General Psych
LEARNING & MEMORY

Before Ebbinghaus

Gods of memory

Egyptian = Thoth
Roman = Minerva
Greek = Mnemosyne (mother of Muse)
"If I'm owed anything, I'm mindful, very. But if I owe, forgetful, very."

Ancient Models

wax tablet model
aviary model (memory like a bird)
scribe model (it's like writing things down)

Roman period

1st mnemonic technique: method of loci
- method of loci imposes a "double task"
- must remember things and places

Ebbinghaus' Contemporaries

Sir William Hamilton, 1859
- Single glance of marbles
- Hard to see more than 6 or 7
- If group in twos & threes, 6 or 7 groups

Sir Francis Galton
Pioneered use survey questionnaires
Suggested Scotland Yard use fingerprints
Introduced
- scatterplots
- "co-relation" (correlation)
- "regression toward the mean"
- 1st to use weather charts; use of "high", "low" and "front"
- 1st to study twins
- 1st word association test

Darwin's cousin
Applied the concepts of evolution to mind
Survey of rich families (law, medicine, kings);
- Concluded success was function of heredity, not environment

Survival of the intellectually fittest
Memory is the "antechamber of consciousness"
Autobiographical memory
- Stories about your life
- Not all that accurate

Vividness of visual imagery
- Recall their breakfast table

Ebbinghaus (1850-1909)

Accomplishments

Devised a word-completion test which is still used in present-day intelligence tests
Investigated color vision & mental capacity
1st to publish an article on measuring the intelligence of school children

Firsts:

1st to study memory experimentally
1st to study memory as it occurred

Procedure

Used self as subject
Careful controls
    list of words; one per card
    items kept in order
    watch (metronome) to set pace (1 per sec)
    when reached end of list, paused 15 seconds
At first, used terms of sounds
Later, used "nonsense words"
CVC (consonant-vowel-consonant)
CCC (consonant-consonant-consonant)
    e.g., BOK, BLV

Paradigm:

Day 1: Learn list (16 to 20 items) by repeating list 8, 16, 24, 32, 42, 53, or 64
Day 2: Wait 24 hours, then relearn list to perfect repetition
Number of trials takes to relearn list on Day 2

Found: What people already knew

1. Difficulty increases with length of list
2. Frequent repetitions needed to learn word lists
3. Serial position effect
    first & last better than middle

Found: New findings

1. Difficulty and amount learned are not related one-to-one
2. Recall falls off rapidly, then more slowly
    A very rapid forgetting in the first hour
    Flattens out at about 35% for first 8 hrs
    65% loss
3. Recall better if learning is spaced out over small study times
    Teaching Typing
    Distributed practice is more efficient
    Not necessarily perceived as fastest

    Most efficient schedule for most any learning is one 1-hour session per day
    Diminished returned at 2-hours
    2+ = better but not as much bang for the buck
    Virtually flat beyond 4-hours
4. Associations in list help
    adjacent associated words very helpful
    nonadjacent associations helpful
5. The best strategy for limiting the decline in recall is to "over learn" the material
    Complete memory = can say it correct once
    Savings = effort saved

Types Of Memory

Memory is not one system

Sensory Memory

- Iconic memory ½ second
  - George Sperling
    - People can see more than they can report
    - Partial report method
    - Grid of 12 letters; 3 rows of 4
    - 3 tones
- Echoic memory 3-4 seconds
  - Replay tape

STM (short-term memory)

- Primary vs active memory
- 7 plus or minus 2 items
- 7 plus or minus 2 chunks
- Varies with type of info to recall
- Atkinson and Shiffrin

LTM (long-term memory)

1. Declarative Memory
   - Conscious memories
   - A. Episodic memory (events)
   - B. Semantic memory (dictionary)
2. Procedural Memory
   - Playing sports
   - Using tools
   - Dancing
   - Doing

- How get from STM to LTM
  - Consolidation by hippocampus
  - Levels of Processing
    - Craik & Lockhart
    - Surface vs. deep processing

Semantic Memory

1. Feature comparison models
   - Smith, Shoben & Ripps (1974)
   - 2 sets of features
     - defining features = necessary; has 4 legs, tail
     - characteristic features = optional; had one as a pet
   - Problems
     - Assumes natural categories have defining features
     - Not well supported by data
     - Category membership seems to be based more on family resemblance
     - Can’t distinguish between statements
       A robin is a bird vs A bird is a robin
     - Using speed of judging may not generalize well
     - Facial recognition

2. Spreading activation models
    Node becomes active
    Activation spreads to other nodes via links
    "Is a chicken a bird?"
    How far between nodes

3. Semantic network models
    One-way links
    From base to target
    Different types of links

4. Category search models
    Two empirical findings:
    1. prototypical items are identified faster
        begin with most typical items; longer to say collie as animal than as dog
        faster verifying most prototypical items; robin faster than ostrich for BIRD
        category generation task: list all BIRDS
            what list first (robin)
    2. negative items are identified slower
        takes longer to reject negative items from a similar category than from a dissimilar category
        longer to reject potato than reject riffle

Conclude:
    Self-terminating for positive (in category)
    Exhaustive search for negative (not in category)

Working Memory = RAM (Baddeley)

1. Phonological Loop
    Speech coding system
    2 components
        Phonological store
            Stores sounds for about 2 seconds
            Refresh with subvocal rehearsal
        Articulatory control process
            Converts visual info into speech code
2. Visuo-Spatial Sketchpad
    Originally called visuo-spatial sketch pad
    Later changed to the visuo-spatial scratch pad
    Not just pictorial info
    Includes word shape, letter shape, etc.
    Use for
        Geographical orientation
        Planning spatial tasks
        Abacus use
    2 separate processes
        Spatial information (where things are)
        Visual information (what they look like)
    Imagery in working memory is spatial
    Not visual

- Previous research findings
  - Imagery is involved in memory
  - Images come from the activation of perceptual systems
  - even in the absence of sensory input
  - Eye movements or their control systems might play a role in imagery
- Visual-Spatial & Concurrent Tasks
  - Brooks' matrix
- Other research
  - (Shepard & Metzler, 1971)
  - 2D representations of 3D shapes
  - 2 shapes could be same or mirror image
  - Measured time needed to rotate figure
- Conclusion
  - Imagery is based on an analog medium
  - gradual manipulation of the image
  - not a series of discrete jumps
  - not an all-or-none system
- Rotation rate was not a function of how complex figures are
  - (Kosslyn, 1980)
  - Picture of boat
  - When a question about the bow was followed by a question about a distant part of the boat such as the rudder
  - It took longer to answer than question about portholes
  - Conclusion = Ss were physically scanning the image
    - Read info from mental images
    - Time to scan along a mental image is a function of distance
    - When walk toward an object, it expanded to fill their visual field
- Similar effect on geographical mental rep.
  - Distance between location on U campus
  - Imagine a barrier between 2 objects in a mental image
  - Distances within town centers judged as further than distance in the suburbs
- Ss taught fictitious maps
  - Estimated distance longer as more intervening places included
  - Smaller effect when Ss reading an actual map
- Ss took longer to imagine traversing a familiar route when told they were carrying a cannonball

Episodic Memory

- What you did today
- Autobiography

Practical Memory (Everyday Memory)

- Do chestnut trees or oak trees lose leaves earlier in the autumn?
- Do horses in fields stand with head or tail to the wind?
- In what direction do the seeds of an apple point?"
- What's on penny
  - recall 3 of 8 critical features
- Draw nickel, dime and quarter, both sides
  - general schema for a US coin
  - Not specific recall
  - drawings tended to resemble each other
  - had features most commonly on coins
- Design a new coin = tend to use same features

Field study of 300 blue- & white-collar jobs
- Watched blue collar tasks
- product assembly, inventory, & pricing delivery tickets at a dairy
- created problems based on observations
- Preloaders task was to pack a given amount of milk by putting together containers of different sizes
- Almost always chose most efficient way to fill an order
  - (add or take from partial cases, etc.)
  - Few errors, high cognitive demands
- Conclusions
  - Novices used single algorithm solution
  - Relied heavily on numerical solutions & counting operations
  - Experts shortcut the arithmetic; worked directly from the "visual display"

Brazilian street vendors (children)
- 98% accurate with real life problems
- 37% correct with abstracted problems
- Used own counting systems to solve problem
- Knowledge obtained in everyday practice is not portable to formal contexts such as school
- Used most familiar strategy in school

Prospective memory

Remembering (forgetting) to do things

Characteristics
- structure of normal day has cueing effect
  - (read story, reminds to do something)
- embarrassed when system fails
  - (social importance)
- "when" memory
  - do this at that time
  - low information content (not a great deal of detail)
- One of most sensitive memory parts to aging
- Easier to remember appointment with others
  - harder to do something to object (collect a document)

Simulate taking pills 4 times a day
- press button on little box 3 times a day
- 2 groups:
  - Good free recall of lists
  - Bad free recall of lists
- Good verbal memory group was less accurate = "absentminded professor effect"

2 types of memory demands
- steps = anytime between now & end of day
  - remember periodically over the day
- pulses = do something at a specific time
  - either remember it once or aware of all day
  - more likely to note in external memory aid
  - judged more important
  - easier to remember

Process

Hear a sound	Sensory memory
Identify a name	Semantic memory
Thinking	Working memory
Visualize	Viz-Spatial memory
Reaction	Emotional memory
Want to keep	Consolidation
Storage	Long-term memory
What do next	Prospective memory
Last night	Episodic memory
Street smarts	Practical memory