Types of Memory

Review Session
Wednesday, 5/14 at 5:00
in PCYNH 106

This will **not** be on Midterm 2.
(It **will** be on the final.)

Distinctions in memory

• (And by memory, here, we mean long-term memory)

Episodic and Semantic

• Knowledge you can state
  • Episodic: *particular events*
    – H.s. graduation dinner
    – Text message you received last night
  • Semantic: *general information*
    – What typically constitutes a dinner
    – What a dog is like (category information)

Semantic memory

• Categories, event schemas
• Concepts that are related activate each other
  (e.g. Meyer & Schvaneveldt 1971)
  – Lexical decision task
  – Prime is related or unrelated word
Semantic memory
• Categories, event schemas
• Concepts that are related activate each other (e.g. Meyer & Schvaneveldt 1971)
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  – Prime is related or unrelated word
    • Fish→lamp (LD to lamp is normal)
    • Cup→bowl (LD to bowl is faster/“facilitated”)

Semantic memory
• Categories
  – Can make inferences
    • Are horses animals?
    • Do horses have electrons?

Semantic memory
• Collins & Quillian: hierarchical model
  – Nodes (bird, fish, animal)
    • Concepts, not word-forms
  – Links
    • Labeled
    • Directed
  – Activation tags

Semantic memory
• Collins & Quillian: hierarchical model
  – Nodes
  – Links
  – Activation tags
  – Superordinate/subordinate

Semantic memory
• Collins & Quillian: hierarchical model
  – Nodes
  – Links
  – Activation tags
  – Superordinate/subordinate
  – Sentence verification
    • A cat has slit pupils. (faster)
    • A cat is an animal. (slower)
Semantic memory

• Collins & Quillian: **hierarchical model**
  – Problem 1: **typicality effect**
    • A penguin is a bird
    • A robin is a bird (FASTER)
    • Ok, stronger link for robin

Episodic memory

• Lots of details
• Temporally specific
  — Remember things in the order they happen
• Memory for source
• Truth determined by individual
  — Not by group consensus, like what “table” refers to

Episodic memory

• Separate from semantic?
• Evidence from amnesia

Amnesia

“TV” amnesia:
Retrgrade: Cannot remember events prior to brain damage
Anterograde: Cannot later remember events that occur after brain damage

Typical:
- bad anterograde
- retrograde (often patchy)
- confabulation (~ time of trauma)
- rest of intellect intact

Episodic memory

• Separate from semantic?
• Evidence from amnesia

Semantic memory

• Collins & Quillian: **hierarchical model**
  – Problem 2: Violations of hierarchy
    • A chicken is a bird
    • A chicken is an animal (FASTER)
    • Add another link: chicken->animal
      — But violates hierarchy!

Semantic memory

• Collins & Quillian: **hierarchical model**
  – Problem 3: false responses
    • A bat is a bird (SLOWER to say false)
    • A bat is a plant
    • “Relatedness effect”
      — Spurious bat/bird similarities

Semantic memory

• Collins & Quillian: **hierarchical model**
  – Problem 2: Violations of hierarchy
    • A chicken is a bird
    • A chicken is an animal (FASTER)
    • Add another link: chicken->animal
      — But violates hierarchy!
Amnesia

- Anterograde: H.M.
  - Surgery for temporal lobe epilepsy: 1953
  - IQ: normal (better than pre-op)
  - Died in 2008; lab at UCSD sectioned and preserved his brain [http://thebrainobservatory.ucsd.edu/hm](http://thebrainobservatory.ucsd.edu/hm)

Amnesia

- Anterograde: H.M.
  - Memory after surgery
    - Couldn’t learn new people, events
    - Few new facts
    - Couldn’t improve on maze-solving task, find house
    - Could draw detailed floor plan of post-surgery house
    - Few new words since 1950’s
      - Preserved: procedural learning

Retrograde amnesia

- Korsakoff’s syndrome
  -Usu. due to long-term alcoholism
  -Severe anterograde (no new memories)
  -Some retrograde
    -Seems to have temporal gradient
      -TV shows
      -Famous people
      -Famous events
    -Prob with gradient: alcohol causes anterograde

Retrograde amnesia

- Korsakoff’s syndrome
  -P.Z. (Butters & Czernak, 1984)
  -Onset at 65; famous scientist
  -Tested memory of his own autobiography
    -Facts: temporal gradient
    -Events: temporal gradient
    -Supports temporal gradient
    -Suggests episodic and semantic not separate
      -Both affected by syndrome

Episodic/Semantic

- Amnesia research doesn’t support distinction
  -Definitely memory for episodes, but
  -Anterograde: Hard to teach new semantic knowledge
  -Also, if episodes add up to semantics, you can’t knock out one without the other
Distinctions in memory

Procedural/Declarative

- Declarative: knowing **that**
  - Last night you had cheesy poofs for dinner
  - Cheesy poofs are not a good dinner
- Procedural: knowing **how**
  - How do you open a bag of cheesy poofs?
  - Hard to verbalize, easy to act out
  - Skills: driving, reading, bow-hunting
  - H.M. could do it--separate

Implicit/Explicit

- Explicit: conscious awareness
  - You know that you know
  - Recall
  - Recognition
- Implicit: no conscious awareness
  - You don’t know you know (may think you’re guessing)
  - Stem completion (gar____)
  - Read rapidly-flashed word
  - Type of repetition priming
    - Previous exposure affects subsequent processing

Implicit/Explicit

- Jacoby & Dallas (1981)
  - Present list of 60 words
  - Process meaning, rhyme, letters (depth)
  - Test: 80 words
    - Recognize presented words
    - ID with brief appearance (35-ms)–80% vs. 65%
    - Just bias?
      - Nope—recognition (explicit) showed depth of processing effects, ID didn’t (implicit)

Implicit/Explicit

- Some manipulations affect implicit but not explicit:
  - Change to physical characteristics

- Even opposite effects (Jacoby, 1983)
  - Antonym task
    - Exp. Imp.
    - Hot-___ (generate) .78 .07
    - Hot-COLD (context) .72 .16
    - COLD (no context) .56 .22

Implicit/Explicit

- Criticisms
  - Ratcliff & McKoon: not different type of memory, but bias
    - Normal stem completion: “absent” – ABD____
    - Tricky stem completion: “absent” –  ABD____
      - Not absent, but close
      - Stem completion is slower if exposed to “absent”
  - Roediger: task demands aren’t equated
  - Explicit: driven by concepts
  - Implicit: driven by data/perception
Models of memory

Adaptive Control of Thought

- "ACT" theory (John R. Anderson, '76, '83, '91)
- Extension of hierarchical model
  - But better?
- Attempts to explain
  - Learning
  - Memory
  - Language
  - Reasoning
  - Problem solving

ACT model

- Proposition: smallest unit of meaning that can be falsified
- Not proposition
- Proposition: The chalkboard is dusty.
- Proposi%on: The professor is dusty.

ACT model

- Proposition: Kind of like a sentence, but one sentence can contain multiple propositions
- [The professor thinks [the chalkboard is dusty]]

ACT model

- Proposition: Kind of like a sentence, but one sentence can contain multiple propositions
- [The class knows [The professor thinks [the chalkboard is dusty]]]

ACT model

- Proposition: Kind of like a sentence, but one sentence can contain multiple propositions
Another issue: what about particular instances?

Not really what we mean.

Type-token distinction:
A *type* is just a class of objects/things; a *token* is a particular instance of that class.

Compare to semantic vs. episodic.

- Spreading activation
  - Nodes activate, intersect if connected to same proposition
  - Have you seen this sentence?
    - The chalkboard is dusty
    - The professor is dusty

- The evidence
  - Getting the “gist”
    - Jim told Ed about the fun exam
    - Jim and Ed talked about the fun test
    - Jim told Ed about the bad exam
  - Nurse primes doctor
  - Fan effects

* All student names have been changed to protect anonymity.
So the more facts you know, the harder it is to access one.
But aren’t we faster to recall more about what we know a lot about?
If based on plausibility, more facts leads to faster response.

Fan effects & plausibility

- Reder & Ross (1983)
  - Learn facts with different fan sizes
  - Then test either
    - Strict recognition or
    - Plausibility

One more model...

Parallel Distributed Processing (PDP)

- E.g. McClelland & Rumelhart (1986)
- Very different approach than ACT
  - Representations
    - Localist (ACT) vs. distributed (PDP)
  - Combines episodic and semantic
    - Episodes “add up to” semantics
  - Brain-inspired
    - Nodes and links (= neurons & their connections)

Parallel Distributed Processing (PDP)

- Localist (ACT) vs. distributed (PDP) representations: why?
  - “grandmother cell”
  - Store many patterns in one network

Parallel Distributed Processing (PDP)

- Combining episodic and semantic
  - Episodes “add up to” semantics
    - Multiple encodings of same/similar events strengthen memory,
      form a generalization (semantic memory)
  - Embodies idea that all remembering occurs in the context
    of every other memory
  - Remembering is being given partial information and “filling
    in” the rest (pattern completion)
Parallel Distributed Processing (PDP)

- Brain-inspired
  - (Not quite like a real brain, but...)
  - Nodes = neurons
  - Connections = synapses
  - A little like IA model, but that was localist too
  - Excitatory (+) & inhibitory (-) connections
  - Goal: map inputs to outputs
  - Both inputs and outputs are patterns of node activations—i.e., distributed

PDP model of memory

- Nodes: 0-1
- How do we map inputs to outputs?
  - What changes?
- The connection weights
  - Like synapses
  - No need to add nodes (new neuron if grandpa remarries?)

Localist: 4 options (4 1-to-1 mappings)
Distributed: 4 x 3 options (or more)