

# 9 :

# Memory

## CHAPTER OVERVIEW

Chapter 9 explores human memory as a system that processes information in three steps. Encoding refers to the process of putting information into the memory system. Storage is the purely passive mechanism by which information is maintained in memory. Retrieval is the process by which information is accessed from memory through recall or recognition.

Chapter 9 also discusses the important role of meaning, imagery, and organization in encoding new memories, how memory is represented physically in the brain, and how forgetting may result from failure to encode or store information or to find appropriate retrieval cues. The final section of the chapter discusses the issue of memory construction. How "true" are our memories of events? A particularly controversial issue in this area involves suspicious claims of long-repressed memories of sexual abuse and other traumas that are "recovered" with the aid of hypnosis and other techniques. As you study this chapter, try applying some of the memory and studying tips discussed in the text.

NOTE: Answer guidelines for all Chapter 9 questions begin on page 248.

## CHAPTER REVIEW

First, skim this section, noting headings and boldface items. After you have read the section, review each objective by completing the sentences and answering the questions that follow it. As you proceed, evaluate your performance by consulting the answers beginning on page 248. Do not continue with the next section until you understand each answer. If you need to, review or reread the section in the textbook before continuing.

## The Phenomenon of Memory (pp. 349–353)

David Myers at times uses idioms that are unfamiliar to some readers. If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 256–257 for an explanation: . . . *mind's storehouse, the reservoir; the roots and fruits; medal winners in a memory Olympics; memory feats; shine the flashlight beam of our attention on.*

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

1. Learning that persists over time indicates the existence of \_\_\_\_\_ for that learning.
2. Memories for surprising, **significant moments** that are especially clear are called \_\_\_\_\_ memories. Like other memories, these 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 \_\_\_\_\_ - \_\_\_\_\_ systems that perform three tasks: \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

4. The classic model of memory has been Atkinson and Shiffrin's \_\_\_\_\_ model. According to this model, we first record information as a fleeting \_\_\_\_\_, from which it is processed into \_\_\_\_\_ memory, where the information is \_\_\_\_\_ through rehearsal into \_\_\_\_\_ memory for later retrieval.
5. The phenomenon of short-term memory has been clarified by the concept of \_\_\_\_\_ memory, which focuses more on the processing of briefly stored information. This form of memory has both \_\_\_\_\_ and \_\_\_\_\_ subsystems, which are coordinated by a \_\_\_\_\_ processor that, with the help of the \_\_\_\_\_ buffer, allows us to process images and words \_\_\_\_\_.
6. Brain scans show that the \_\_\_\_\_ are active during complex thinking, whereas areas in the \_\_\_\_\_ and \_\_\_\_\_ are active when auditory and visual information is in working memory.

**Encoding: Getting Information In**  
(pp. 353–361)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 256–257 for an explanation: *boost*; *nonsense syllables*; *a raw script . . . finished stage production*; *mental snapshots*; *"talk until you are blue in the face"*; *"peg-word"*; *Motionless while learning the numbers*.

**Objective 3:** Describe the types of information we encode automatically.

1. Encoding that does not require conscious attention or effort is called \_\_\_\_\_. Some processing requires effort at first but with \_\_\_\_\_ and \_\_\_\_\_ it becomes effortless.

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

**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 \_\_\_\_\_.
3. With novel information, conscious repetition, or \_\_\_\_\_, boosts memory.
4. A pioneering researcher in verbal memory was \_\_\_\_\_. In one experiment, he found that the longer he studied a list of nonsense syllables, the \_\_\_\_\_ (fewer/greater) the number of repetitions he required to relearn it later.
5. After material has been learned, additional repetition, or \_\_\_\_\_, usually will increase retention.
6. When people go around a circle reading words, their poorest memories are for the \_\_\_\_\_ (least/most) recent information heard. This phenomenon is called the \_\_\_\_\_ effect.
7. Memory studies also reveal that distributed rehearsal is more effective for retention; this is called the \_\_\_\_\_.
8. The tendency to remember the first and last items in a list best is called the \_\_\_\_\_. Following a delay, first items are remembered \_\_\_\_\_ (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 \_\_\_\_\_ encoding; encoding by \_\_\_\_\_

sound is called \_\_\_\_\_ encoding;  
encoding the image of words is  
\_\_\_\_\_ encoding.

10. Craik and Tulving's study comparing visual, acoustic, and semantic encoding showed that memory was best with \_\_\_\_\_ encoding.
11. Our excellent recall of information that relates to ourselves is called the \_\_\_\_\_ 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 \_\_\_\_\_. Because they tend to be highly memorable, they aid \_\_\_\_\_.
13. Concrete, high-imagery words tend to be remembered \_\_\_\_\_ (better/less well) than abstract, low-imagery words.
14. Memory for concrete nouns is facilitated when we encode them \_\_\_\_\_ and \_\_\_\_\_.
15. Our tendency to recall the high points of pleasurable events such as family vacations illustrates the phenomenon of \_\_\_\_\_.
16. Memory aids are known as \_\_\_\_\_ devices. One such device involves forming associations between a familiar series of locations and to-be-remembered words; this technique is called the "\_\_\_\_\_."
17. Using a jingle, such as the one that begins "one is a bun," is an example of the "\_\_\_\_\_ 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 \_\_\_\_\_. An example of this technique involves forming words from the first letters of to-be-remembered words; the resulting word is called an \_\_\_\_\_.
19. In addition, material may be processed into \_\_\_\_\_, which are composed of a few broad concepts divided into lesser concepts, categories, and facts.

**Storage: Retaining Information** (pp. 361–370)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 257–258 for an explanation: *lightning flashes; Sherlock Holmes; champion memorist; with tongue only partly in cheek; Arousal can sear certain events into the brain; mirror-image writing . . . jigsaw puzzle; London cabbie; Savoring.*

**Objective 8:** Contrast two types of sensory memory.

1. Stimuli from the environment are first recorded in \_\_\_\_\_ memory.
2. George Sperling found that when people were briefly shown three rows of letters, they could recall \_\_\_\_\_ (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/less) accurate. This suggests that people have a brief photographic, or \_\_\_\_\_, memory lasting about a few tenths of a second.
3. Sensory memory for sounds is called \_\_\_\_\_ memory. This memory fades \_\_\_\_\_ (more/less) rapidly than photographic memory, lasting for as long as \_\_\_\_\_.

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

4. Peterson and Peterson found that when \_\_\_\_\_ was prevented by asking subjects to count backward, memory for letters was gone after 12 seconds. Without \_\_\_\_\_ processing, short-term memories have a limited life.
5. Our short-term memory capacity is about \_\_\_\_\_ chunks of information. This capacity was discovered by \_\_\_\_\_.
6. Short-term memory for random \_\_\_\_\_ (digits/letters) is slightly better than for random \_\_\_\_\_ (digits/letters), and memory for information we hear is somewhat \_\_\_\_\_ (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 \_\_\_\_\_ (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 \_\_\_\_\_.
9. Penfield's electrically stimulated patients \_\_\_\_\_ (do/do not) provide reliable evidence that our stored memories are precise and durable.
10. Psychologist \_\_\_\_\_ attempted to locate memory by cutting out pieces of rats' \_\_\_\_\_ after they had learned a maze. He found that no matter where he cut, the rats \_\_\_\_\_ (remembered/forgot) the maze.
11. It is likely that forgetting occurs because new experiences \_\_\_\_\_ with our retrieval of old information, and the physical memory trace \_\_\_\_\_ 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 \_\_\_\_\_ between neurons.
13. Kandel and Schwartz have found that when learning occurs in the sea snail *Aplysia*, the neurotransmitter \_\_\_\_\_ is released in greater amounts, making synapses more efficient.
14. After learning has occurred, a sending neuron needs \_\_\_\_\_ (more/less) prompting to fire, and the number of \_\_\_\_\_ it stimulates may increase. This phenomenon, called \_\_\_\_\_, \_\_\_\_\_, may be the neural basis for learning and memory. Blocking this process with a specific \_\_\_\_\_, or by genetic engineering that causes the absence of an \_\_\_\_\_, interferes with learning. Rats given a drug that enhances \_\_\_\_\_ will learn a maze \_\_\_\_\_ (faster/more slowly).
15. Drugs that boost production of the protein \_\_\_\_\_, or the neurotransmitter \_\_\_\_\_, may enhance memory.
16. After LTP has occurred, an electric current passed through the brain \_\_\_\_\_ (will/will not) disrupt old memories and \_\_\_\_\_ (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/impair) learning and memory.
18. Two emotion-processing clusters, the \_\_\_\_\_, in the brain's \_\_\_\_\_ system increase activity in the brain's memory-forming areas.

19. Drugs that block the effects of stress hormones \_\_\_\_\_ (facilitate/disrupt) memories of emotional events. Stress that is prolonged, however, may cause an area of the brain (the \_\_\_\_\_) that is vital for laying down memories to \_\_\_\_\_.

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

20. The loss of memory is called \_\_\_\_\_. Studies of people who have lost their memory suggest that there \_\_\_\_\_ (is/is not) a single unified system of memory.
21. Although amnesia victims typically \_\_\_\_\_ (have/have not) lost their capacity for learning, which is called \_\_\_\_\_ memory, they \_\_\_\_\_ (are/are not) able to declare their memory, suggesting a deficit in their \_\_\_\_\_ memory systems.
22. Amnesia patients typically have suffered damage to the \_\_\_\_\_ of their limbic system. This brain structure is important in the processing and storage of \_\_\_\_\_ memories. Damage on the left side of this structure impairs \_\_\_\_\_ memory; damage on the right side impairs memory for \_\_\_\_\_ designs and locations. The rear part of this structure processes \_\_\_\_\_ memory.
23. The hippocampus seems to function as a zone where the brain \_\_\_\_\_ (temporarily/permanently) stores the elements of a memory. However, memories \_\_\_\_\_ (do/do not) migrate for storage elsewhere. The hippocampus is active during \_\_\_\_\_ sleep, as memories are processed for later retrieval. Recalling past experiences activates various parts of the \_\_\_\_\_ and \_\_\_\_\_ lobes.
24. The cerebellum is important in the processing of \_\_\_\_\_ memories. Humans and lab-

oratory animals with a damaged cerebellum are incapable of simple \_\_\_\_\_ conditioning. Those with damage to the \_\_\_\_\_ are incapable of \_\_\_\_\_ conditioning, indicating that this brain region is important in the formation of \_\_\_\_\_ memories.

25. The dual explicit-implicit memory system helps explain \_\_\_\_\_ amnesia. We do not have explicit memories of our first three years because the \_\_\_\_\_ is one of the last brain structures to mature.

### Retrieval: Getting Information Out (pp. 370–375)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to page 258 for an explanation: *buoyant mood . . . rose-colored glasses; morph from devils into angels.*

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

- The ability to retrieve information **not in conscious awareness** is called \_\_\_\_\_.
- Baird found that 25 years after graduation, people were not able to \_\_\_\_\_ (recall/recognize) the names of their classmates but were able to \_\_\_\_\_ (recall/recognize) 90 percent of their names and their yearbook pictures.
- If you have learned something and then forgotten it, you will probably be able to \_\_\_\_\_ it \_\_\_\_\_ (more/less) quickly than you did originally.

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

- The process by which associations can lead to retrieval is called \_\_\_\_\_.

5. The best retrieval cues come from the associations formed at the time we \_\_\_\_\_ 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/different) contexts.

Summarize the text explanation of the déjà vu 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 \_\_\_\_\_ memory.
8. Our tendency to recall experiences that are consistent with our current emotional state is called \_\_\_\_\_ memory.

Describe the effects of mood on memory.

9. People who are currently depressed may recall their parents as \_\_\_\_\_.

People who have recovered from depression typically recall their parents about the same as do people who \_\_\_\_\_.

\_\_\_\_\_ . Moods also influence how we \_\_\_\_\_ other people's behavior.

**Forgetting** (pp. 375–381)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to pages 258–259 for an explanation: *applause for memory; may lie poised on the tip of the tongue; mental attic; sheepishly; The words relit a blown-out candle in the mind.*

**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 \_\_\_\_\_, we would constantly be overwhelmed by **informa-**tion.
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 \_\_\_\_\_, the three sins of \_\_\_\_\_, and the one sin of \_\_\_\_\_.

**Objective 19:** Discuss the role of encoding **failure in** forgetting.

3. The first type of forgetting is caused by \_\_\_\_\_ failure.
4. This type of forgetting occurs because some of the information that we sense never actually \_\_\_\_\_.
5. One reason for age-related memory decline is that the brain areas responsible for \_\_\_\_\_ new information are \_\_\_\_\_ (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/a long time) after the material is learned.
7. This type of forgetting is known as \_\_\_\_\_, which may be caused by a gradual fading of the physical \_\_\_\_\_.
8. When information that is stored in memory temporarily cannot be found, \_\_\_\_\_ 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 \_\_\_\_\_, which is especially possible if we simultaneously learn similar, new material.
10. The disruptive effect of previous learning on current learning is called \_\_\_\_\_. The disruptive effect of learning new material on efforts to recall material previously learned is called \_\_\_\_\_.
11. Jenkins and Dallenbach found that if subjects went to sleep after learning, their memory for a list of nonsense syllables was \_\_\_\_\_ (better/worse) than it was if they stayed awake.
12. In some cases, old information facilitates our learning of new information. This is called \_\_\_\_\_.

**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 \_\_\_\_\_, may protect a person from painful memories.
14. Increasing numbers of memory researchers think that motivated forgetting is \_\_\_\_\_ (less/more) common than Freud believed.

15. Emotions and their associated \_\_\_\_\_ hormones generally \_\_\_\_\_ memories.

### Memory Construction (pp. 382–390)

If you do not know the meaning of any of the following words, phrases, or expressions in the context in which they appear in the text, refer to page 259 for an explanation: *reconstruction as well as reproduction*; *"hypnotically refreshed"*; *sincerely wrong*.

**Objective 23:** Explain how misinformation and imagination can 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 \_\_\_\_\_.
2. When witnesses to an event receive misleading information about it, they may experience a \_\_\_\_\_ and misremember the event. A number of experiments have demonstrated that false memories \_\_\_\_\_ (can/cannot) be created when people are induced to imagine nonexistent events; that is, these people later experience "\_\_\_\_\_." People who believe they have recovered memories of alien abduction and child sex abuse tend to have \_\_\_\_\_.

Describe what Loftus' studies have shown about the effects of misleading postevent information on eyewitness reports.

**Objective 24:** Describe source amnesia's contribution to false memories.

3. At the heart of many false memories is \_\_\_\_\_, which occurs when we \_\_\_\_\_ an event to the wrong source.

**Objective 25:** List some differences and similarities between true and false memories.

4. Researchers compare memories to \_\_\_\_\_, noting that people's initial \_\_\_\_\_ of events influence their memories.
5. The persistence of a memory \_\_\_\_\_ (does/does not) reveal whether or not it derives from an actual experience. Whereas real memories have more \_\_\_\_\_, gist memories are more \_\_\_\_\_.
6. Eyewitnesses' confidence in their memories \_\_\_\_\_ (is/is not) related to the accuracy of those memories.
7. Memory construction explains why memories "refreshed" under \_\_\_\_\_ are often inaccurate.

**Objective 26:** Give arguments supporting and rejecting the position that very young children's reports are reliable.

8. Research studies of children's eyewitness recall reveal that preschoolers \_\_\_\_\_ (are/are not) more suggestible than older children or adults. For this reason, whether a child produces an accurate eyewitness memory depends heavily on how he or she is \_\_\_\_\_.
9. Children are most accurate when it is a first interview with a \_\_\_\_\_ person who asks \_\_\_\_\_ questions.

**Objective 27:** Discuss the controversy over reports of repressed and recovered memories of childhood sexual abuse.

10. Researchers increasingly agree that memories obtained under the influence of hypnosis or drugs \_\_\_\_\_ (are/are not) reliable.

11. Memories of events that happened before age \_\_\_\_\_ are unreliable. This phenomenon is called \_\_\_\_\_.
12. Memory construction makes it clear that memory is best understood not only as a \_\_\_\_\_ and biological event, but also as a \_\_\_\_\_ phenomenon.

**Improving Memory** (pp. 391–392)

If you do not know the meaning of the following word in the context in which it appears in the text, refer to page 259 for an explanation: *Sprinkled.*

**Objective 28:** Explain how an understanding of memory can contribute to effective study techniques.

1. The SQ3R study technique identifies five strategies for boosting memory: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

Discuss several specific strategies for improving memory.

**PROGRESS TEST 1**

*Multiple-Choice Questions*

Circle your answers to the following questions and check them with the answers beginning on page 250. If your answer is incorrect, read the explanation for why it is incorrect and then consult the appropriate pages of the text (in parentheses following the correct answer).

1. The three steps in memory information processing are:
- a. input, processing, output.
  - b. input, storage, output.
  - c. input, storage, retrieval.
  - d. encoding, storage, retrieval.