

Overview

- Memory representation
- Multi-store models
- Working memory
- Learning processes
- Long-term memory
- Semantic memory
- Forgetting
- Amnesia
- Eyewitness testimony

2

Memory

- The ability to remember things we have experienced, imagined, or learned
- Memory is often seen as steps in an *information-processing* model
 - Encoding
 - Storage
 - Retrieval

3

The Sensory Registers

- Sensory registers are the first stop for all sensory information
- The sensory registers are very large, but information stays for only a very short time

4

Visual and Auditory Registers

- Visual register holds images, or icons, that represent all aspects of a visual image
 - Icons normally last about ¼ second in the visual register
- Auditory register holds echoes of sound
 - Echoes can last up to several seconds in the auditory register

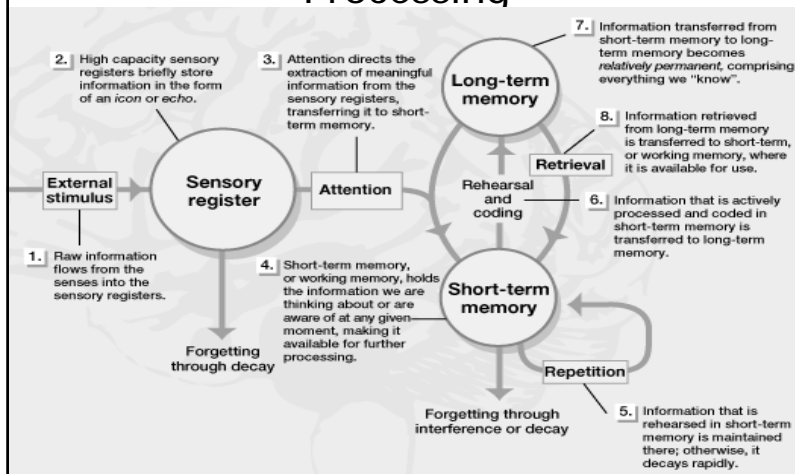
5

Attention

- Selects certain information for further processing
- We normally pay attention to only a small portion of incoming information

6

Sequence of Information Processing



Short-Term Memory

- Short-term memory holds information we are aware of or thinking about at any given moment
- Sometimes referred to as *working memory*

8

Capacity of Short-Term Memory

- Early research indicated that STM can hold 5-10 bits of information
- Current research has demonstrated that STM can hold whatever is rehearsed in 1.5 to 2 seconds
- Larger amounts of information can be held by using the process of *chunking*

9

Encoding in Short-Term Memory

- Much information is stored in STM phonologically (according to how it sounds)
- Some information is stored visually
- Research has shown that memory for visually encoded information is better than phonologically encoded information

10

Maintaining Short-Term Memory

- Information can be held in STM by using *rote rehearsal*, also called *maintenance rehearsal*
- Rote rehearsal involves repeating information over and over
- This technique is not very effective in creating long term memories

11

Long-Term Memory

- Everything that is learned is stored in long-term memory
- Capacity of long-term memory
 - Vast amounts of information may be stored for many years
 - No known limits to capacity

12

Encoding in Long-Term Memory

- Most information is encoded in terms of meaning
- Some information is stored verbatim
- Some information is coded in terms of nonverbal images

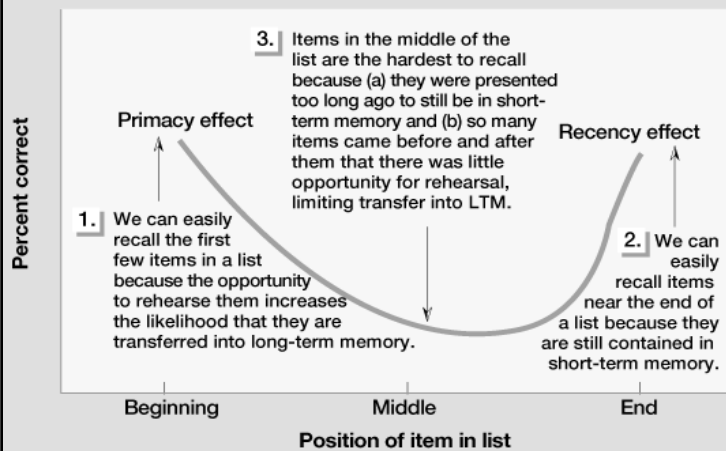
13

Serial Position Effect

- People tend to recall the first items (*primacy effect*) and last items (*recency effect*) in a list
- Demonstrates how short- and long-term memory work together
- Primacy effect reflects long-term memory
- Recency effect reflects short-term memory

14

Serial Position Effect



Maintaining Long-Term Memory

- Rote rehearsal
 - Repetition can result in long-term memory
 - Only effective if there is intent to learn material
 - Example: What does a penny look like?



16

Maintaining Long-Term Memory

- Elaborative rehearsal
 - Process of relating new information to information already stored in memory
 - Meaning is assigned to new information and then linked to as much existing knowledge as possible

17

Schemata

- A schema is a set of beliefs or expectations about something based on past experience
- Incoming information is fit with existing schemata
- Schemata can also influence the amount of attention paid to a given event

18

Types of Long-Term Memory

- Episodic memories
 - Memories for personal events in a specific time and place
- Semantic memories
 - Memory for general facts and concepts not linked to a specific time
- Procedural memories
 - Motor skills and habits
- Emotional memories
 - Learned emotional responses to various stimuli

19

Explicit and Implicit Memory

- Explicit memory
 - Memory for information we can readily express and are aware of having
 - This information can be intentionally recalled
- Implicit memory
 - Memory for information that we cannot readily express and may not be aware of having
 - Cannot be intentionally retrieved

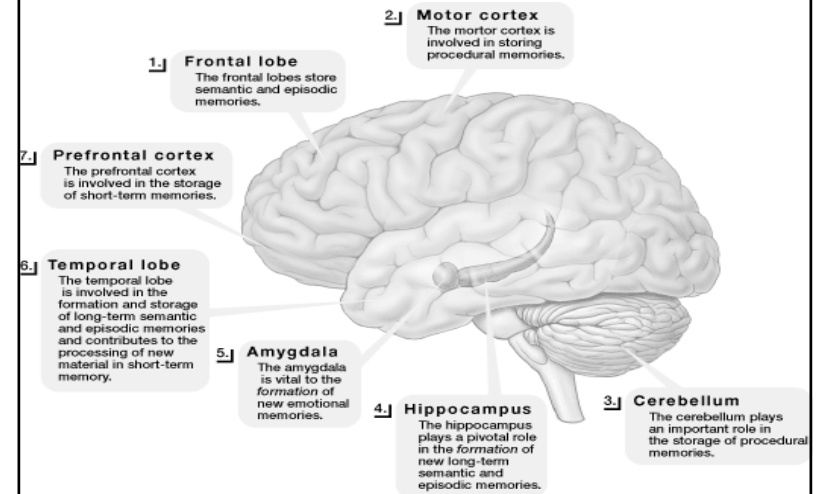
20

The Biology of Memory

- How are memories formed?
 - Changes in synaptic connections among neural cells
 - Called *long-term potentiation*
- Where are memories stored?
 - There is no one place
 - Different parts of the brain are specialized for different types of information

21

Where Are Memories Stored?



The Biology of Forgetting

- Decay theory
 - Memories deteriorate because of the passage of time
- Amnesia
 - Memory loss caused by accidents, surgery, poor diet, or disease
- Retrograde amnesia
 - Loss of memory from prior to an accident or injury

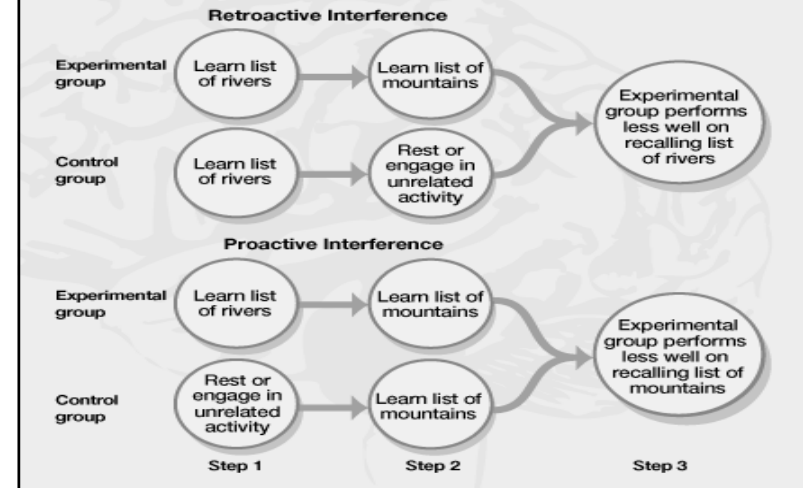
24

Experience and Forgetting

- Retroactive interference
 - Occurs when new information interferes with information already in memory
- Proactive interference
 - Occurs when information already in memory interferes with new information

25

Interference



Experience and Forgetting

- Situational factors
 - Recall of information is better if environment is the same as when information was learned
- State-dependent memory
 - Recall of information is better if person is in the same physiological state as when information was learned
- Reconstruction
 - Memories can be altered with each retrieval

27

How to Reduce Forgetting

- Develop motivation
- Practice memory skills
- Be confident in your ability to remember
- Minimize distractions
- Stay focused
- Make meaningful connections to what is in long-term memory
- Use mental imagery
- Use retrieval cues
- Rely on more than memory alone
- Be aware of possible distortion due to schemata

28

Special Topics in Memory

- Autobiographical memory
 - Recollection of events in our life
 - More recent events are easier to recall
- Childhood Amnesia
 - Generally poor memory for events prior to age two
 - May occur because brain is not fully developed at birth
 - Another theory is that it may be due to lack of clear sense of self in young children

29

Special Topics in Memory

- Extraordinary memory
 - Includes eidetic imagery (photographic memory)
 - Usually due to well developed memory techniques
- Flashbulb memories
 - Vivid memories of dramatic event
 - May occur because of strong emotional content

30

Special Topics in Memory

- Recovered memories
 - Involved the recall of long-forgotten dramatic event
 - May be the result of suggestion
 - Some evidence that memories can be repressed and recalled later

31

Eye Witness Testimony

- Eyewitness testimony
 - Shown to be unreliable
 - People's recall for events may be influenced by what they heard or imagined
- Mistakes are made either because of what happens at the time of the event or because of what happens after the event.
- Eye witness not entirely attending to incident or aware of its significance.
- Further important factor criminal violence...

32

Eye Witness Testimony

- **Loftus & Burns** (1982) – used 2 filmed versions of a crime
 - Criminals escape in non-violent way.
 - A boy was shot in the face as criminals were escaping.
- Those participants who saw this violent version had poorer memory for information presented during the previous two minutes than did those who saw the non-violent version.



33

Eye Witness Testimony

- **Loftus & Palmer** (1974) – Evidence as to what happens after an incident.
 - “**Smashed into**” participants gave an average speed estimate of 40.8MPH
 - “**Hit**” participants estimated the speed of 34.0MPH.
 - A week later, the participants were asked whether they had seen any broken glass :
 - 32% of the ‘smashed’ group said yes
 - 14% in the ‘hit’ group said yes.
- ⇒ eyewitness witness is rather fragile and can easily be distorted by post-event questioning.

34

Eye Witness Testimony

- **Loftus** (1991) – **Misinformation acceptance**
- Eyewitnesses willing to accept misleading post-event information, later regarding it as their own memory.
- Tendency for eyewitness memories to be influenced by misinformation acceptance increases as time elapses since the original incident.

35

Eye Witness Testimony

- **Kassin et al.**, (1989) – Meta-analysis on eyewitness testimony:
 - The confidence of eyewitnesses does not predict the accuracy of their testimony (3%)
 - Eyewitness usually overestimate the duration of events (5%)
 - Eyewitnesses’ testimony about an event depends in part on information obtained afterwards (7%)
 - Eyewitnesses’ memories for an event show normal forgetting curve (24%)
 - Eyewitnesses’ testimony can be influenced by the way in which questions put to them are worded (27%)
 - There is an increased risk of misidentification when only one person is in an identification parade than when there are several (29%).

36

Eye Witness Testimony

- **Practical improvement**
- **Geiselman et al** (1985) – based on our knowledge of working memory should improve police interviews, therefore suggested **basic cognitive interview**:
 1. Memory traces usually consist of a number of different related pieces of information, and this means that various retrieval cues may allow us to gain access to any given memory trace.
 2. The retrieval cue may only be affective when the information overlaps with information contained in the memory trace (encoding).

37

Eye Witness Testimony

Basic Cognitive Interview features:

1. Eyewitnesses should try to recreate the external and internal context present when the incident occurred, in order to maximise the overlap with the information in the memory traces; this can involve revisiting the scene of the incident and recreating the mood state at the time of the incident.
2. Everything of any possible relevance to the incident is reported, even if it is a very incomplete or frightened from.
3. The events and details of the incident are recalled in different orders; the first details recalled act as retrieval cues for the others.

38

Ageing

- Common belief that memory becomes impaired with age, though not as much as suspected.
 - **Harris & Sunderland** (1981) – Demonstrated improved memory with older adults.
 - **Williams** (1969) – Carers attributed memory failure to lesions or accidents without indication of previous impairments.
 - **Kral** (1978) – Demonstrated that dementia patients attempting to learn memory skills results in further confusion.



39

Cultural Influences on Memory

- Cultural values and practices influence what kinds of things we remember and how easily we recall them

40

References

- Ashcraft, M.H. (1994) *Human Memory and Cognition*. HarperCollins, NY. This book deals with the main issues in human memory.
- Baddeley, A. (1999) *Essentials of Human Memory*. Boston: Psychology Press. Alan Baddeley is one of the leading memory researchers in the world, and he writes in an accessible way about theory and research in memory in this book.
- Baddeley, A. (1994) *Your Memory: A User's Guide*. Penguin.
- Neisser, U. & Winograd, E. (1988) *Remembering Reconsidered*. C.U.P., Cambridge.
- Eysenck, M.W., & Keane, M.T. (1995) *Cognitive Psychology: A student's handbook*. LEA, Hove. Chapters 6-8 contain detailed accounts of numerous topics relating to those covered here. *
- Wells, G. & Loftus, E. (1984) *Eyewitness Testimony*. C.U.P., Cambridge.

41

Internet Links

- <http://www.exploratorium.edu/memory/index.html> - Explores the biological, psychological, and cultural aspects of memory, from personal experiences to breakthroughs in cognitive science.
- http://www.wooster.edu/psychology/gil_lund/eyewitness/p340home.html - Memory and Eye Witness Testimony

42

Review Questions

- Describe and evaluate the multi-store model of memory.
- Compare and contrast the short-term store of the multi-store model with the working memory system.
- Memory is inseparable from the person who is doing the remembering. Discuss.
- How has everyday remembering been studied by psychologists?
- Outline the main explanations for forgetting.
- Describe the levels of processing theory of memory.
- Outline levels-of-processing theory. How successful has this theory been in accounting for the evidence?
- Discuss different ways in which the processes operating at the time of learning affect long-term memory.
- What are the advantages and disadvantages of assuming that there are separate episodic and semantic memory systems?
- Compare and contrast various theories of semantic memory. 43

Further Background Reading

- Levels of processing theory :
 - Motivated learning (Hyde & Jenkins, 1973)
- Semantic Memory :
 - Theory of Semantic Memory (Collins & Quillian, 1969)
 - Spreading Activation Theory (Collins & Loftus, 1975)
 - Concept Instability (Barsalou, 1982, 1989)
- Remembering :
 - Flashbulb memory (Brown & Kulik, 1977)
 - Prospective memory (Istomina, 1975)
 - Autobiographical memory (Conway & Bekerian, 1987) 44