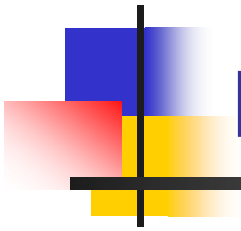


Mental Imagery and Mapping

Mental Imagery

- Subjective representation of non-present object or event that is experienced as the object or event itself
- Banned by Behaviorists
- Visual imagery is only one form of mental imagery

Comparison: Differences

How do we compare perception and imagery?

Perception	Imagery
Stimulus required	No stimulus required
Sensory receptor required	No sensory receptors needed
Bottom-up and top-down-processing	Top-down processing only

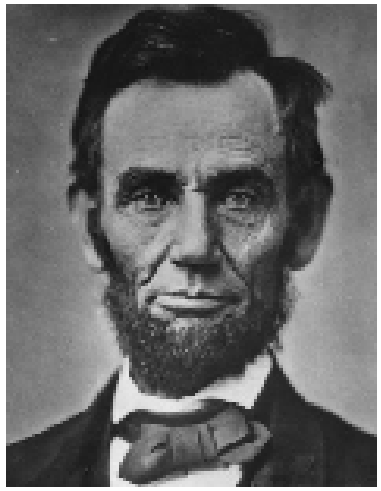
Comparison: Similarities

Perception	Imagery
Representation (visual, auditory, etc) is same for perception and images.	

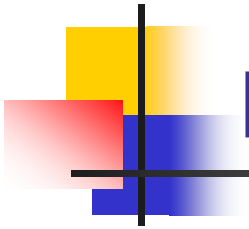
Same/similar brain regions involved in the two processes.

Visual imagery interferes with visual perception

Try imagining president Lincoln's face and read the text given below.



Imagery involves one or more of your five senses, hearing, taste, touch, smell, sight. An author uses a word or phrase to stimulate your memory of those senses. These memories can be positive or negative which will contribute to the mood of your poem.

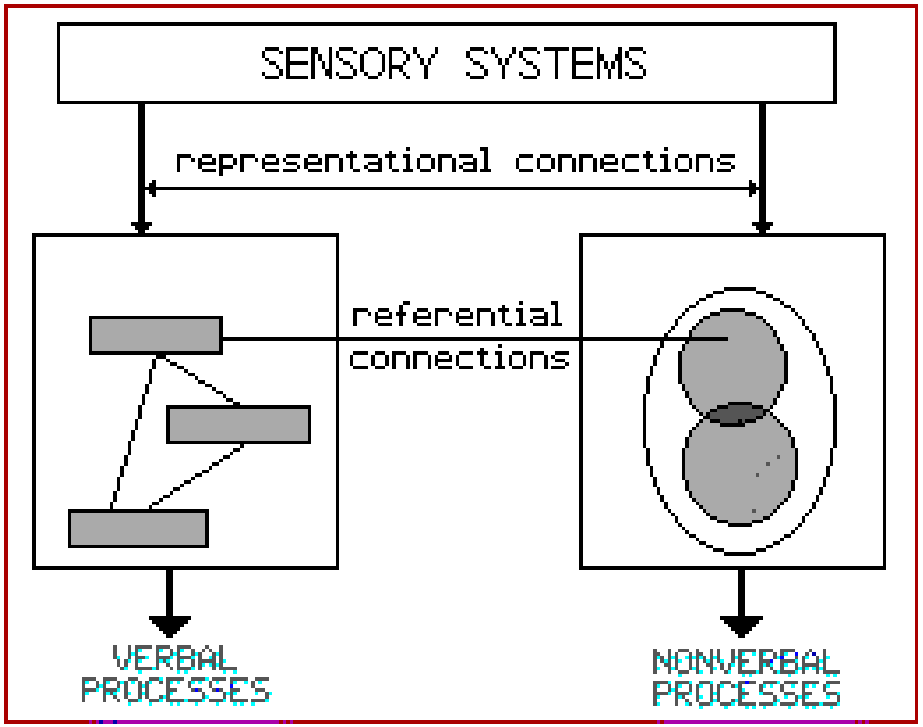


Mental Imagery

- 3 Theories
  - (a) Dual-coding hypothesis
  - (b) Conceptual-propositional hypothesis
  - (c) Functional-equivalency hypothesis

Mental Imagery

- **Dual-coding hypothesis (Paivio)**
  - Information mentally represented as a verbal or non-verbal system…or both
  - *Picture-like code* and *word-like code*
  - Each concept connected to other related concepts (activation of one primes activation of others)


SENSORY SYSTEMS
representational connections
referential
connections
VERBAL
PROCESSES
NONVERBAL
PROCESSES

Mental Imagery

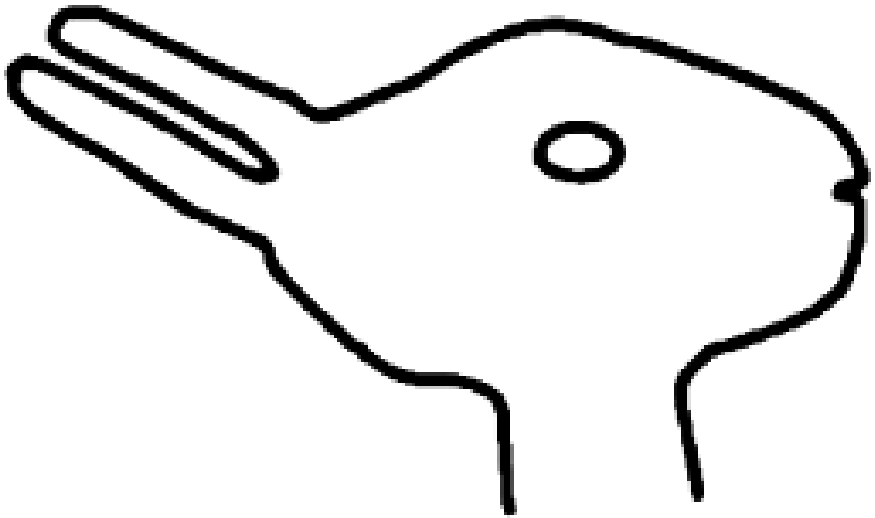
- **Dual-coding hypothesis (Paivio)**
  - Subjects given list of pictures and/or words
  - Differences in retention found
  - Provides evidence of importance for imagery in cognitive functioning and operations

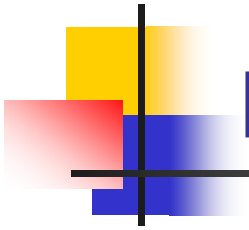
Mental Imagery

- **Dual-coding hypothesis (Paivio)**
  - Shepard (1967)
    - After 2 hours = 100% response rate accuracy for pictures, 88% for words
  - Standing (1977)
    - After 2 days, recall was 62% for words, 77% for pictures, and 88% for bizarre pictures

Mental Imagery

- **Conceptual-propositional hypothesis**
  - We code and store interpretations of events that are highly conceptual
  - Information is not stored in memory like a photograph



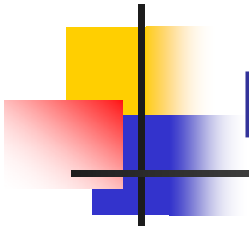


Mental Imagery

- **Functional-equivalency hypothesis**
  - Imagery and perception are very similar, if not functionally equivalent
  - "Perceptual overlap"

Mental Imagery

- Automatic Processes
  - unintentional
  - unconsious
  - effortless
- Controlled Processes
  - intentional
  - conscious
  - effortful

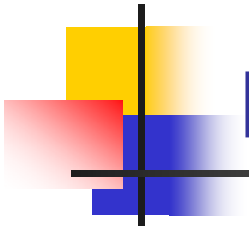


Mental Imagery

- **Controlled vs. Automatic Processing**
  - Amygdala involved in automatic judgments (good vs. bad)
  - Prefrontal cortex implicated in more controlled, evaluative reactions

Mental Imagery

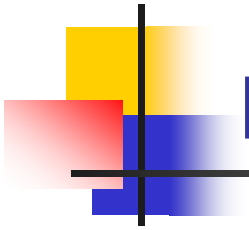
- **Cognitive Maps**
  - A mental map that relates preferences and perceptions with a spatial matrix
  - Mental representations assist decision-making across environmental contexts



Mental Imagery

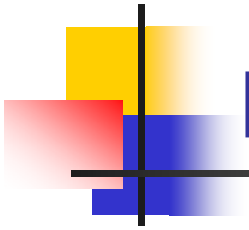
- **Route knowledge**
  - Knowledge drawn upon to function in environment
  - *Ex*: Geographical maps, giving directions to DigiPen
  - More difficult to acquire?


SCORE 1560
LIVES 3
200



Mental Imagery

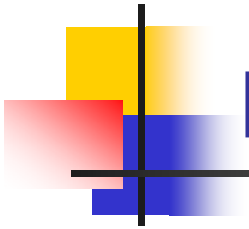
- **Survey knowledge**
  - Understanding spatial relationships across broader contexts
  - *Ex*: DigiPen campus vs. UW campus
  - Easy acquisition?



Mental Imagery

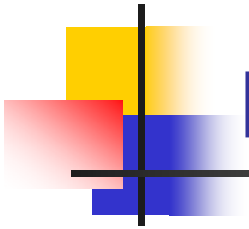
- **Cognitive Maps**
  - Tend to be “drawn” very subjectively and are prone to personal bias
  - Is DigiPen a ‘small’ college? Is that the first thing that comes to mind in your mental map?


Location of the super top secret area, a second Bowser fight, and the Laser Suit
Twin Bridges
Vanilla Dome
Top Secret Area
Donut Plains
Soda Lake
Forest of Illusion
Yoshi's Island
Valley of Bowser
Flying ship from SMB3
Yoshi's House
Chocolate Island



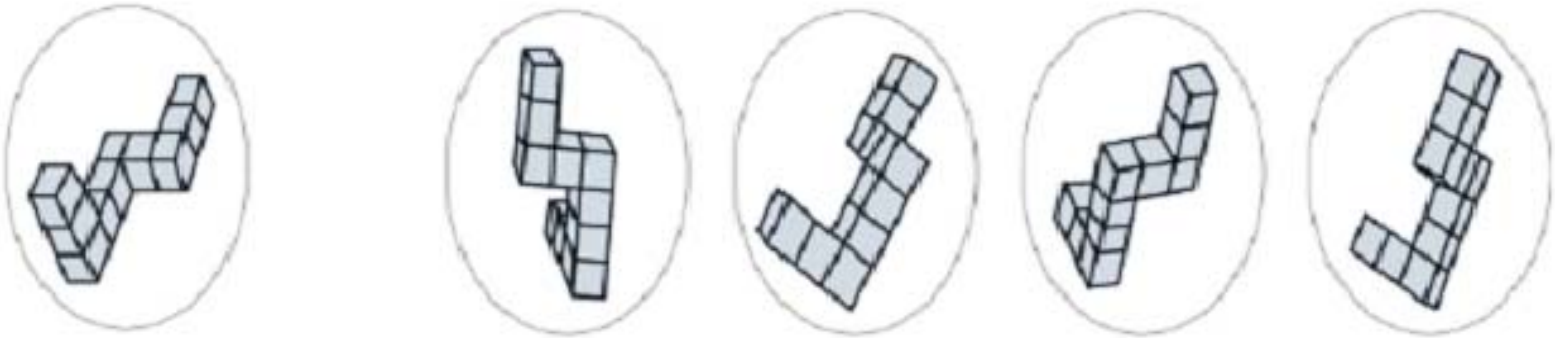
Mental Imagery

- **Cognitive Maps**
  - A "metaphor" for cognitive spatial constructs
  - Not a flawless or photographic representation of actual physical space
    - Often incomplete and error-prone



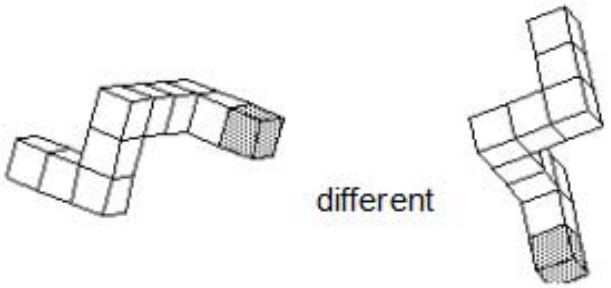
Mental Imagery

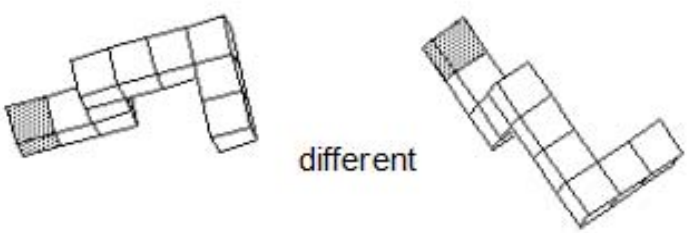
- **Cognitive Maps**
  - Cognitive reference points
  - Alignment
  - Rotation

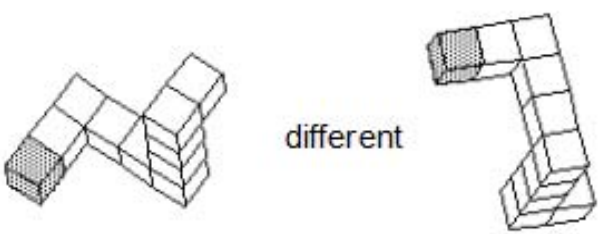


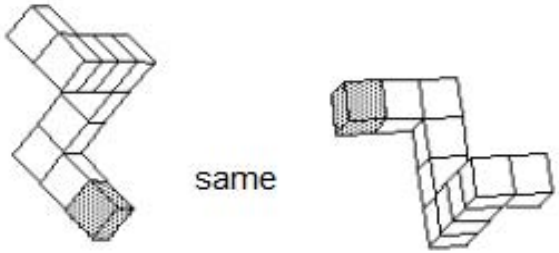
1 2 3 4 5

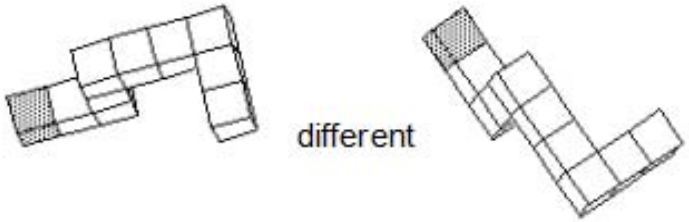
Example Trials

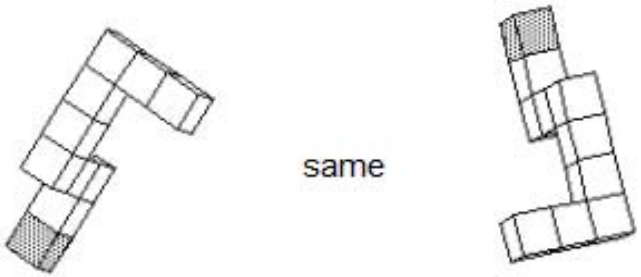


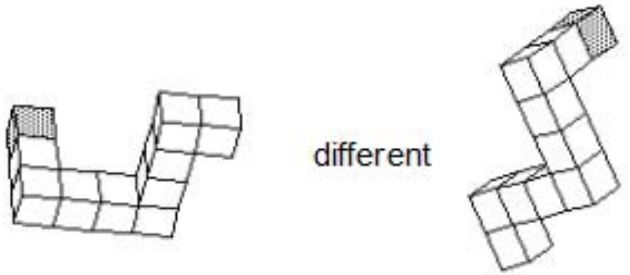






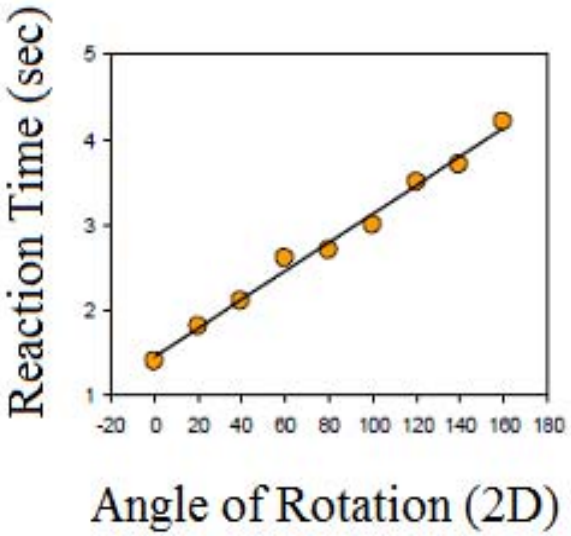


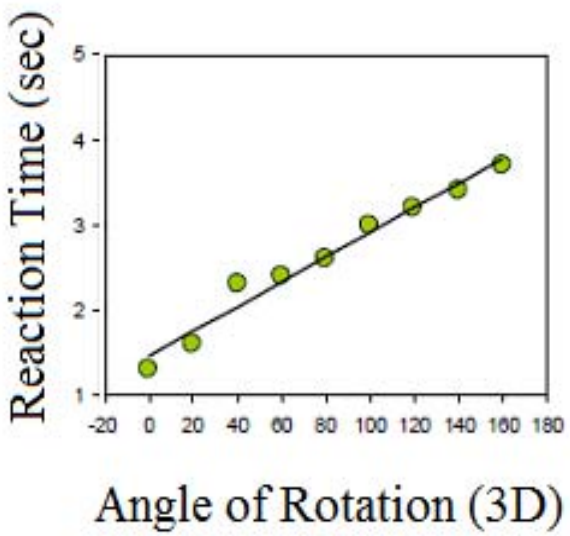




Images and Rotation

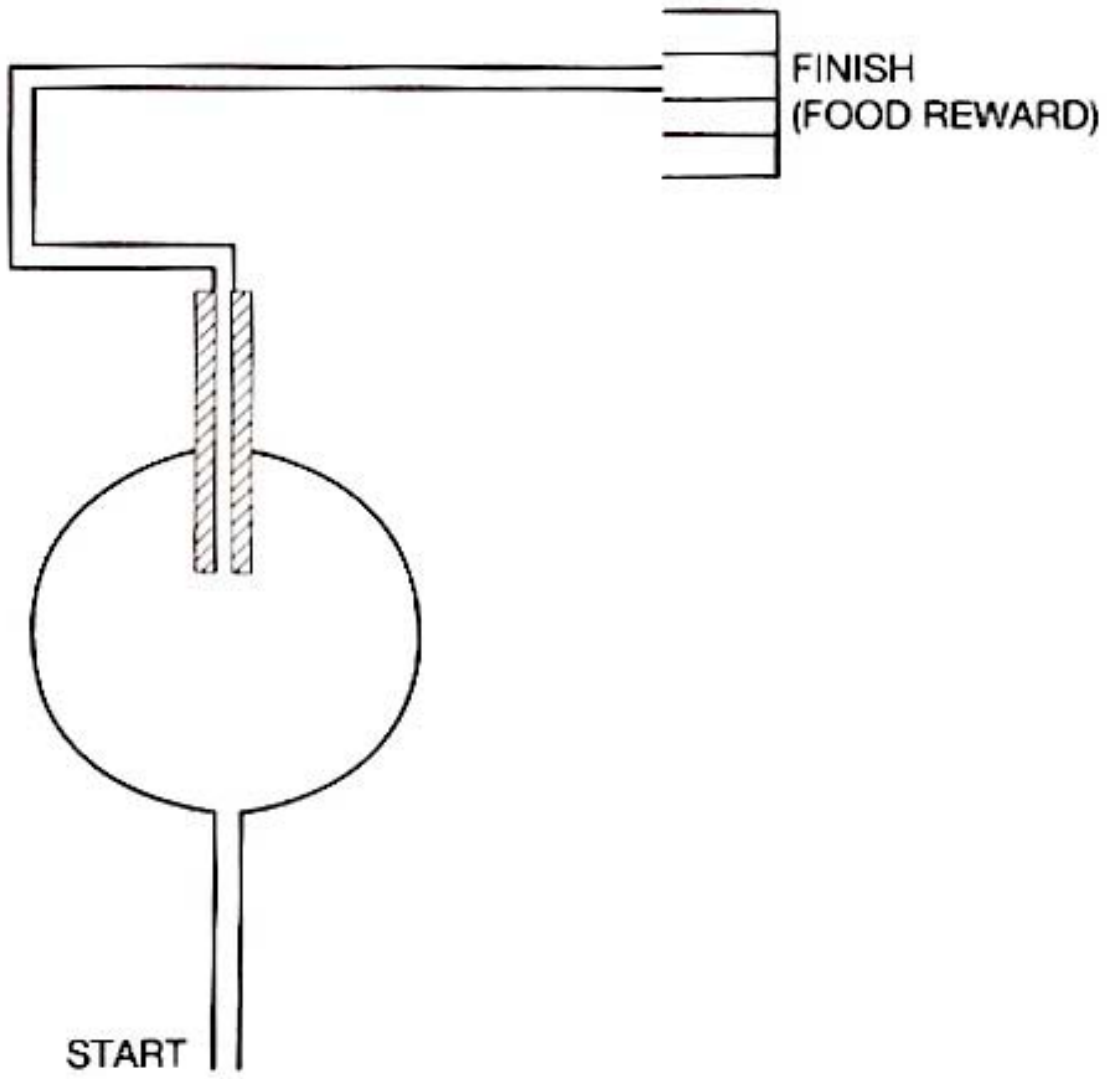
Reaction times increased linearly as the angle of rotation increased, whether the drawings rotated in 2-D or 3-D

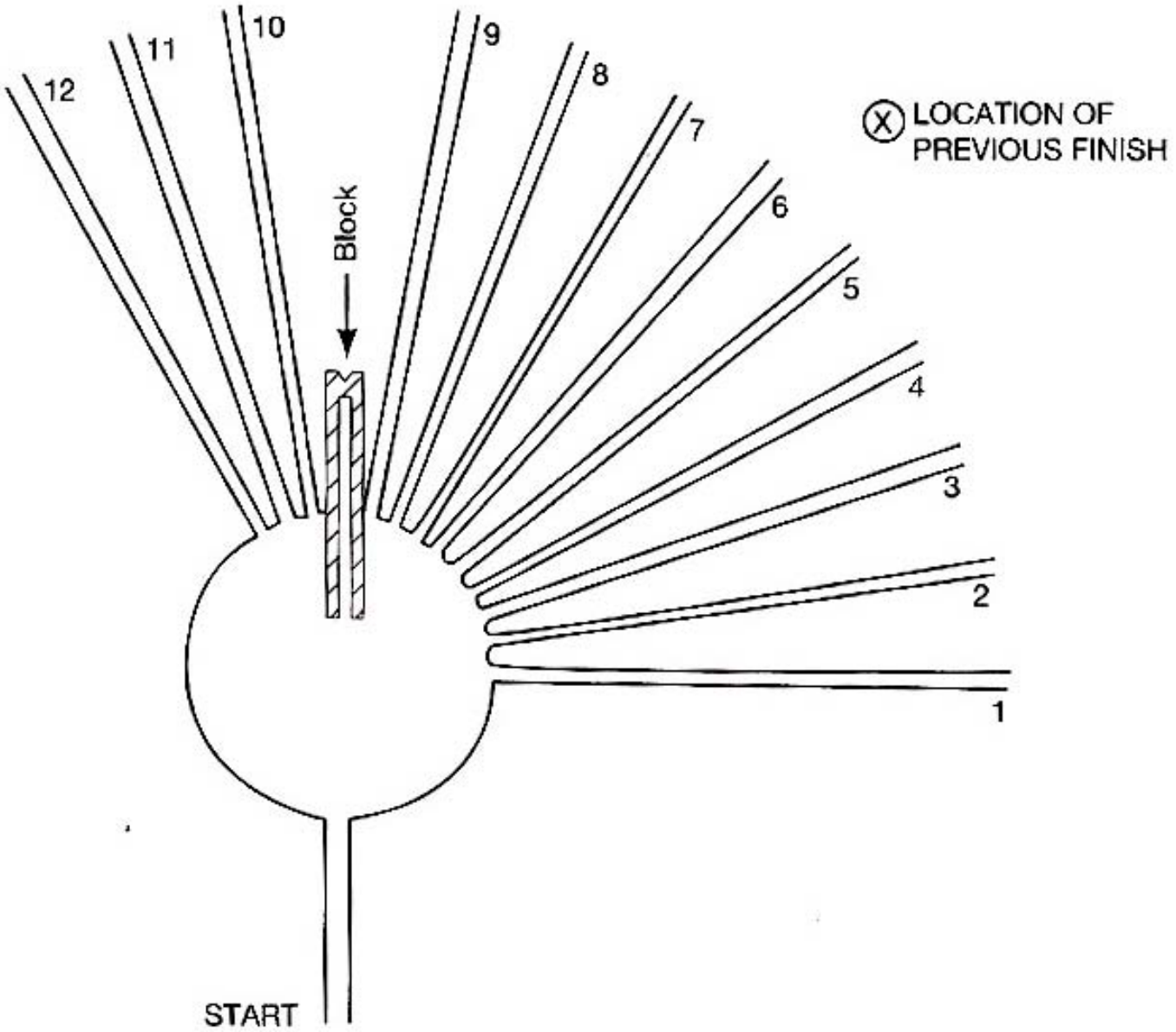


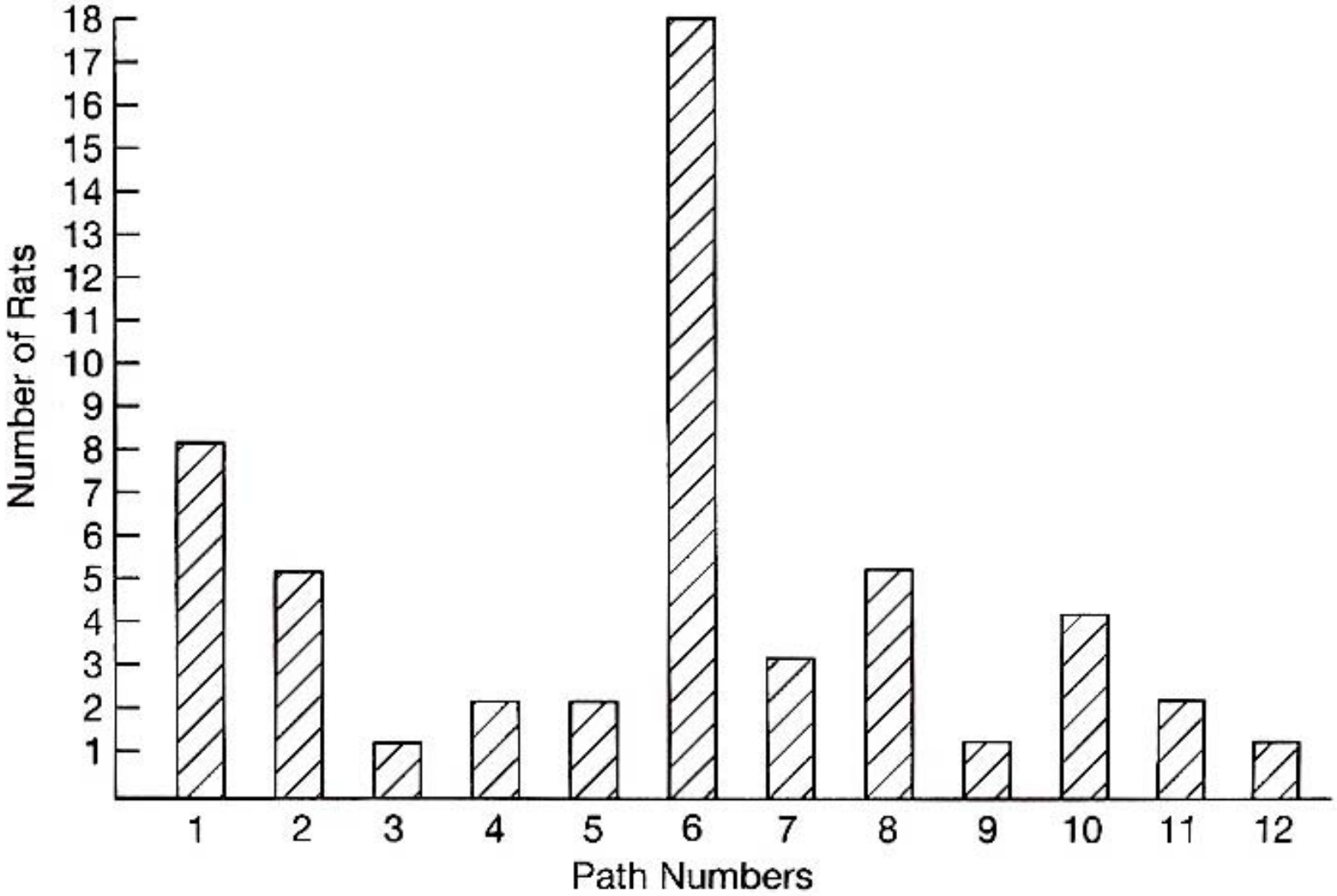


Are the angle in the faces of the two clocks the same?

Clock Faces	Reaction Time
	Slow
	Fast

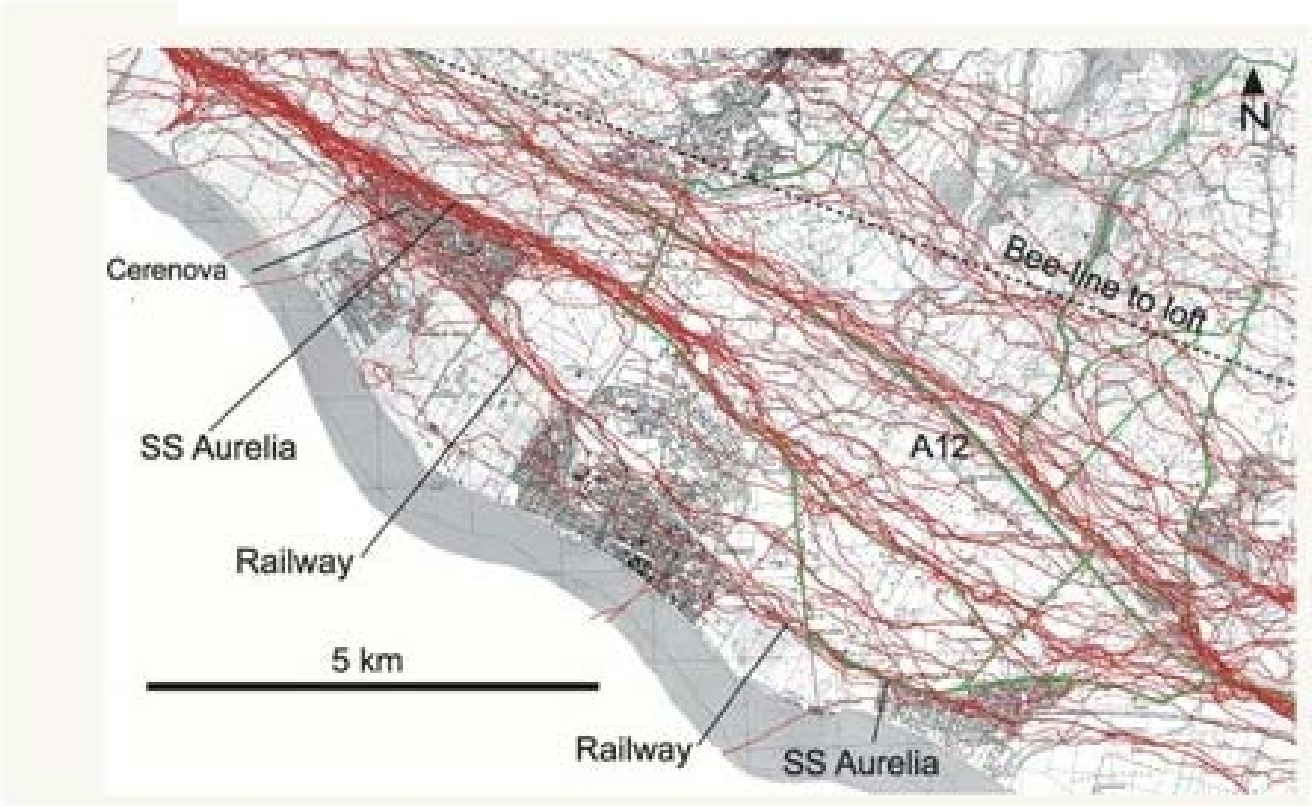

FINISH
(FOOD REWARD)
START

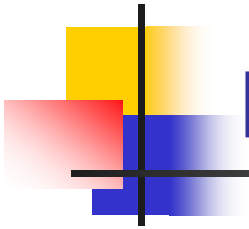

12
11
10
9
8
7
6
5
4
3
2
1
Block
LOCATION OF
PREVIOUS FINISH
START


Number of Rats
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
1
2
3
4
5
6
7
8
9
10
11
12
Path Numbers


YOU
ARE
HERE

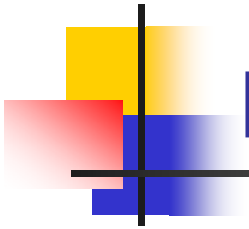
Carrier pigeons follow "highways"





Mental Imagery

- **Cognitive Maps**
  - Landmarks as navigational aids are often major features (…but subjective importance varies!)
  - Lines/boundary edges, routes, linearity/curvature
  - Surface areas, gradient textures, color, changes in slope/elevation
  - Social factors: perceived crowding, accessibility, safety



Mental Imagery

- **Cognitive Maps**
  - Like other mental processes, mapping develops over time as a function of age, interest, experience
  - Draws upon multiple sensory/cognitive inputs
    - Motor response/capability
    - Interpretation of symbols (road signs, structures)
    - Devising “short-cuts”

Mental Imagery

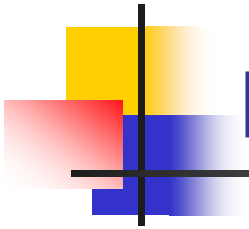
- **Cognitive Maps**
  - Individual differences in spatial abilities
    - Ability to think geometrically
    - Image complex spatial relations
    - Recognize spatial patterns
    - Perceive three-dimensional structures in two dimensions

Mental Imagery

- **Cognitive Maps**
  - "Spatial iconicity" – location relates to mental representations of words and mapping
    - Presented word pairs: Are they related?
      - Basement
      - Attic

        vs.

      - Attic
      - Basement



Mental Imagery

- **Cognitive Maps**
  - "Spatial iconicity"
    - When vertical arrangements of word pairs are 'correct', participants display faster recall than when pairs are 'incorrect'


RUSSIA
ARCTIC OCEAN
Bering Strait
Bering Sea
Beaufort Sea
Greenland Sea
Arctic Circle
RUSSIA
UNITED STATES
Greenland (DEN.)
ICELAND
Baffin Bay
Denmark Strait
U.K.
IRELAND
Davis Strait
Hudson Bay
Labrador Sea
CANADA
NORTH PACIFIC OCEAN
UNITED STATES
NORTH ATLANTIC OCEAN
Tropic of Cancer
Gulf of Mexico
THE BAHAMAS
MEXICO
CUBA
HAITI
DOMINICAN REPUBLIC
BELIZE
HONDURAS
GUATEMALA
EL SALVADOR
NICARAGUA
Caribbean Sea
TRINIDAD and TOBAGO
COSTA RICA
PANAMA
VENEZUELA
GUYANA
SURINAME
French Guiana (FR.)
COLOMBIA
Equator
GALAPAGOS ISLANDS (ECUADOR)
ECUADOR
PERU
BRAZIL
BOLIVIA
SOUTH PACIFIC OCEAN
Tropic of Capricorn
PARAGUAY
CHILE
URUGUAY
ARGENTINA
SOUTH ATLANTIC OCEAN
Scale 1:67,000,000
Azimuthal Equal-Area Projection
0 500 1000 1500 2000 Kilometers
0 500 1000 1500 2000 Miles
Boundary representation is not necessarily authoritative.
Falkland Islands (administered by U.K., claimed by ARGENTINA)
Cape Horn