering everything since the last quiz, is on Wednesday.

- I. What is a mental code?
- II. Imagery as a mental code
 - Brief history
 - A. What is imagery for?
 - B. Relation of imagery and perception
 - C. Imagery and the brain
 - D. Why have more than one mental code?
- III. Memory for pictures: Boundary extension

I. What is a "mental code"?

-a **mental code** is a hypothetical code used by the mind-brain to represent, store, and transform information: transforming the information includes the processes we call "thinking."

-Note that a mental code has two roles:

- 1) to make some information easily available
- 2) to serve as an index to other information: e.g., holding words in an acoustic code in STM

II. IMAGERY as a candidate for a major code

History of ideas about imagery, in brief:

Greeks

Thoughts are faint mental images

Bishop Berkeley

Triangles

Jerry Fodor

Images are ambiguous, thoughts aren't

Zenon Pylyshyn

The Homunculus problem: who looks at the images?

Structural descriptions, not dense arrays

A. What is imagery for ?

Try answering these questions:

Which is larger, a golf ball or a tangerine?

A tiger or a Great Dane dog?

Is the hot water tap on the L or R?

Does a tractor have two big wheels in front?

Which is darker (on the outside), a cucumber or a watermelon?

-Did you feel that you used imagery to answer any of these?

So: One thing that imagery seems to be used for:

-Retrieving subtle spatial or perceptual information from memory:

(i) that has not been stored as such and (ii) that can't be deduced easily from other information.

Other possible uses for imagery:

-planning movements

-understanding descriptions (e.g., form a mental model)

-maintaining an image of the immediate environment?

-solving certain kinds of problems

-planning layouts (e.g., artist)

-getting around in the dark

-route-planning

-MENTAL ABACUS: highly skilled abacus users are faster in doing arithmetic than someone with a hand calculator: AND can use a "mental abacus." Stigler (1984, **Cognitive Psychology**, p. 145 ff.)

Evidence for mental abacus: recognizing intermediate abacus layouts

B. Relationship of visual imagery and perception

-Selective interference: The Brooks experiment

-Spatial or visual interference? Baddeley's experiment: Mental matrix task with two types of interfering tasks:

-blindfolded subject and pendulum (spatial, not visual)

-detect change in brightness of a stationary light (visual, not spatial)

Constraints on imagery: Like perception, it has some limitations:

(1) Visual angle of mind's eye (Kosslyn, 1978)

INTERPRETATION: K: there's a specialized imagery ability that has constraints somewhat like those of vision itself, in this case with a limited "angle" of view. (Lab 2)

(2) Imagery "acuity"

-rabbit beside an elephant versus beside a fly:

-Image size can be changed: zooming.

(3) Imagery "scanning" [see Reisberg chapter]

-memorize map with places on it

-scan from designated start point to a place named by the experimenter

-critics: "demand characteristics" of experiment

(4) Mental rotation (Shepard, etc.: See Reisberg. Understand what a linear RT function tells us.)

(5) Inspecting one's image to read off information, like perception:

Weber and Castleman exercise in Lab 2.

(6) Limited capacity of imaging

(In class:) Try task in which you mentally create an image in an imaginary grid of large squares. When I say North, draw a mental line upward on the grid, one unit, when I say Northeast, draw one diagonally from that point to the next square up and over to the right, etc. Okay start: North, northeast, west, south, west, west, south,

west, northeast, west, southwest, east. Now draw it [back of handout].

C. Imagery and the brain

Imagery and perception overlap in the brain:

(1) Kosslyn and his colleagues: imaging activates the primary visual areas in the cortex. Larger, smaller images generate larger, smaller areas of activation.

(2) O'Craven & Kanwisher (2001):

-Background: FFA (fusiform face area) and PPA (parahippocampal place area)

-task of viewing/imaging faces, or viewing/imaging places

(3) Lesions in the brain

-unilateral neglect patient (damage to R hemisphere, Bisiach and colleagues)

D. Why might it be advantageous to have more than one code?

1. Different time courses (short-term; longer-term)

2. Different information is available on the surface--so suitable to different tasks.

-analog versus digital clocks

3. Can take advantage of reduction in interference when performing dual tasks

-using fingers to tally "targets" when listening to a list

So: just how many mental codes do we have?

We don't know for sure.

CONCLUSION: Imagery is a well-established code distinct from at least one other code--although there continue to be skeptics.

III. Memory for pictures: Boundary extension

Even our immediate memory for pictures is schematic rather than literal (Intraub & Richardson, 1989).

Change blindness: It's difficult to spot a change in a picture, unless the change is central to your interpretation of the picture.

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