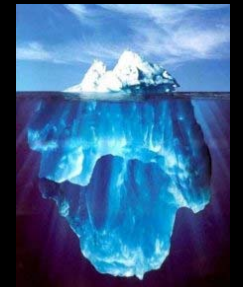


# Mental Imagery



STAR  
WARS



AMERICAN LITERATURE	TELEVISED HISTORY	THE WIZARD OF OZ	ST. PETER	OH "ME"	"KISSING MUSIC"
\$100	\$100	\$100	\$100	\$100	\$100
\$200	\$200	\$200	\$200	\$200	\$200
\$300	\$300	\$300	\$300	\$300	\$300
\$400	\$400	\$400	\$400	\$400	\$400
\$500	\$500	\$500	\$500	\$500	\$500

GREG



# Questions About *Visual Imagery*

- ❑ **Question 1:** Do visual images exist?
  - Introspection & some simple RT data.
- ❑ **Question 2:** Are images like pictures or words?
  - Scanning, rotating, and zooming visual images.
- ❑ **Question 3:** Does visual imagery engage the same processes used in vision?
  - Interactions between imagery & perception.
  - The neural bases of visual imagery.
- ❑ **Question 4:** How are images stored in memory?
  - Dual-coding (Pavio) & Image-file theory (Kosslyn).

# Effects of Imagery on Performance

*Kosslyn (1976)*

## Group 1: "Form an image of a cat"

*Does a cat have a head?*

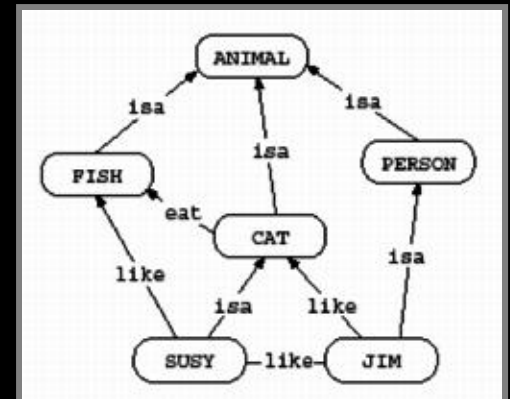
*Does a cat have claws?*



## Group 2: "Think about a cat"

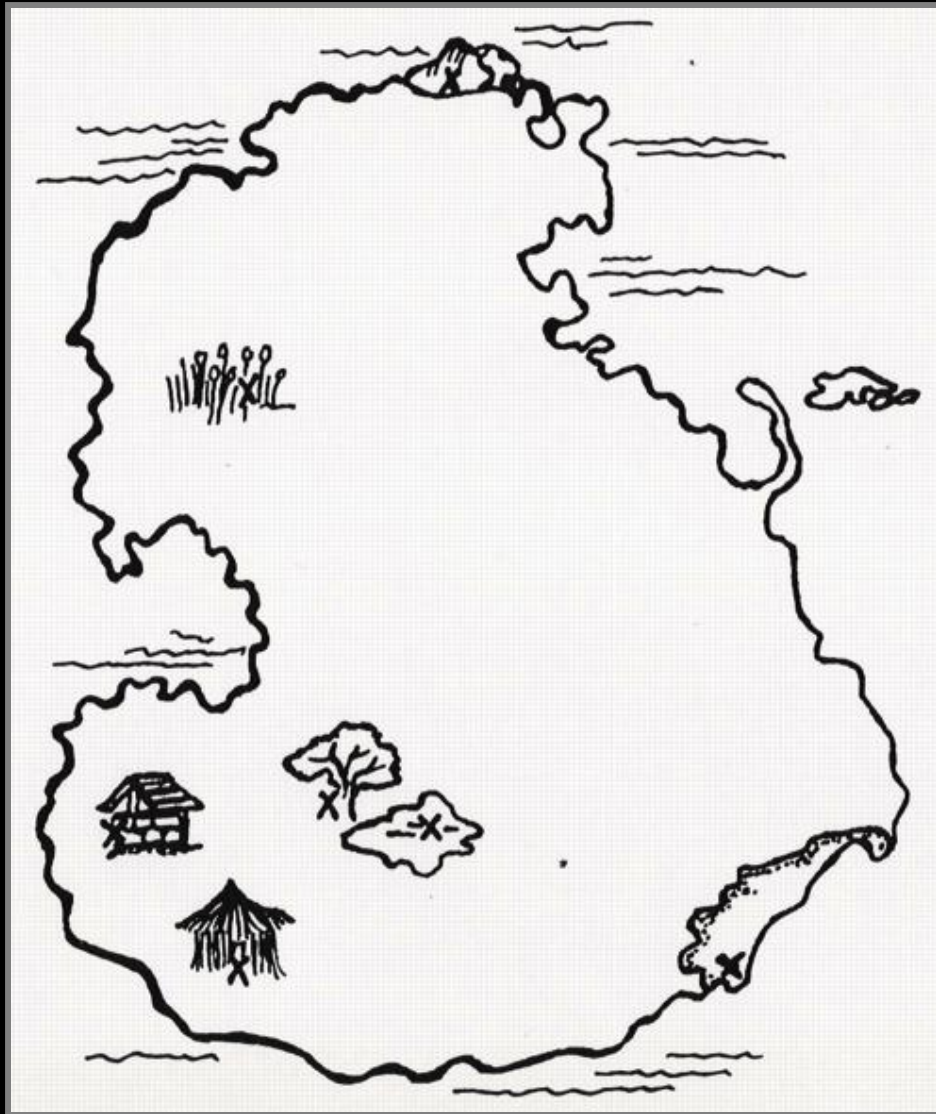
*Does a cat have a head?*

*Does a cat have claws?*



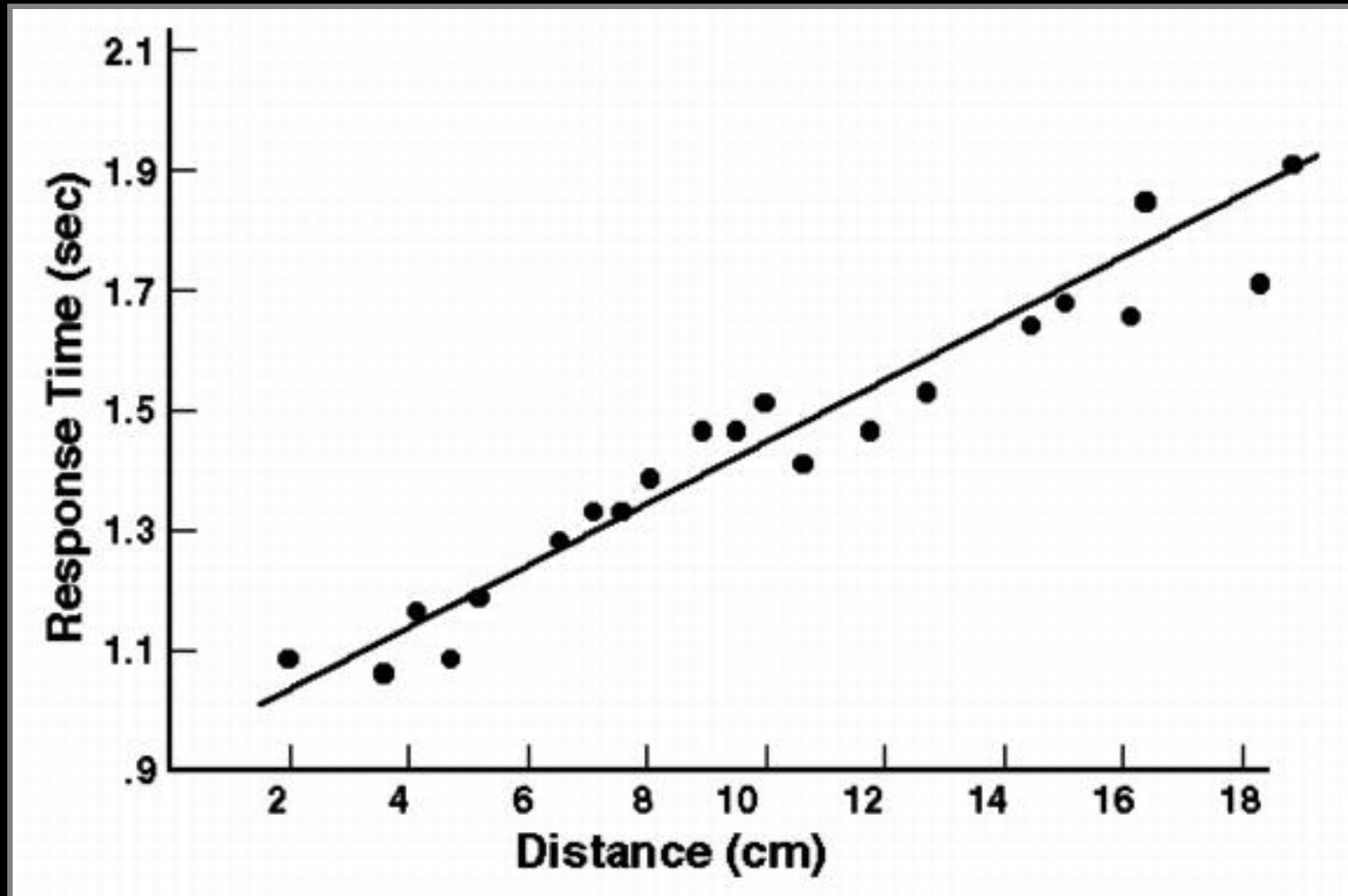
# Scanning Images: Mental Travel

*Kosslyn, Ball, & Reiser (1978)*



- Subjects memorize map along with specific landmarks.
- Then asked to imagine traveling between landmarks, pressing a button when they arrived at their destination.

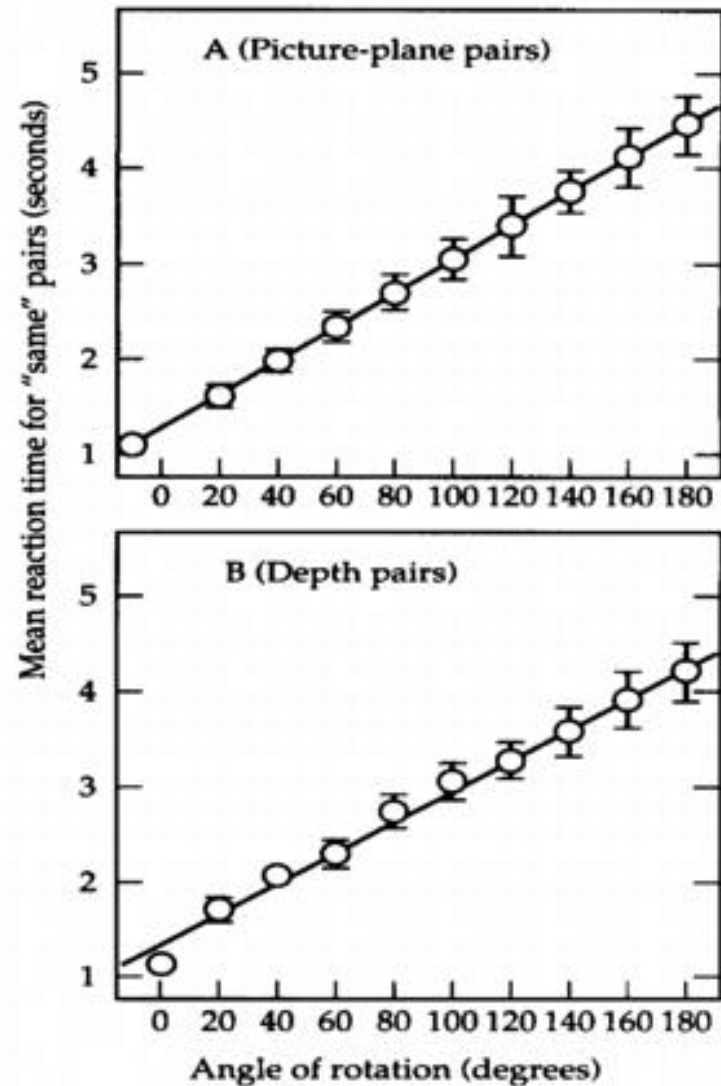
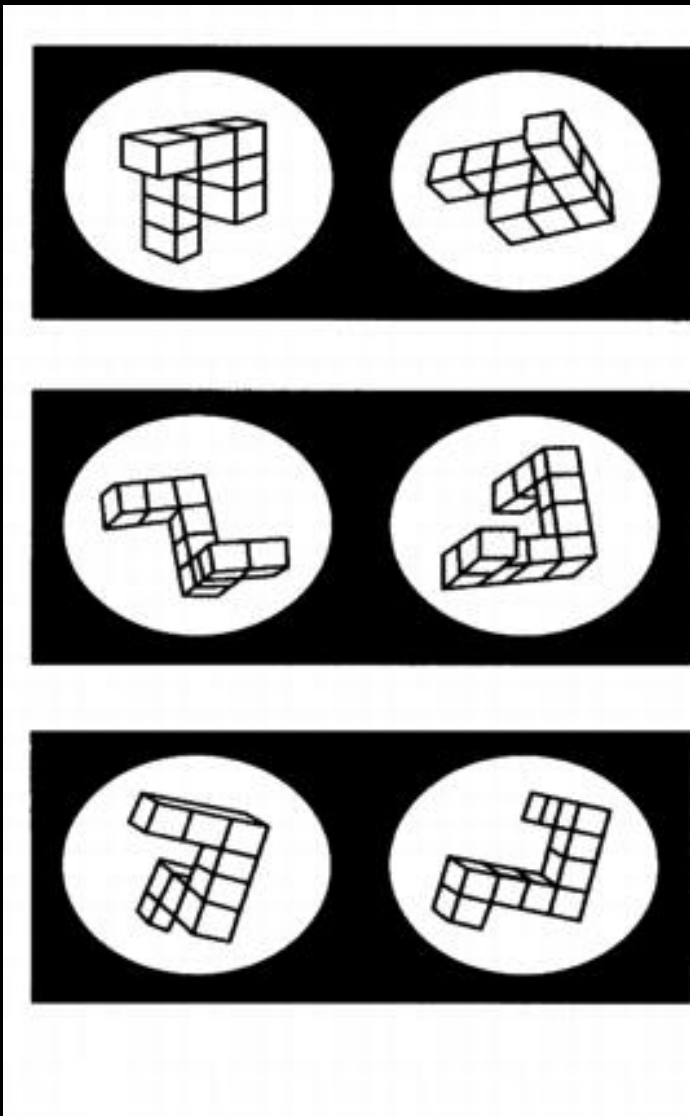
# Scanning Images: Mental Travel



*This linear relation suggests that people are operating on an image in a similar way to operating on a picture.*

# Mental Rotation (Shepard & Metzler, 1971)

*Same shape or different shape?*



# Mental Zooming (see Kosslyn, 1983)



- S's told to imagine a mouse next to *either* (a) an elephant or (b) a paper clip.
- Asked "Does the mouse have whiskers?"
- Subjects faster in the paper clip condition.

*Don't have to zoom the image as much!*

# Perception/Imagery Interactions: Interference Effects (Segal & Fusella, 1970)

- S's asked to detect a faint visual or auditory signal, while maintaining a visual or auditory image.

		<i>Percentage detections</i>				<i>Percentage false alarms</i>	
		<b>Visual signal</b>	<b>Auditory signal</b>			<b>Visual signal</b>	<b>Auditory signal</b>
<b>While visualizing</b>	<b>While maintaining an auditory image</b>	61%	67%	7.8%	3.7%		
	<b>While maintaining a visual image</b>	63%	61%	3.6%	6.7%		

***Interactions between imaging & perceiving suggest that the two activities share processes.***

# Perception/Imagery Interactions: Facilitation Effects (Farah, 1985)

*Can visualization pave the way for perception?*

Image

Percept

T



H

H



H

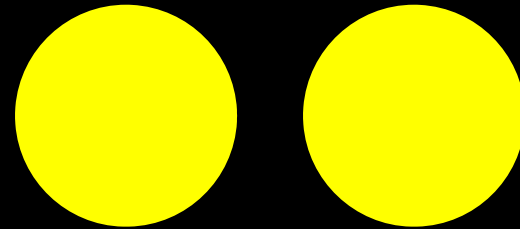
- Participants told to imagine an H or T.
- Then asked to identify a letter presented in noise.
- Identification was enhanced when imaging the target.

*Implications for Sports? Other activities?*

# Acuity Effects in Imagery

- **Visual acuity** is the ability to see fine detail.

## Two-Point Acuity

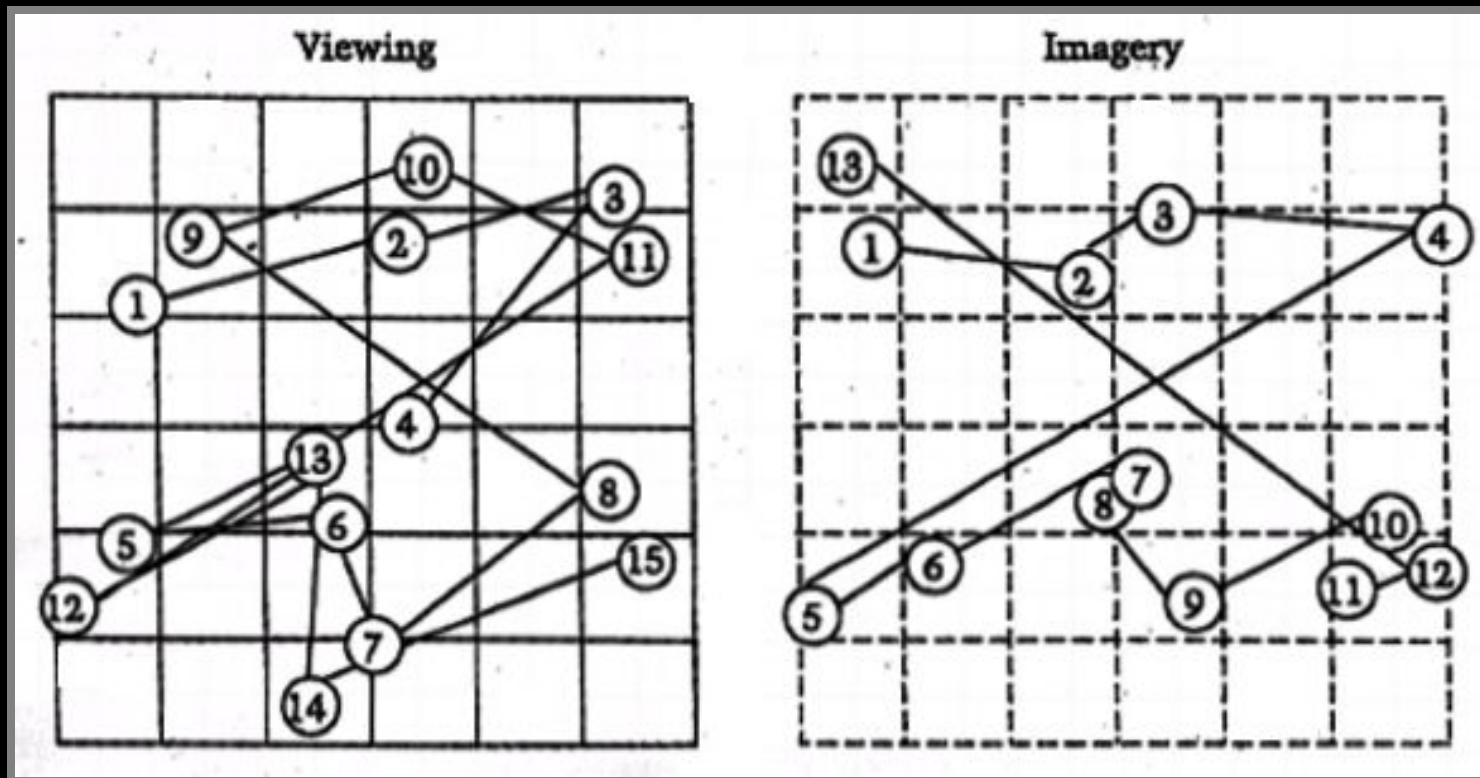


- Two-Point Acuity is much greater at the center of the visual field than in the periphery.
- Finke & Kosslyn (1980) asked S's to imagine two dots, then look away until they blurred together.

*Results showed high correspondence between acuity measured with real dots & imagined dots – suggesting that imagery is based on perception.*

# Eye Movements During Imagery

- Participants' eye movements recorded as they scanned real and imaged matrices & pictures.



*Eye movements & fixations when inspecting images are correlated with those used during perception.*

# Neural Basis of Visual Imagery

- **Activation studies (PET & fMRI)**

- **Lesion studies**

  - **Achromatopsia**

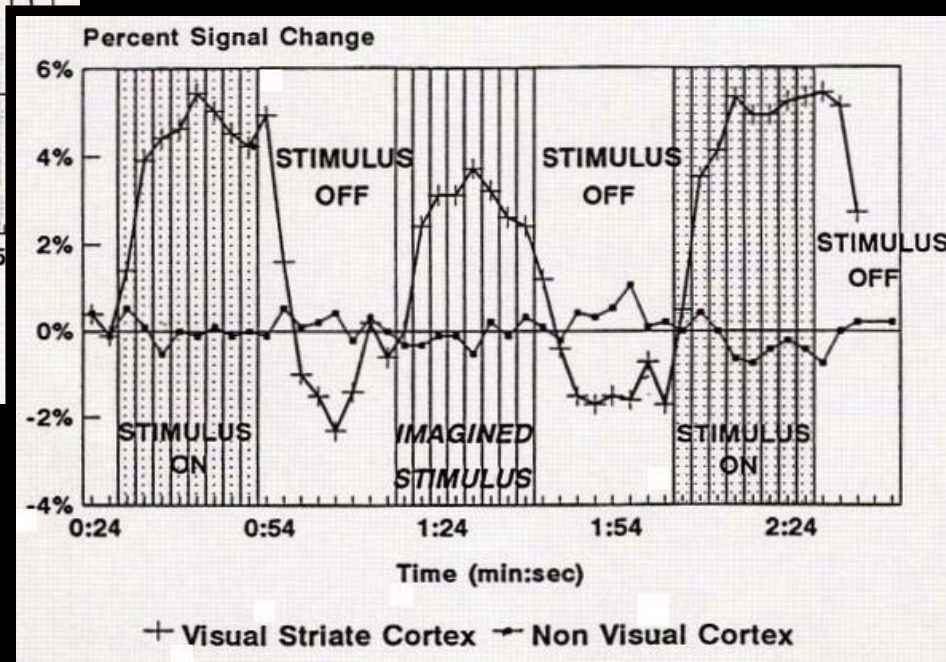
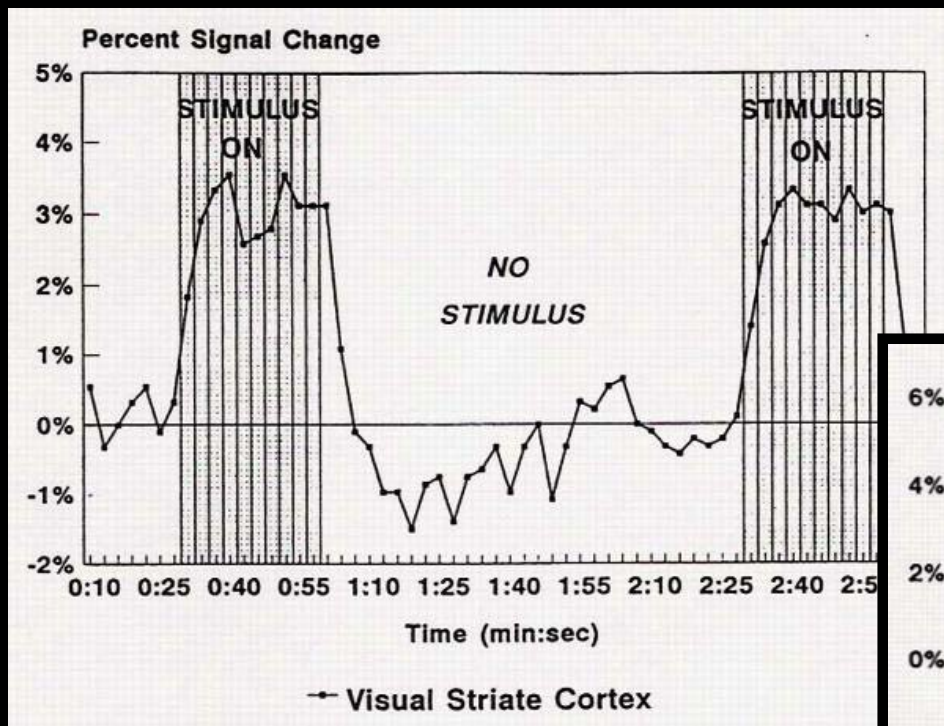
  - **What and where deficits**

  - **Attentional Neglect**

  - **Transcranial Magnetic Stimulation (TMS).**

# fMRI Studies

- Brain's activity recorded during perception and during imagery.



*Both perception and imagery activate the primary visual areas of the brain.*

# Achromatopsia

- Cortical color blindness...



- also eliminates ability to form color images.
- and the ability to answer questions about the color of common objects.

# What and Where Deficits

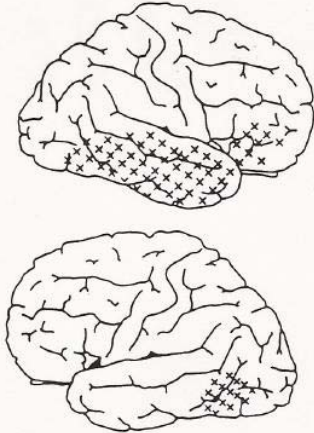
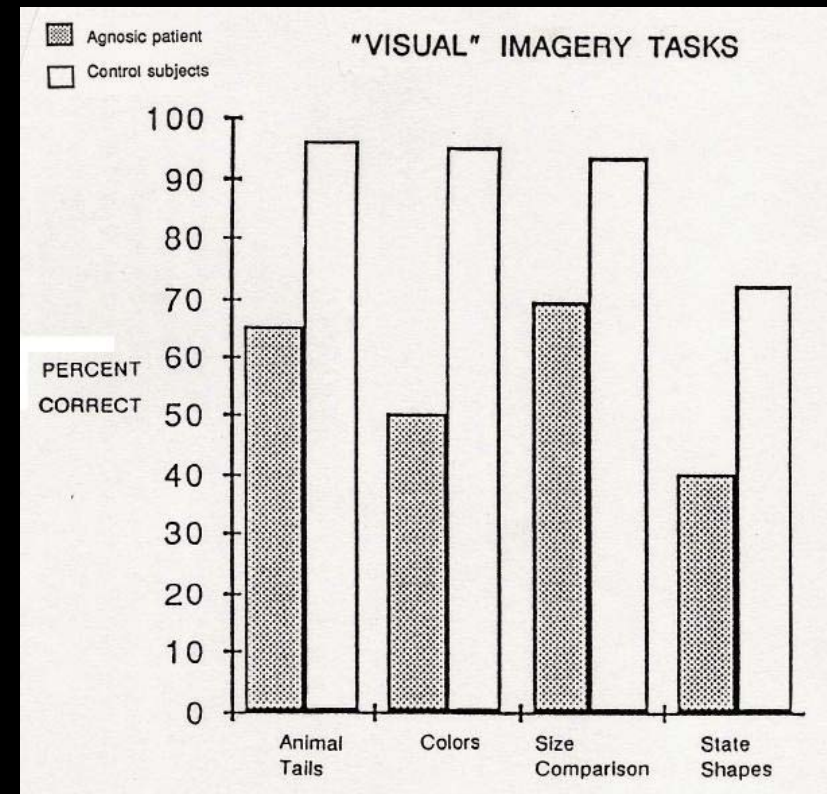
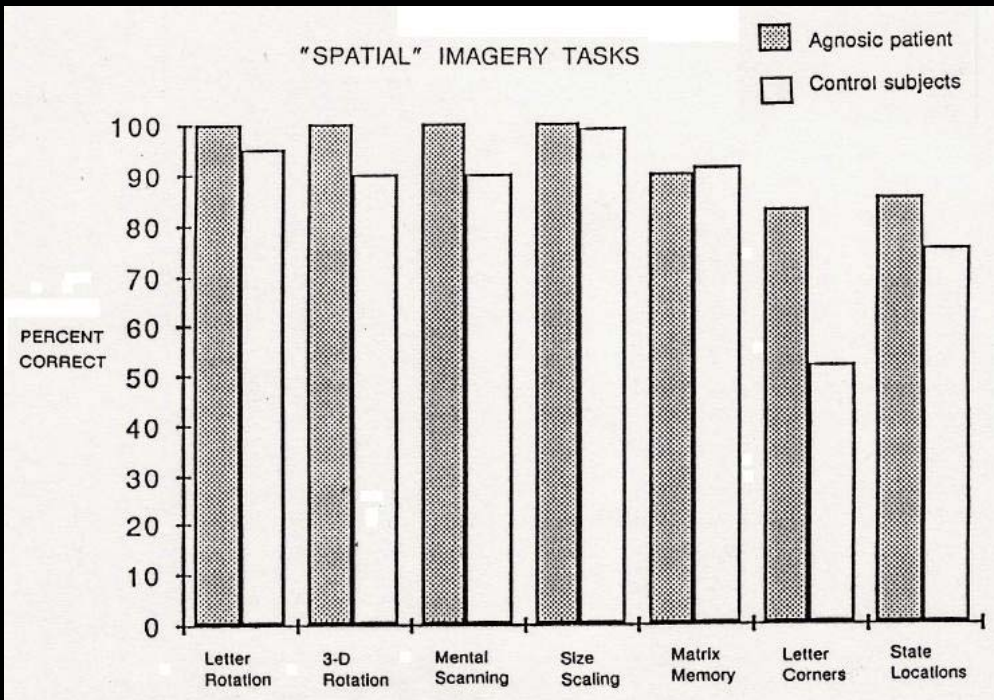
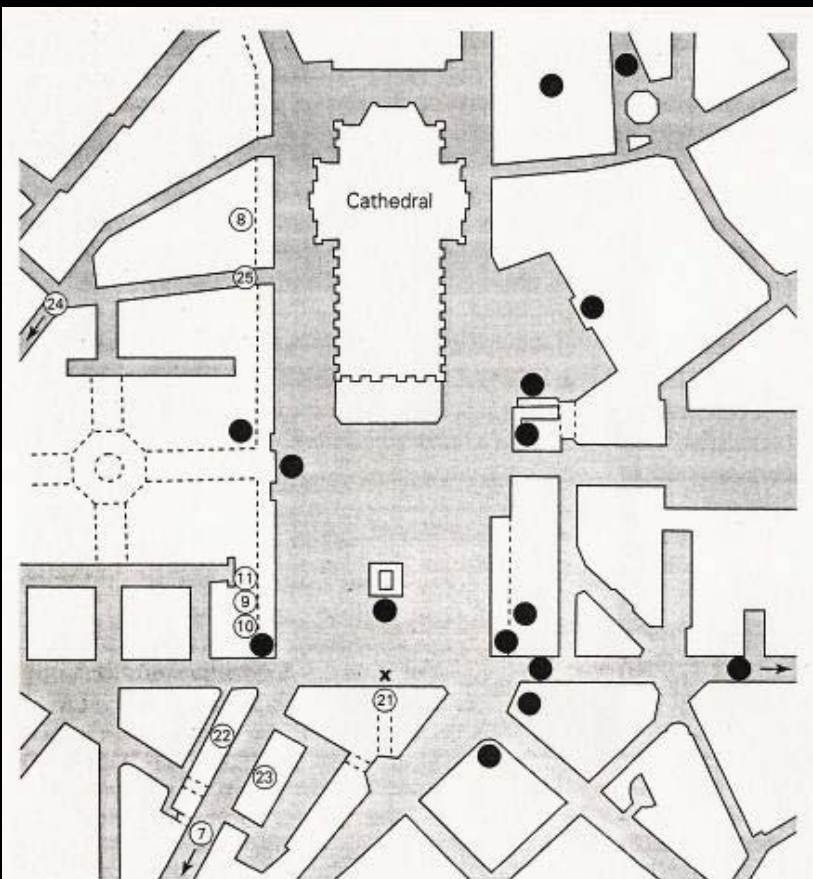


FIGURE 62.2 Diagram showing regions of damage in the brain of case L. H.

*Damage to the "what" (ventral) pathway produces deficits in visual, but not spatial, imagery.*

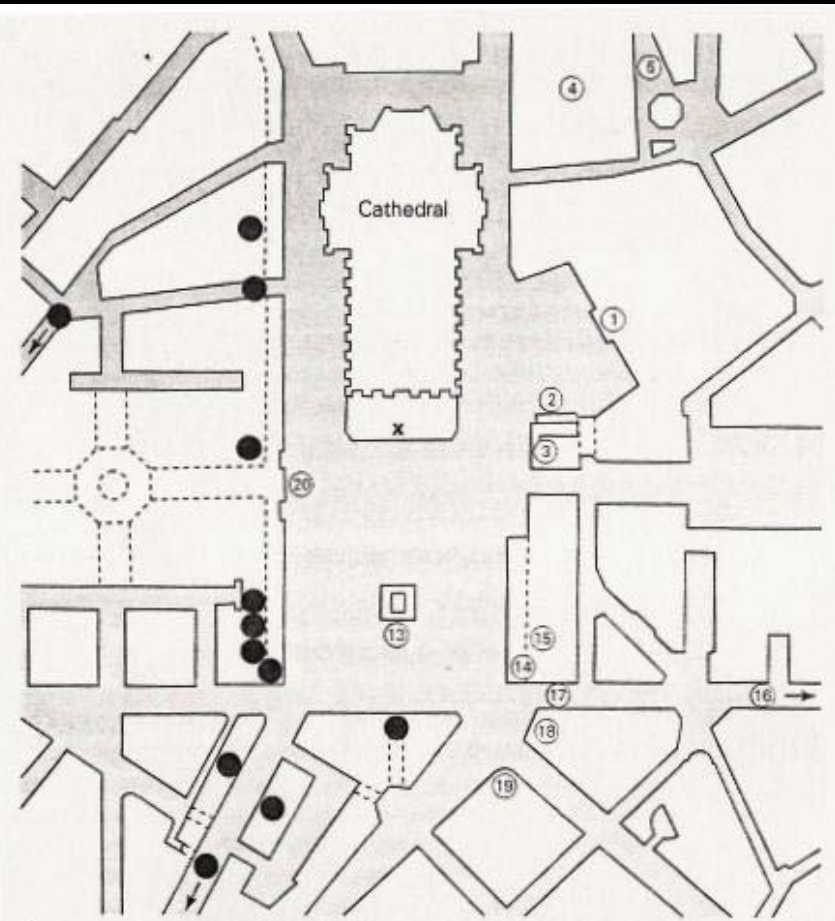


# Attentional Neglect



A

Figure 7.13 Maps indicating which structures were reported by patients with hemineglect when they imagined standing in the Piazza del Duomo in Milan, Italy.

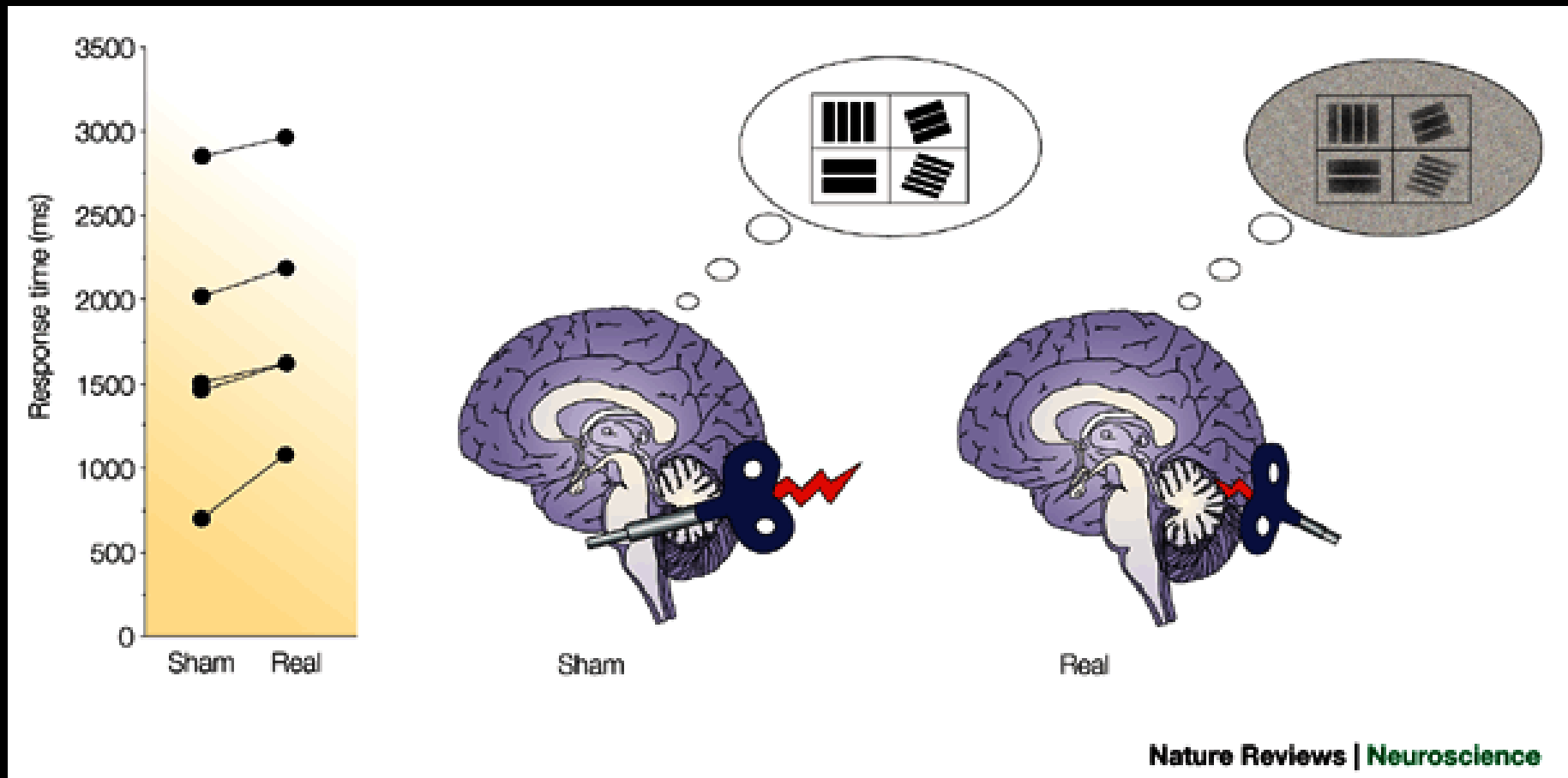
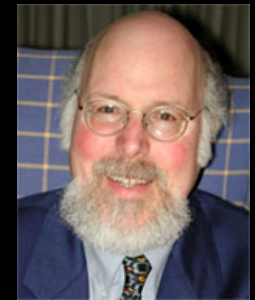


B

Figure 7.13 (Continued)

*Hemi-neglect also affects spatial imagery.*

# Kosslyn: TMS to Area V1 (BA17) Interferes with Imagery



*Shows that early visual areas play a role in imagery.*

# Long-Term Visual Memory

## □ **Memory for pictures.**

- **The picture-superiority effect.**
- **Schema effects.**
- **Verbal-Visual interactions.**

## □ **How is visual information stored in memory?**

- **Paivio's dual-coding theory**
- **Kosslyn's image-file theory**

# The Picture-Superiority Effect

*Memory for pictures is greater than that for words.*

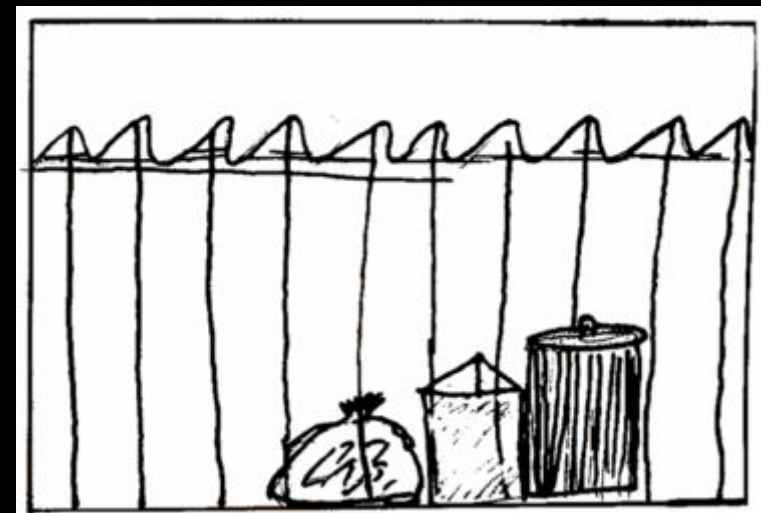
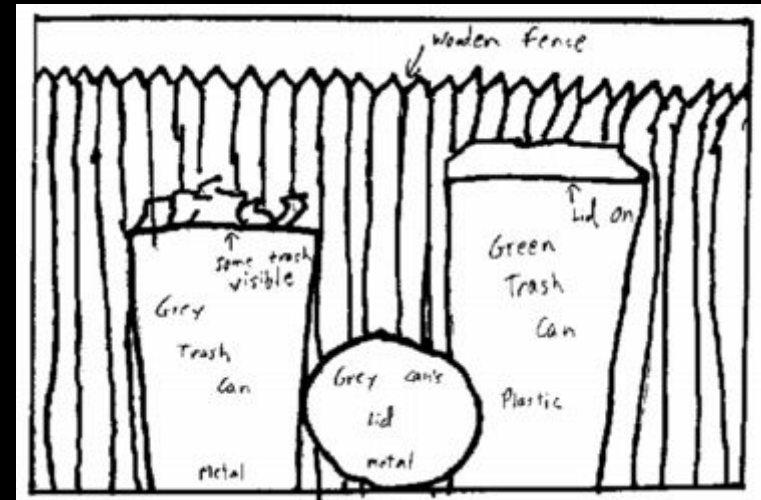
- **Shepard (1967) showed S's 612 pics for 6 sec's each & then tested 2AFC recog.**
  - 98% immediate accuracy
  - 90% accuracy after a week
  - 58% accuracy after 4 months
- **Standing (1973) showed 10,000 pics (!) for 5 sec's each over 5 days & then tested 2AFC recog 2 days later.**
  - 83% accuracy in picking out old pics.

# Schemas

More likely  
to recognize  
change.

➤ Toaster vs. fireplace in kitchen.

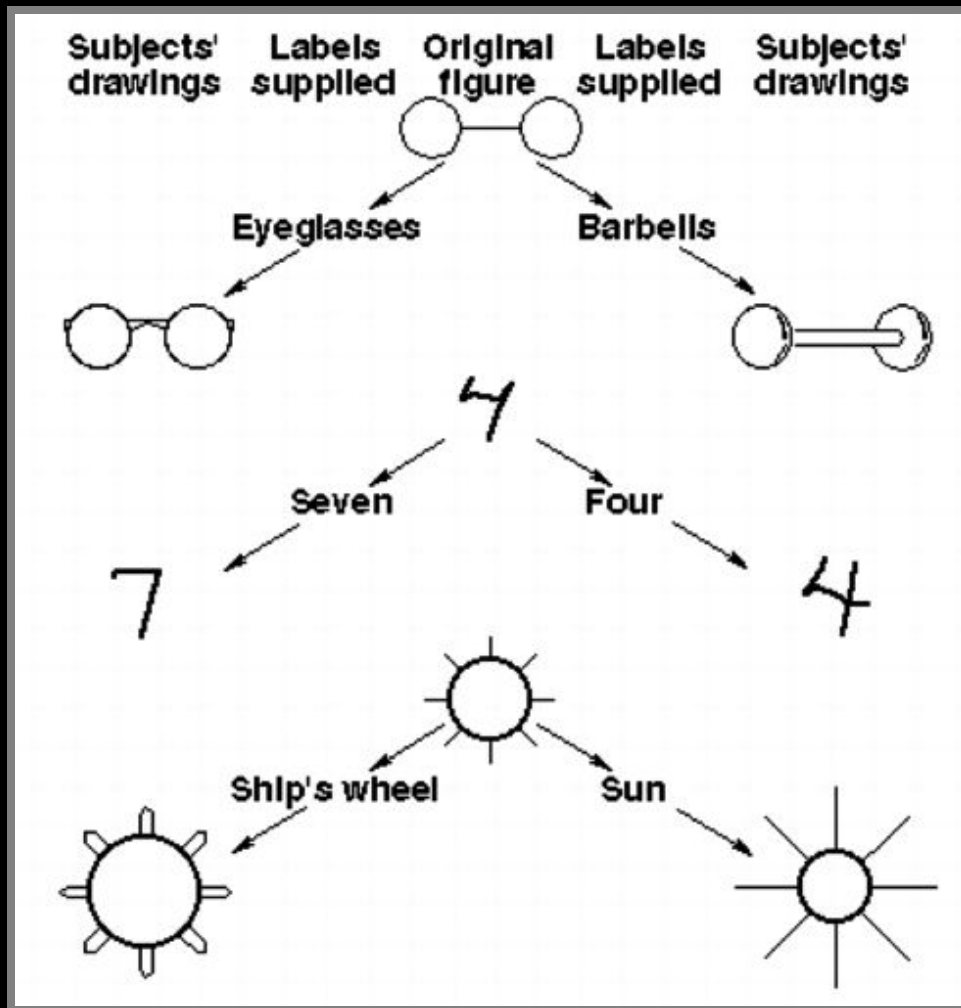
➤ Boundary extension:



- A wider perspective, not truly seen, is often included in subjects' drawings.

# Verbal-Visual Interactions

➤ *Which is further north, Seattle or Montreal?*



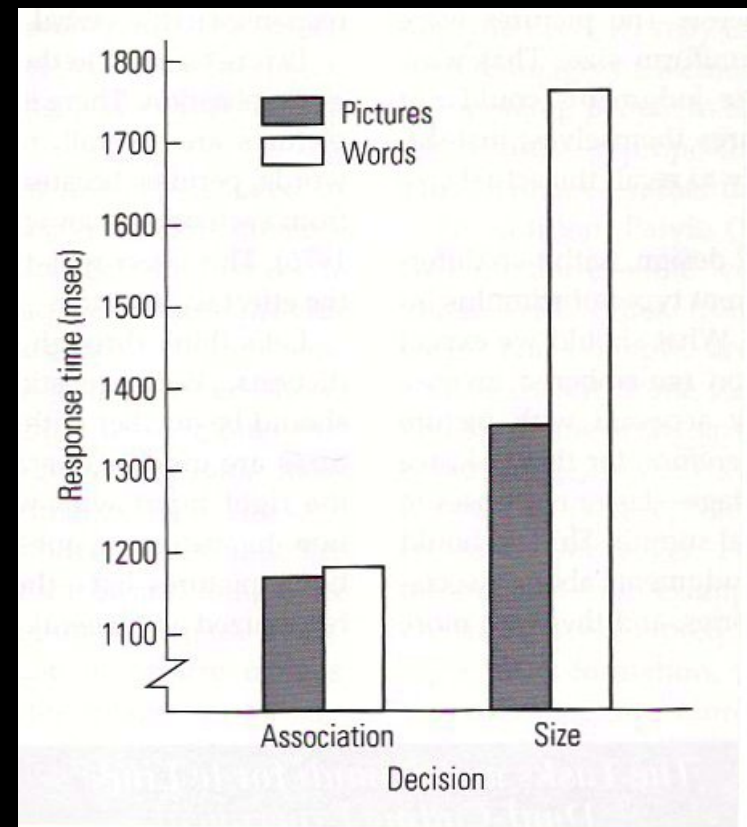
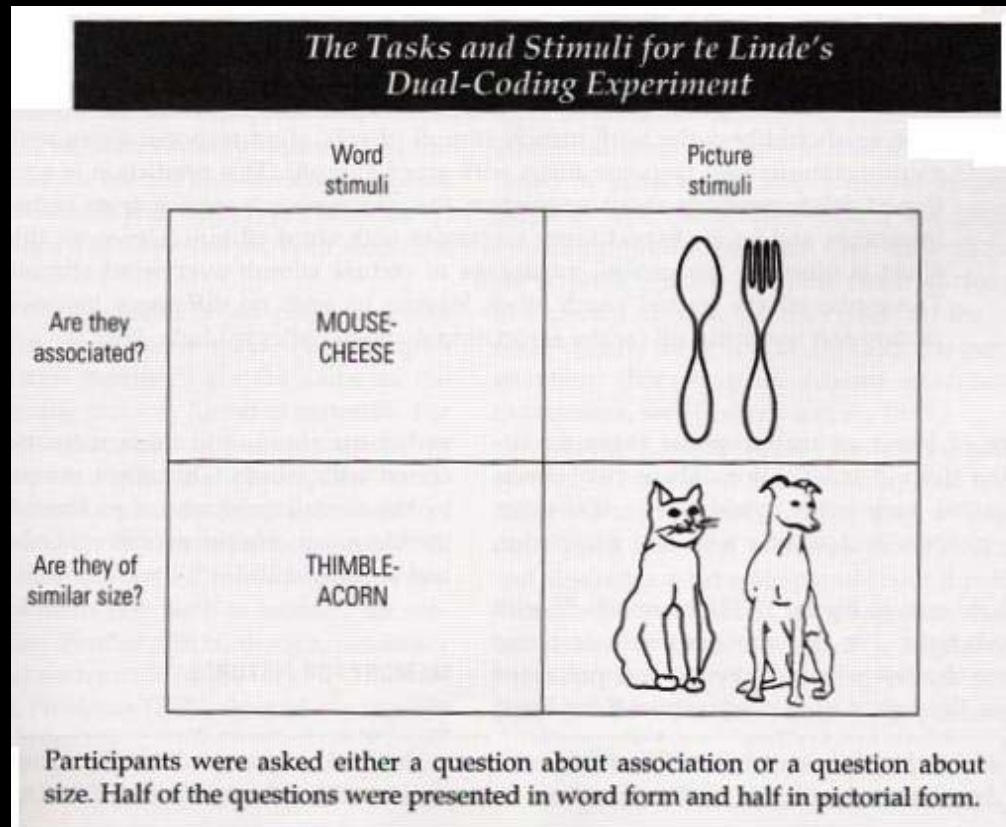
- **Effects of verbal labels on memory for pictures.**
- **Verbal overshadowing:** giving verbal labels to non-verbal perceptions or images can impair later memory performance.

# Other Image-related Memory Effects

- Concrete words (helicopter, mountain, etc.) are remembered better than abstract words (e.g., freedom, logic, etc.). Why?
- High-imageability words (tree, dog, etc.) are remembered better than low-imageability words (e.g., cousin, vein, etc.). Why?
- Imagery, especially interactive imagery, is a very good incidental encoding strategy. Why?

# Paivio's Dual-Coding Theory

Claims that info in LTM can be stored (coded) in two separate ways, verbally and/or as an image. The different forms may be useful in different situations.



**Verbal Codes best at mediating Semantic Associations;  
Image Codes best at mediating size/shape info.**

# Kosslyn's Image-File Theory

## Kosslyn's model

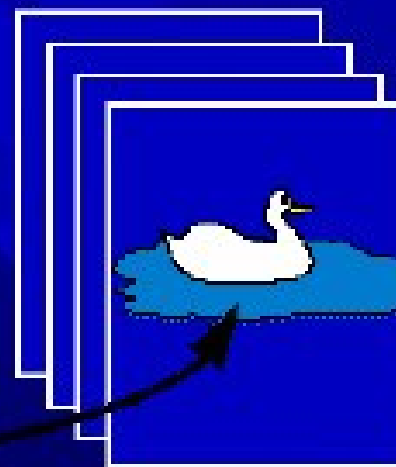
Spatial Medium



"Visual Buffer"

Visuo-Spatial Sketch Pad

Image Files



rotate  
scan  
transform



Propositional  
Files