

UNIT 7A: MEMORY

THE PHENOMENON OF MEMORY

OBJECTIVE 1: Define *memory*, and explain how flashbulb memories differ from other memories.

1. Learning that persists over time indicates the existence of MEMORY for that learning.
2. Memories for surprising, significant moments that are especially clear are called FLASHBULB memories. Like other memories, these CAN memories (can/cannot) err.

OBJECTIVE 2: Describe Atkinson-Shiffrin's classic three-stage processing model of memory, and explain how the contemporary model of working memory differs.

3. Both human memory and computer memory can be viewed as INFORMATION - PROCESSING systems that perform three tasks: ENCODING, STORAGE, and RETRIEVAL.
4. The classic model of memory has been Atkinson and Shiffrin's THREE - STAGE PROCESSING model. According to this model, we first record information as a fleeting SENSORY MEMORY, from which it is processed into SHORT - TERM memory, where the information is ENCODED through rehearsal into LONG - TERM memory for later retrieval.
5. The phenomenon of short-term memory has been clarified by the concept of WORKING memory, which focuses more on the processing of briefly stored information. This form of memory has both AUDITORY and VISUAL - SPATIAL subsystems, which are coordinated by a CENTRAL EXECUTIVE processor that, with the help of the EPISODIC buffer, allows us to process images and words SIMULTANEOUSLY.
6. Brain scans show that the FRONTAL LOBES are active during complex thinking, whereas areas in the PARIETAL and the TEMPORAL LOBES are active when auditory and visual information is in working memory.

ENCODING: GETTING INFORMATION IN

OBJECTIVE 3: Describe the types of information we encode automatically.

1. Encoding that does not require conscious attention or effort is called AUTOMATIC

PROCESSING. Some processing requires effort at first but with PRACTICE and EXPERIENCE it becomes effortless.

Give examples of material that is typically encoded with little or no effort.

AUTOMATIC PROCESSING INCLUDES THE ENCODING OF INFORMATION ABOUT SPACE, TIME, AND FREQUENCY. IT ALSO INCLUDES THE ENCODING OF WORD MEANING, A TYPE OF ENCODING THAT APPEARS TO BE LEARNED.

OBJECTIVE 4: Contrast effortful processing with automatic processing, and discuss the next-in-line effect, the spacing effect, and the serial position effect.

2. Encoding that requires attention and effort is called EFFORTFUL PROCESSING.
3. With novel information, conscious repetition, or REHEARSAL, boosts memory.
4. A pioneering researcher in verbal memory was EBBINGHAUS. In one experiment, he found that the longer he studied a list of nonsense syllables, the FEWER (fewer/greater) the number of repetitions he required to learn it later.
5. After material has been learned, additional repetition, or OVERLEARNING, usually will increase retention.
6. When people go around a circle reading words, their poorest memories are for the MOST (least/most) recent information heard. This phenomenon is called the NEXT - IN - LINE effect.
7. Memory studies also reveal that distributed rehearsal is more effective for retention; this is called the SPACING EFFECT.
8. The tendency to remember the first and last items in a list best is called the SERIAL POSITION EFFECT. Following a delay, first items are better remembered BETTER (better/less well) than last items.

OBJECTIVE 5: Compare the benefits of visual, acoustic, and semantic encoding in remembering verbal information, and describe a memory-enhancing strategy related to the self-reference effect.

9. Encoding the meaning of words is referred to as SEMANTIC encoding; encoding by sound is called ACOUSTIC encoding.
10. Craik and Tulving's study comparing visual, acoustic, and semantic encoding showed that memory was best with SEMANTIC encoding.

11. Our excellent recall of information that relates to ourselves is called the _____ **SELF** _____ - _____ **REFERENCE** _____ effect.

OBJECTIVE 6: Explain how encoding imagery aids effortful processing, and describe some memory-enhancing strategies that use visual encoding.

12. Memory that consists of mental pictures is based on the use of _____ **IMAGERY** _____. Because they tend to be highly memorable, they aid _____ **EFFORTFUL** _____ **PROCESSING** _____.
13. Concrete, high-imagery words tend to be remembered _____ **BETTER** _____ (better/less well) than abstract, low-imagery words.
14. Memory for concrete nouns is facilitated when we encode them _____ **SEMANTICALLY** _____ and _____ **VISUALLY** _____.
15. Our tendency to recall the high points of pleasurable events such as family vacations illustrates the phenomenon of _____ **ROSY** _____ **RETROSPECTION** _____.
16. Memory aids are known as _____ **MNEMONIC** _____ devices. One such device involves forming associations between a familiar series of locations and to-be-remembered words; this technique is called the “_____ **METHOD** _____ **OF** _____ **LOCI** _____.”
17. Using a jingle, such as the one that begins “one is a bun,” is an example of the “_____ **PEG** _____ - _____ **WORD** _____” system.

OBJECTIVE 7: Discuss the use of chunking and hierarchies in effortful processing.

18. Memory may be aided by grouping information into meaningful units called _____ **CHUNKS** _____. An example of this technique involves forming words from the first letters of to-be-remembered words; the resulting word is called an _____ **ACROYNM** _____.
19. In addition, material may be processed into _____ **HIERARCHIES** _____, which are composed of a few broad concepts divided into lesser concepts, categories and facts.

STORAGE: RETAINING INFORMATION

OBJECTIVE 8: Contrast two types of sensory memory.

1. Stimuli from the environment are first recorded in _____ **SENSORY** _____ memory.
2. George Sperling found that when people were briefly shown three rows of letters, they could recall _____ **ABOUT HALF** _____ (virtually all/about half) of them. When Sperling sounded a tone immediately after a row of letters was flashed to indicate which letters were to be recalled, the subjects were much _____ **MORE** _____ (more/less) accurate. This suggests that people have a brief photographic, or

_____ **ICONIC** _____, memory lasting about a few tenths of a second.

3. Sensory memory for sounds is called _____ **ECHOIC** _____ memory. This memory fades _____ **LESS** _____ (more/less) rapidly than photographic memory, lasting for as long as _____ **3 OR 4 SECONDS** _____.

OBJECTIVE 9: Describe the duration and working capacity of short-term memory.

4. Peterson and Peterson found that when _____ **REHEARSAL** _____ was prevented by asking subjects to count backward, memory for letters was gone after 12 seconds. Without _____ **ACTIVE** _____ processing, short-term memories have a limited life.
5. Our short-term memory capacity is about _____ **7** _____ chunks of information. This capacity was discovered by _____ **GEORGE MILLER** _____.
6. Short-term memory for random _____ **DIGITS** _____ (digits/letters) is slightly better than for random _____ **LETTERS** _____ (digits/letters), and memory for information we hear is somewhat _____ **BETTER** _____ (better/worse) than that for information we see.
7. Both children and adults have short-term recall for roughly as many words as they can speak in _____ **2** _____ (how many?) seconds.

OBJECTIVE 10: Describe the capacity and duration of long-term memory.

8. In contrast to short-term memory – and contrary to popular belief – the capacity of permanent memory is essentially _____ **UNLIMITED (LIMITLESS)** _____.
9. Penfield’s electrically stimulated patients _____ **DO NOT** _____ (do/do not) provide reliable evidence that our stored memories are precise and durable.
10. Psychologist _____ **KARL LASHLEY** _____ attempted to locate memory by cutting out pieces of rats’ _____ **CORTEXES** _____ after they had learned a maze. He found that no matter where he cut, the rats _____ **REMEMBERED** _____ (remembered/forgot) the maze.
11. It is likely that forgetting occurs because new experiences _____ **INTERFERE** _____ with our retrieval of old information, and the physical memory trace _____ **DECAYS** _____ with the passage of time.

OBJECTIVE 11: Discuss the synaptic changes that accompany memory formation and storage.

12. Researchers believe that memory involves a strengthening of certain neural connections, which occurs at the _____ **SYNAPSES** _____ between neurons.

13. Kandel and Schwartz have found that when learning occurs in the sea snail *Aplysia*, the neurotransmitter SEROTONIN is released in greater amounts, making synapses more efficient.
14. After learning has occurred, a sending neuron needs LESS (more/less) prompting to fire, and the number of RECEPTOR SITES it stimulates may increase. This phenomenon, called LONG - TERM POTENTIATION, may be the neural basis for learning and memory. Blocking this process with a specific DRUG, or by genetic engineering that causes the absence of an ENZYME, interferes with learning. Rats given a drug that enhances LTP will learn a maze FASTER (faster/more slowly).
15. Drugs that boost production of the protein CREB, or the neurotransmitter GLUTAMATE, may enhance memory.
16. After LTP has occurred, an electric current passed through the brain WILL NOT (will/will not) disrupt old memories and WILL (will/will not) wipe out recent experiences.

OBJECTIVE 12: Discuss some ways stress hormones can affect memory.

17. Hormones released when we are excited or under stress often FACILITATE (facilitate/impair) learning and memory.
18. Two emotion-processing clusters, the AMYGDALA, in the brain's LIMBIC system increase activity in the brain's memory-forming areas.
19. Drugs that block the effects of stress hormones DISRUPT (facilitate/disrupt) memories of emotional events. Stress that is prolonged, however, may cause an area of the brain (the HIPPOCAMPUS) that is vital to laying down memories to SHRINK.

OBJECTIVE 13: Distinguish between implicit and explicit memory, and identify the main brain structure associated with each.

20. The loss of memory is called AMNESIA. Studies of people who have lost their memory suggest that there IS NOT (is/is not) a single unified system of memory.
21. Although amnesia victims typically HAVE NOT (have/have not) lost their capacity for learning, which is called IMPLICIT memory, they ARE NOT (are/are not) able to declare their memory, suggesting a deficit in their EXPLICIT memory systems.

22. Amnesia patients typically have suffered damage to the HIPPOCAMPUS of their limbic system. This brain structure is important in the processing and storage of EXPLICIT memories. Damage on the left side of this structure impairs VERBAL memory; damage on the right side impairs memory for VISUAL designs and locations. The rear part of this structure processes SPATIAL memory.
23. The hippocampus seems to function as a zone where the brain TEMPORARILY (temporarily/permanently) stores the elements of a memory. However, memories DO (do/do not) migrate for storage elsewhere. The hippocampus is active during SLOW - WAVE sleep, as memories are processed for later retrieval. Recalling past experiences activates various parts of the FRONTAL and TEMPORAL lobes.
24. The cerebellum is important in the processing of IMPLICIT memories. Humans and laboratory animals with a damaged cerebellum are incapable of simple EYE - BLINK conditioning. Those with damage to the AMYGDALA are incapable of FEAR conditioning, indicating that this brain region is important in the formation of IMPLICIT memories.
25. The dual explicit-implicit memory system helps explain INFANTILE amnesia. We do not have explicit memories of our first three years because the HIPPOCAMPUS is one of the last brain structures to mature.

RETRIEVAL: GETTING INFORMATION OUT

OBJECTIVE 14: Contrast the recall, recognition, and relearning measures of memory.

1. The ability to retrieve information not in conscious awareness is called RECALL.
2. Bahrick found that 25 years after graduation, people were not able to RECALL (recall/recognize) 90 percent of their names and were able to RECOGNIZE (recall/recognize) their yearbook pictures.
3. If you have learned something and then forgotten it, you will probably be able to RELEARN it MORE (more/less) quickly than you did originally.

OBJECTIVE 15: Explain how retrieval cues help us access stored memories, and describe the process of priming.

4. The process by which associations can lead to retrieval is called PRIMING.
5. The best retrieval cues come from the associations formed at the time we ENCODE a memory.

OBJECTIVE 16: Cite some ways that context can affect retrieval.

6. Studies have shown that retention is best when learning and testing are done in THE SAME (the same/different) contexts.

Summarize the text explanation of the déjà vu experience. **THE DÉJÀ VU EXPERIENCE IS MOST LIKELY THE RESULT OF BEING IN A CONTEXT SIMILAR TO ONE THAT WE HAVE ACTUALLY BEEN IN BEFORE. IF WE HAVE PREVIOUSLY BEEN IN A SIMILAR SITUATION, THOUGH WE CANNOT RECALL WHAT IT WAS, THE CURRENT SITUATION MAY PRESENT CUES THAT UNCONSCIOUSLY HELP US TO RETRIEVE THE EARLIER EXPERIENCE.**

OBJECTIVE 17: Describe the effects of internal states on retrieval.

7. The type of memory in which emotions serve as retrieval cues is referred to as STATE - DEPENDENT memory.
8. Our tendency to recall experiences that are consistent with our current emotional state is called MOOD - CONGRUENT memory.

Describe the effects of mood on memory.

WHEN HAPPY, FOR EXAMPLE, WE PERCEIVE THINGS IN A POSITIVE LIGHT AND RECALL HAPPY EVENTS; THESE PERCEPTIONS AND MEMORIES, IN TURN, PROLONG OUR GOOD MOOD. MOODS ALSO INFLUENCE HOW WE INTERPRET OTHER PEOPLE'S BEHAVIOR.

9. People who are currently depressed may recall their parents as REJECTING, PUNITIVE AND GUILT-PROMOTING. People who have recovered from depression typically recall their parents about the same as do people who HAVE NEVER SUFFERED DEPRESSION. Moods also influence how we INTERPRET other people's behavior.

FORGETTING

OBJECTIVE 18: Explain why we should value our ability to forget, and distinguish three general ways our memory fails us.

1. Without the ability to FORGET, we would constantly be overwhelmed by information.
2. Memory researcher Daniel Schacter has identified the seven sins of memory, divided into three categories that identify the ways in which our memory can fail: the three sins of FORGETTING, the three sins of DISTORTION, and the one sin of INTRUSION.

OBJECTIVE 19: Discuss the role of encoding failure in forgetting.

3. The first type of forgetting is caused by ENCODING failure.
4. This type of forgetting occurs because some of the information that we sense never actually ENTERS THE MEMORY SYSTEM.
5. One reason for age-related memory decline is that the brain areas responsible for ENCODING new information are LESS (more/less) responsive in older adults.

OBJECTIVE 20: Discuss the concept of storage decay, and describe Ebbinghaus' forgetting curve.

6. Studies by Ebbinghaus and by Bahrick indicate that most forgetting occurs SOON (soon/ a long time) after the material is learned.
7. This type of forgetting is known as STORAGE DECAY, which may be caused by a gradual fading of the physical MEMORY TRACE.
8. When information that is stored in memory temporarily cannot be found, RETRIEVAL failure has occurred.

OBJECTIVE 21: Contrast proactive and retroactive interference, and explain how they can cause retrieval failure.

9. Research suggests that memories are also lost as a result of INTERFERENCE, which is especially possible if we simultaneously learn similar, new material.
10. The disruptive effect of previous learning on current learning is called PROACTIVE INTERFERENCE. This disruptive effect of learning new material on efforts to recall material previously learned is called RETROACTIVE INTERFERENCE.
11. Jenkins and Dallenbach found that if subjects went to sleep after learning, their memory for a list of nonsense syllables was BETTER (better/worse) than it was if they stayed awake.
12. In some cases, old information facilitates our learning of new information. This is called POSITIVE TRANSFER.

OBJECTIVE 22: Summarize Freud's concept of repression, and state whether this view is reflected in current memory research.

13. Freud proposed that motivated forgetting, or REPRESSION, may protect a person from painful memories.
14. Increasing numbers of memory researchers think that motivated forgetting is LESS (less/more) common than Freud believed.

15. Emotions and their associated STRESS hormones generally STRENGTHEN memories.

MEMORY CONSTRUCTION

OBJECTIVE 23: Explain how misinformation and imagination cannot distort our memory of an event.

1. Research has shown that recall of an event is often influenced by past experiences and present assumptions. The workings of these influences illustrate the process of memory CONSTRUCTION.
2. When witnesses to an event receive misleading information about it, they may experience a MISINFORMATION EFFECT and misremember the event. A number of experiments have demonstrated that false memories CAN (can/cannot) be created when people are induced to imagine nonexistent events; that is, these people later experience "IMAGINATION INFLATION." People who believe they have recovered memories of alien abduction and child sex abuse tend to have VIVID IMAGINATIONS.