Social Memory

Fall 2015

1

The Function of Perception

- Forming Mental Representations of…
- Objects and Events Experienced in the...
- Present Environment so that…
- Behavior is Governed by the Meaning of the Current Stimulus

Perceptual Activity Ends with the Identification and Categorization of the Distal Stimulus

2

Perception, Categorization, and Memory

If every act of perception involves an act of categorization….

(as Bruner said it did)

Memory provides the conceptual knowledge that permits categorization to occur.

3

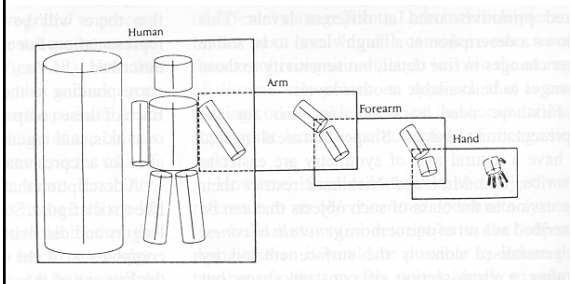
Relations Between Perception and Memory

- Memory as Background of Perception
  - Knowledge, Expectations, Beliefs
  - Cognitive Basis for Perception
- Memory Trace as a Byproduct of Perceptual Activity
  - Record of Perceptual Activity
  - Description of Percept

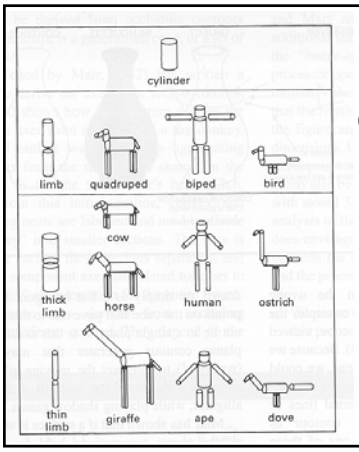
4

Decomposition of Human Form into Cylinders

Marr & Nishihara (1978)



5



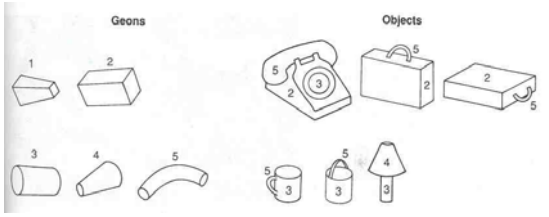
More Cylinder-Figures

Marr & Nishihara (1978)

6

Decomposition into Geons

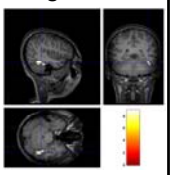
Biederman (1985)



7

Some Phenomena of Face Recognition

- Classification of Errors in Face Recognition
  - Familiarity
  - Identification
- Prosopagnosia
  - Cannot Recognize Familiar Faces
  - Can Determine Gender, Emotional Expression
  - Can Read Lips
- Evidence from Reaction-Time Studies
  - Familiarity < Occupation < Name
    - Cannot State Name Before Occupation (?)

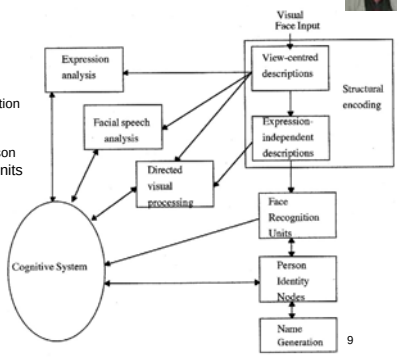


8

Model of Face Recognition

Bruce & Young (1986, 2012); Young & Bruce (1991, 2011)

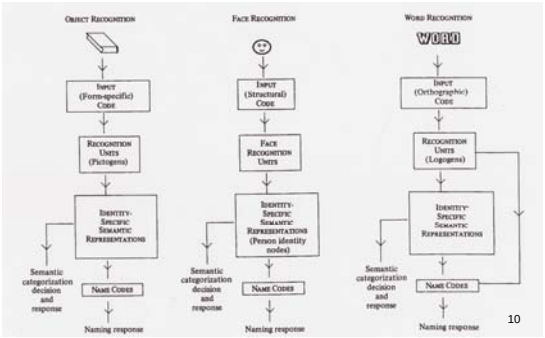
- Face Recognition Unit
  - 1/Person
  - Activated by Recognition
- Person Identity Node
  - 1/Person
  - Face Belongs to Person
- Semantic Information Units
  - Occupation
  - Personality
- Name Recognition Unit
  - Verbal Label



9

Parallels Between Face, Object, and Word Recognition

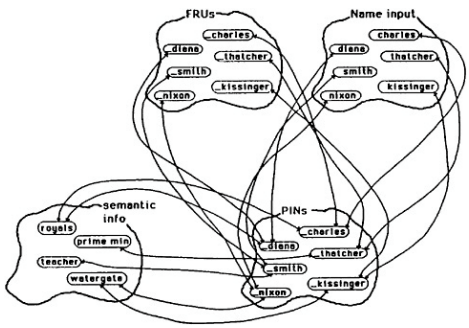
Bruce & Young (1986)



10

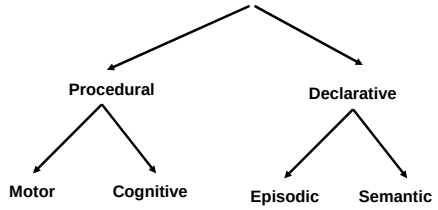
Interactive Activation Model of Face Recognition

Burton et al. (1990)



11

Taxonomy of Memory



12

Two Forms of Knowledge

Winograd (1975); Anderson (1976)

- Declarative Knowledge
  - – Factual Statements
  - – Propositional Format
- Procedural Knowledge
  - – Directions for Action
  - – Production Format

13

Declarative Knowledge

- Factual Statements
  - – About World, Past
- Sentence Format
  - – Propositions
    - Subject - Verb – Object
- Types of Representations
  - – Meaning-Based
    - Verbal Description
  - – Perception-Based
    - Mental Image

A **bicycle** is a two-wheeled vehicle with seat and handles, propelled by pedaling.

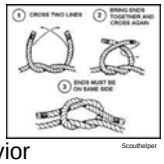
A **bicycle** looks like this:

Strand Theatre, Shelbyville IN

14

Procedural Knowledge

- Directions for Goal-Directed Action
- "If-Then" Format (Productions)
  - – Goal - Condition – Action
  - – Production System
- Motor
  - – Actions Take Form of Overt Behavior
    - Alter Objective, Publicly Observable World
- Mental
  - – Actions Take Form of Mental Transformation
    - Alter Internal, Private Mental Representations



Scoutshelper

X + 6 = 38

15

Types of Declarative Knowledge

Tulving (1972, 1983)

- Episodic
  - – Autobiographical Memory
  - – Factual Knowledge About Personal Experiences
    - Spatio-Temporal Context
    - Self-Reference
- Semantic
  - – Mental "Dictionary" or "Encyclopedia"
  - – Abstract, Conceptual Knowledge About the World

16

Episodic Memory

- Autobiographical/Personal
  - – Specific Experiences
  - – Narratives
- Elements
  - – Description of event
  - – Episodic context
    - Time, Place
    - Causal Relations
  - – Self-Reference
    - Agent or Patient, Stimulus or Experiencer
    - Internal Mental State

17

Semantic Memory

- Abstract, Context Free
  - – Mental Lexicon
  - – *Generic* Memory?
- Object Knowledge
- Linguistic Knowledge
- Categorical Knowledge
  - – Subsets-Supersets
  - – Similarity
  - – Category-Attribute

18

Declarative Social Memory

- Factual Knowledge
  - Has Truth Value
- Propositional Representation
  - Subject-Relation-Object
    - The *subject* verbed the **object**
  - Propositional Network
- Examples
  - *John smiled at Lucy*
  - *John is a neurotic extravert*
  - *Neurotics are anxious and excitable, while Extraverts are talkative and sociable*

19

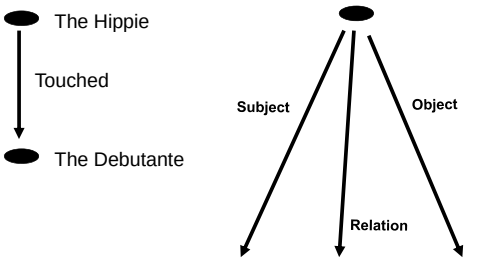
Structure of Declarative Memory

- Nodes
  - Represent Concepts
- Associative Links
  - Represent Relations Among Concepts
- Perception Activates Corresponding Nodes
- Activation Spreads Across Associative Links
- Spreading Activation Creates Priming
  - Processing of One Event
  - Facilitates or Impairs Processing of Another

20

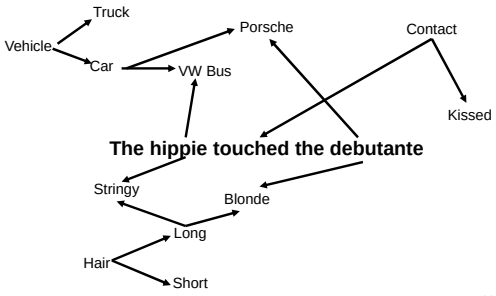
Propositional Representation

After Anderson (1976)



21

An Associative Network



22

Relations Between Episodic and Semantic Memory

- Semantic Knowledge Begins in Episodes
  - Learning Experiences
- Accumulation Blurs Episodic Features
- Episodic Memory Formed Against Background of Semantic Knowledge
  - Cognitive Basis for Perception

23

Memory in Social Cognition

Procedural

- Motor
  - Eye Contact
  - Handgrip
  - Display Rules
  - Interpersonal Distance
- Cognitive
  - Impression Formation
  - Self-Regulation

Declarative

- Semantic
  - Implicit Personality Theory
- Episodic
  - Autobiographical Memory
  - Person Memory

24

Person Memory

- Knowledge Concerning Another Person
- Mix of Declarative Memories
  - Episodic
    - Memories of Past Encounters
    - Knowledge of Behavioral Episodes
  - Semantic
    - Generic Knowledge About Person
    - Traits, Attitudes, Other Characteristics

25

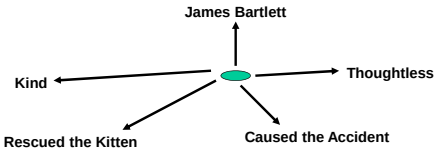
Memory and Person Memory

- Person Memory Can Be Studied with Techniques Used in Nonsocial Memory
- Social Context is Important
  - Impression Formation Improves Person Memory

What Do Person Memories Look Like?

26

Associative Structure of Person Memory



27

Individuation and Reference in Person Memory

Anderson & Hastie (1974)

First You Learn:

- James Bartlett rescued the kitten.
- James Bartlett adopted the child.
- The lawyer caused the accident.
- The lawyer cursed the salesgirl.

28

Individuation and Reference in Person Memory

Anderson & Hastie (1974)

First You Learn:

- James Bartlett rescued the kitten.
- James Bartlett adopted the child.
- The lawyer caused the accident.
- The lawyer cursed the salesgirl.

Then You Learn:

- James Bartlett is the lawyer.

29

Individuation and Reference in Person Memory

Anderson & Hastie (1974)

First You Learn:

- James Bartlett rescued the kitten.
- James Bartlett adopted the child.
- The lawyer caused the accident.
- The lawyer cursed the salesgirl.

Then You Learn:

- James Bartlett is the lawyer.

Now You're Asked:

- Did James Bartlett cause the accident?

30

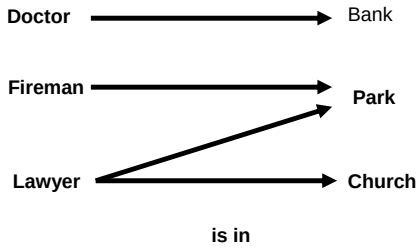
Retrieval from Episodic Memory

Anderson (1974)

- Learn Facts about People, Locations
  - The doctor is in the bank (1-1)
  - The fireman is in the park (1-2)
  - The lawyer is in the church (2-1)
  - The lawyer is in the park (2-2)
  - – Memorize to criterion of perfect recall
  - – Recognition
    - Studied targets
      - – The doctor is in the bank
    - Unstudied lures
      - – The doctor is in the park

31

People and Locations
Anderson (1974)



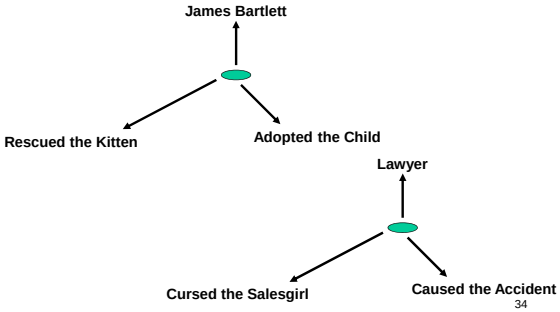
32

The Fan Effect

Anderson (1974)

33

Separate Representations



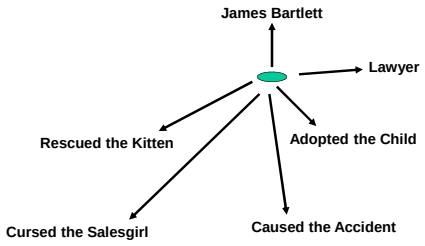
34

Separate Representations

- James Bartlett
  - – Rescued the kitten
  - – Adopted the child
  - – Is the lawyer
- The Lawyer
  - – Is James Bartlett
  - – Caused the accident
  - – Cursed the salesgirl
- Can't Answer the Question
  - – Knowledge Not Represented in Memory
- But We *Can* Answer the Question

35

Single Representation



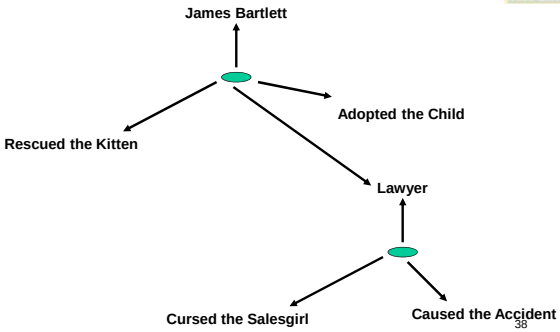
36

Single Representation

- James Bartlett
  - – is the lawyer
  - – rescued the kitten
  - – adopted the child
  - – caused the accident
  - – cursed the salesgirl
- Answer Question by Memory Retrieval
  - – Knowledge Represented Directly

37

Linked Representations



38

Linked Representations

- James Bartlett
  - – rescued the kitten
  - – adopted the child
  - – is the lawyer
    - caused the accident
    - cursed the salesgirl
- Answer Question by Inference
  - – From Knowledge that Bartlett is the Lawyer

39

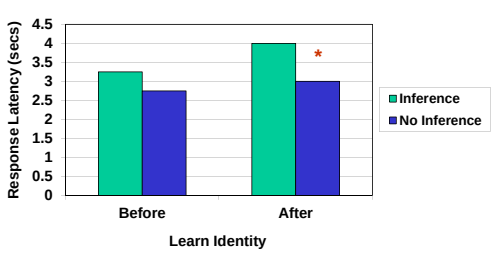
Experimental Procedure

- Study Facts
  - – About James Bartlett
  - – About the Lawyer
- Learn Identity
  - – Before Learning Facts
  - – After Learning Facts
- Sentence Verification
  - – No Inferences
    - James Bartlett rescued the kitten
  - – Inferences
    - James Bartlett cursed the salesgirl

40

Response Latencies in Sentence Verification

Anderson & Hastie (1974)



41

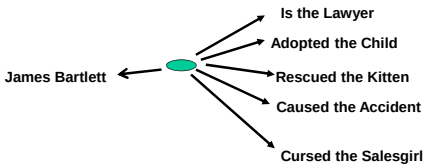
How Persons Are Represented in Memory

- Node Representing a Person
  - – James Bartlett
  - – The Lawyer
- Nodes Representing Facts about Person
  - – Behaviors, Experiences
  - – Traits, Attitudes
- Associative Links
  - – Connect Person Nodes to Fact Nodes

42

Individuation and Reference

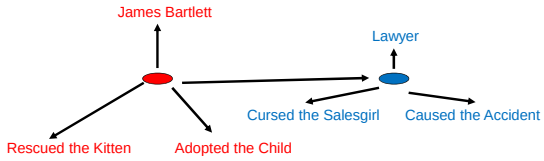
- If Reference Known at the Outset
  - Reference Treated as Another Fact



43

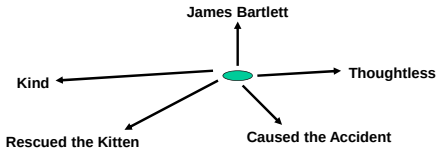
Individuation and Reference

- If Reference Learned Later
  - Reference Links Representations
    - Knowledge of **B** not Transferred to **A**
    - Get from **A** to **B** via Associative Link



44

Associative Structure of Person Memory



45

Schematic Effects on Person Memory

- Information in Person Memory
  - Semantic
    - General Characteristics
  - Episodic
    - Specific Behaviors, Experiences
- What is the Relation Between Semantic and Episodic Person Memory?
  - How Does Semantic Knowledge Affect Episodic Knowledge
  - How are Relations Represented?

46

Memory and Schema-Congruence

- Bartlett (1932)
  - Memory Favors Schema-Congruence
- Conflicting Results
  - Congruence > Controls
  - Congruence = Controls
  - Congruence < Controls
- Result Depends on Control Condition

47

Schematic Effects on Person Memory

Hastie & Kumar (1979)

- Present Trait Ensemble
  - Traits Descriptive of Target Person
  - Induce Schema for Person
    - Prior Beliefs and Expectations
- Study Specific Behaviors
  - Vary Relationship to Schema
    - Schema-Congruent
      - p(Behavior | Schema) > p(Behavior | No Schema)
    - Schema-Incongruent
      - p(Behavior | Schema) < p(Behavior | No Schema)
    - Schema-Irrelevant
      - p(Behavior | Schema) = p(Behavior | No Schema)

48

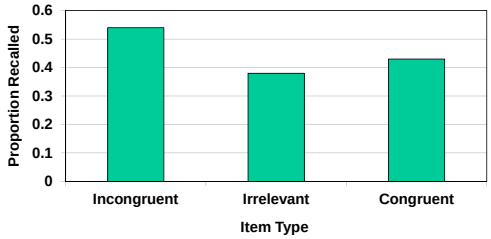
Sample Materials

- Judy is:
  - intelligent, clever, bright, smart, quick, wise, knowledgeable, decisive
- Judy…
  - won the chess tournament.
  - attended the symphony concert.
  - made the same mistake three times.
  - was confused by the television show.
  - ordered a cheeseburger for lunch.
  - took the elevator to the third floor.

49

Schematic Effects on Memory

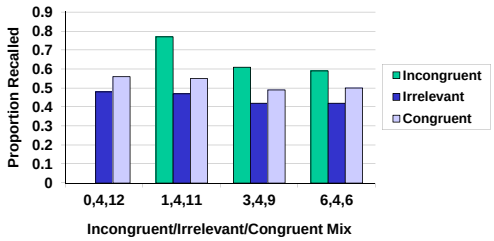
Hastie & Kumar (1979), Exp. 1



50

Schematic Effects on Memory

Hastie & Kumar (1979), Exp. 2



51

The Schematic Processing Principle

The Memorability of an Event
is a Function of its Relationship
to Pre-Existing Schemata.

52

Two Processes in the Schematic Processing Effect

Hastie & Kumar (1979); Hastie (1980, 1981, 1984)

- Schema-Congruent
  - Schema Provides Internally Generated Cues
  - Facilitates Retrieval
- Schema-Incongruent
  - Surprise Instigates Explanatory Activity
  - Facilitates Encoding
- Schema-Irrelevant
  - Get Neither Advantage

53

Explanation in Terms of Network Model of Memory

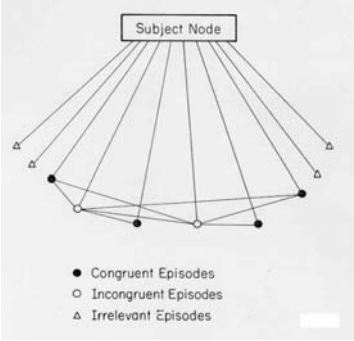
Srull (1981)

- Behavioral Items Linked to Person Node
- Interitem Associations
  - Among Incongruent Items
  - Between Incongruent and Congruent Items
- Retrieval by Tracing Associative Links
  - Favor Incongruent Items
    - Most Associative Links
  - Ignores Irrelevant Items
    - No Associative Links

54

Srull's Model of Person Memory

Srull (1981)



55

Effects of Schema-Incongruent Behaviors on Memory

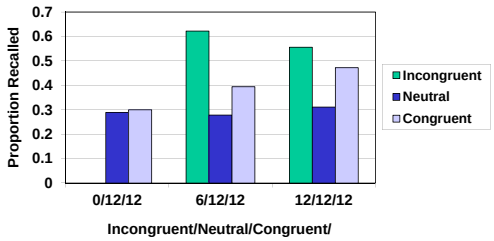
Srull et al. (1985)

- Induce Schema
  - Memorize Trait Ensemble
- Study Behaviors
  - 12 Schema-Congruent
  - 12 Schema-Neutral
  - 0, 6, or 12 Schema-Incongruent
- Test Recall for Behaviors

56

Recall and Schema-Congruence

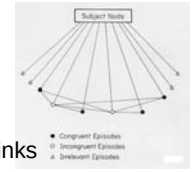
Srull et al. (1985)



57

Priming Effects on Person Memory

Srull et al. (1985)

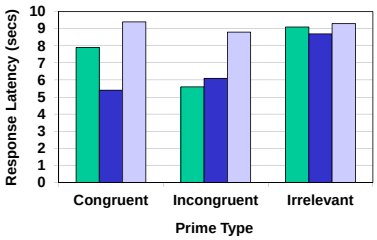


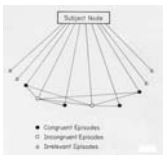
- Test Recognition for Behaviors
  - Response Latency
- Priming Mediated by Associative Links
  - Between Incongruent Items
  - Between Congruent, Incongruent Items

58

Priming in Sentence Verification

Srull et al. (1985)





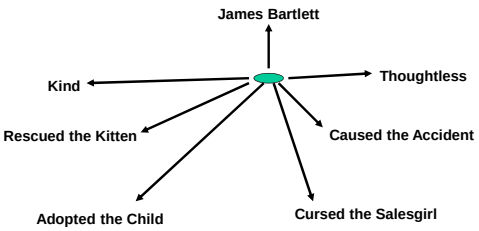
59

How Are Traits Represented in Person Memory?

- Nodes Representing…
  - Person
  - Behaviors
  - Traits
- Relation Between Traits and Behaviors
  - Traits, Behaviors Linked Independently
  - Behaviors Organized by Traits

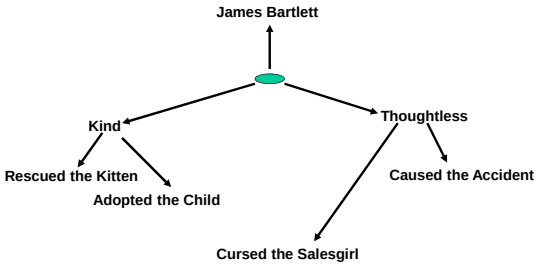
60

Traits and Behaviors Represented Independently



61

Behaviors Clustered by Traits



62

Organization of Person Memory

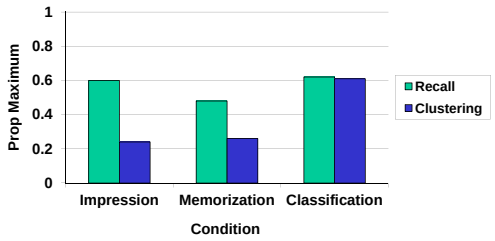
Klein & Loftus (1990)

- 20 Behavior Descriptions
  - 4 per trait
    - Athletic, Intelligent, Honest, Religious, Sociable
- 3 Conditions
  - Impression Formation
  - Memorization
  - Category Sorting

63

Recall and Clustering

Klein & Loftus (1990)



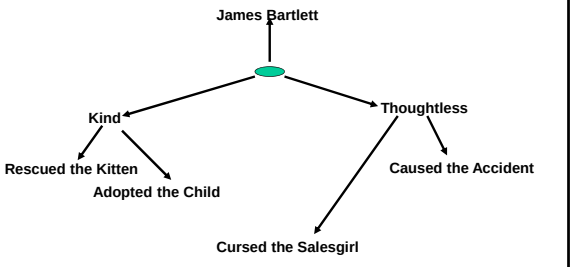
64

Beyond Clustering: Priming

- Nodes Representing…
  - Person
  - Traits
  - Behaviors
- If Behaviors Clustered Under Trait nodes
  - Traits Should Prime Behaviors
- If Traits, Behaviors Linked Independently
  - No Priming Effects

65

Behaviors Clustered by Traits



66

Priming Effects in Person Memory

Klein, Loftus, Trafton, & Fuhrman (1992)

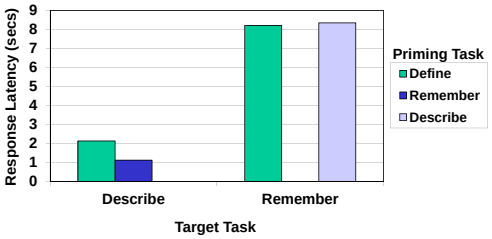
- Target Person: *Mother*
  - Rate Descriptiveness of Each Trait
- Present Trait Term
  - Define
  - Describes *Mother*
  - Remember Event Involving *Mother*
- Compare Performance
  - Trial *N* vs. Trial *N-1*

Does Remembering a Trait
Prime Remembering a Behavior?

67

Traits Highly Descriptive of *Mother*

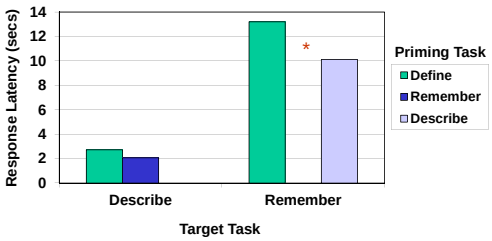
Klein, Loftus, Trafton, & Fuhrman (1992)



68

Traits Less Descriptive of *Mother*

Klein, Loftus, Trafton, & Fuhrman (1992)



69

Implications for the Organization of Person Memory

- Retrieval of Highly Descriptive Traits
  - *Does Not* Prime Retrieval of Trait-Related Behaviors
    - Highly Descriptive Traits are Represented Independently of Trait-Related Behaviors
- Retrieval of Less-Descriptive Traits
  - *Does* Prime Retrieval of Trait-Related Behaviors
    - Trait Judgments are Based on Retrieval of Exemplary Behaviors

70

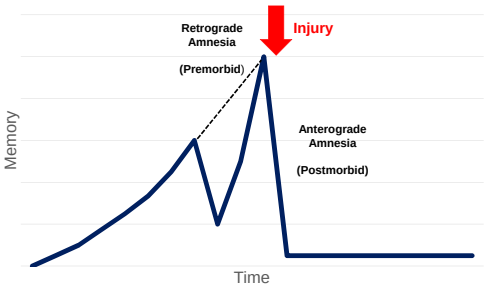
Evidence from Amnesia

Tulving (1993); Klein & Loftus (1996)

- Amnesic Patients
  - Anterograde (Postmorbid Memories)
  - Retrograde (Premorbid Memories)
- Cannot Remember Episodes
  - No Episodic Self-Knowledge
- But Can Describe Personality
  - Spared Semantic Self-Knowledge
- Can Even Appreciate Personality Change
    - Source Amnesia?

71

Forms of Amnesia



72

The Case of K.C.

Tulving (1993)

- Motorcycle Accident at Age 30
- Complete Amnesia
  - Anterograde
  - Retrograde
- Personality Change
  - Premorbid, Extraverted
  - Postmorbid, Introverted

73

Ratings of K.C.'s Postmorbid Personality

- K.C.'s vs. Mother's Ratings of *K.C.*
  - *Q* = .77
- K.C.'s vs. Mother's Ratings of *Mother*
  - *Q* = .80

74

K.C.'s Personality: Premorbid vs. Postmorbid

- 2-Alternative Forced Choice
  - Matched Items for Social Desirability
- Reliability of K.C.'s "Post" Ratings
  - 76% Agreement
- Mother's ratings of K.C. "Pre" vs. "Post"
  - 50% Agreement (Chance)
- K.C. "Post" vs. Mother "Post"
  - 73% Agreement
- K.C. "Post" vs. Mother "Pre"
  - 53% Agreement (Chance)

75

The Case of W.J.

Klein, Loftus, & Kihlstrom (1996)

- 18 y/o College Undergraduate
  - 2nd-Quarter Freshman
- Concussive Blow to the Head
  - No Neurological Abnormalities
- Anterograde Amnesia
  - 45 Min After Injury
- Retrograde Amnesia
  - Covering Previous 6-7 Months
  - Cleared in 11 Days

76

Memory Testing in W.J.

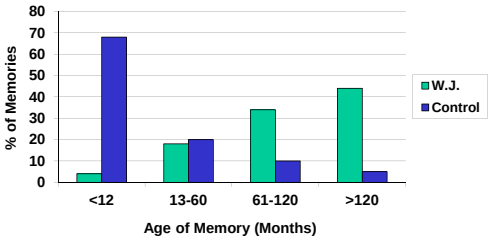
Klein et al. (1996)

- Digit Span
- Free Recall
- Semantic Memory
- Episodic Memory
  - Galton Cued-Recall Technique
    - Unconstrained
    - Constrained
- Personality Testing

77

Autobiographical Memory During Amnesia

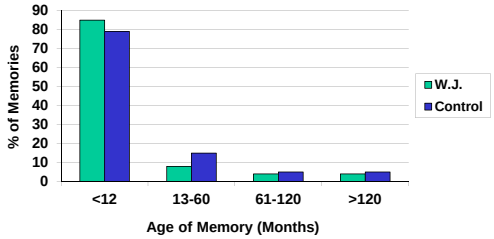
Klein et al. (1996)



78

Autobiographical Memory Post-Amnesia

Klein et al. (1996)



79

W.J.'s Personality in College

Klein et al. (1996)

- Agreement with Boyfriend, College
  - *r* = .65*[a] Controls, *r* = .65*[a]

  Knows What She's Like Now
- College vs. High-School
  - *r* = .53*[b]

  Some Relation to High-School Personality
- Test-Retest Reliability, College
  - *r* = .74 *[c] Controls, *r* = .78*[c]

  College Self Not Accounted For by High-School Self

80

Trait and Behavioral Self-Knowledge in Amnesia

- Amnesics Retain Knowledge of Personality
  - Forget Knowledge of Events
- Trait, Behavioral Information
  - Represented Independently
  - Confirms Results of Priming Studies

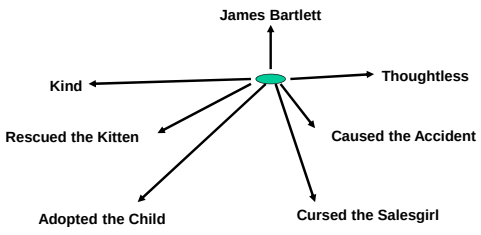
81

Structure of Person Memory

- Persons Represented as Nodes
- Traits, Behaviors Represented as Nodes
  - Fan Out from "Person" Node
- Trait and Behavioral Knowledge Represented Separately
  - Behaviors Do Not Fan Out from the Traits They Exemplify

82

Traits and Behaviors are Represented Independently



83

Neural Representation of Memory

- Distributed (Lashley; Hebb)
  - Reverberating Pattern of Neural Activity
  - Distributed Widely Over Cerebral Cortex
- Localist (Penfield)
  - Activity of Single Neurons
    - Or Small Clusters of Neurons
  - Centered on Specific Cortical Location
    - A "Grandmother Neuron" (Lettvin, 1967)

84

Invariant Visual Representation by Single Neurons

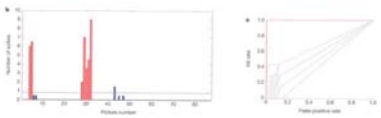
Quian Quiroga, Reddy, Kreiman, Koch, & Fried (2005)

- 8 Patients with Intractable Epilepsy
  - Electrodes Implanted to Localize Seizures
    - Medial Temporal Lobe
      - Hippocampus, Amygdala
      - Entorhinal Cortex, Parahippocampal Cortex
    - 8 Active Microwires per Electrode
- Responses to Visual Stimulation
  - Individuals, Objects, Animals, Landmarks
    - Selection Based on Interviews with Patients
    - Activity Spikes Within 1 Second
      - 5 SD Above Baseline

85

The "Jennifer Aniston" Neuron?

Quian Quiroga et al. (2005)

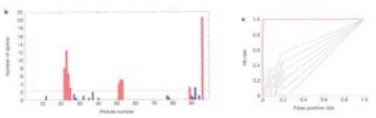


Single Unit in Left Posterior Hippocampus

86

The "Halle Berry" Neuron?

Quian Quiroga et al. (2005)



Single Unit in right Anterior Hippocampus

87

Summary of Findings

Quian Quiroga et al. (2005)

- Tested 993 Units
  - 343 Single Units, 650 Multi-Units
- Response to 1+ Pictures in 132 (14%)
- Then Test 3-8 Variants
  - 51 of 132 Showed Invariant Representation
    - People, Landmarks, Animals, Food Items
- Representations are Abstract
  - Different Views of Subject
  - Photographs and Line Drawings
  - Pictures and Names

88

Maybe there is a "*Grandmother Neuron*" After all!

- Sparse Neural Representation
  - Small Number of Units Active At Any One Time
- Psychophysical Linking Principle (Barlow, 1972)
  - Whenever two stimuli can be distinguished reliably...
  - …the physiological messages they cause in some single neuron would enable them to be distinguished with equal or greater reliability
- Knowledge Distributed Widely in Cortex
  - But Comes Together in Single Units
- Hippocampus as Index
  - Relates Memories to Each Other

89