**Chapter 9**

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

*Memory*is the persistence of learning over time, through the storage and retrieval of information. *Flashbulb memories,*which are attached to emotionally significant moments or events, differ from most other memories in their striking clarity.

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**Objective 2**| **Describe Atkinson-Shiffrin’s classic three-stage processing model of memory, and explain how the contemporary model of working memory differs.**

The Atkinson-Shiffrin classic three-stage model of memory suggests that we (1) register fleeting *sensory memories*, some of which are (2) processed into on-screen*short-term*memories, a tiny fraction of which are (3) encoded for *long-term memory*and, possibly, later retrieval. In pointing out the limits of this model, contemporary memory researchers note that we register some information automatically, bypassing the first two stages. And they prefer the term *working memory*(rather than *short-term memory*) because it emphasizes a more active role in this second processing stage, where we rehearse and manipulate information, associating new stimuli with older stored memories. The working-memory model includes visual-spatial and auditory subsystems, coordinated by a central executive processor that focuses attention where needed.

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

We unconsciously and automatically encode incidental information, such as space, time, and frequency. We also register well-learned information, such as words in our native language, by this form of processing.

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**Objective 4**| **Contrast effortful processing with automatic processing, and discuss the next-in-line effect, the spacing effect, and the serial position effect.**

*Automatic processing*happens unconsciously, as we absorb information (space, time, frequency, well-learned material) in our environment. *Effortful processing*(of meaning, imagery, organization) requires conscious attention and deliberate effort (rehearsal). The *next-in-line effect*is our tendency to forget (through failure to encode) what the person ahead of us in line has said because we are focusing on what we will say in our upcoming turn. The *spacing effect*is our tendency to retain information more easily if we practice it repeatedly over time (spaced study) than if we practice it in one long session (cramming). The *serial position effect*is our tendency to recall the first and last items in a long list (such as a grocery list) more easily than we recall the intervening items.

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**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.**

*Visual encoding*(of picture images) and *acoustic encoding*(of sounds, especially of words) are shallower forms of processing than is *semantic encoding*(of meaning). We process verbal information best when we encode it semantically, especially if we apply the self-reference effect, making information “relevant to me.”

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

Encoding imagery aids effortful processing because vivid images are very memorable. We tend to remember concrete nouns better than abstract nouns because, for example, we can associate both an image and a meaning with *gorilla*, but only a meaning with*process*. Many *mnemonic devices*(memory strategies or aids) rely on imagery. Others trap items in memory by combining visual encoding (imagining a series of vivid images) and acoustic encoding (a memorable rhyme).

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**Objective 7**| **Discuss the use of chunking and hierarchies in effortful processing.**

We remember organized information better than we do random data, and chunking and hierarchies are two ways to organize information. In *chunking,*we cluster information into familiar, manageable units, such as words into sentences. In*hierarchies,*we process information by dividing it into logical levels, beginning with the most general and moving to the most specific.

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

As information enters the memory system through our senses, we register and store visual images via *iconic memory,*in which picture images last no more than a few tenths of a second. We register and store sounds via *echoic memory,*where echoes of auditory stimuli may linger as long as 3 or 4 seconds.

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

At any given time, we can focus on and process only about seven items of information (either new or retrieved from our memory store). Without rehearsal, information disappears within seconds from short-term memory and is forgotten.

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**Objective 10**| **Describe the capacity and duration of long-term memory.**

Our capacity for storing information permanently in longterm memory is essentially unlimited.

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**Objective 11**| **Discuss the synaptic changes that accompany memory formation and storage.**

Contemporary researchers are focusing on memory-related changes within and between single neurons. As experience strengthens the pathways between neurons, synapses transmit signals more efficiently. In a process known as *long-term potentiation (LTP),*sending neurons in these pathways release neurotransmitters more quickly, and receiving neurons may develop additional receptors, increasing their ability to detect the incoming neurotransmitters. LTP appears to be the neural basis for learning and memory.

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**Objective 12**| **Discuss some ways stress hormones can affect memory.**

By enabling the production of extra glucose (which fuels brain activity), stress hormones alert the brain to important events. The amygdala, an emotion-processing structure in the brain’s limbic system, arouses brain areas that process emotion. These emotion-triggered hormonal changes may produce indelible memories.

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

We are often not aware of our *implicit (procedural) memories*—our memory of our own skills and operantly and classically conditioned responses. These memories are processed in part by the cerebellum, near the brainstem. We consciously recall our*explicit (declarative) memories*—our general knowledge, specific facts, and personally experienced events. Explicit memories are processed in various subregions of the hippocampus (a neural center in the limbic system) and sent for storage in other areas in the brain. The implicit and explicit memory systems are independent. Damage to the hippocampus may destroy the ability to consciously recall memories,

without destroying skills or classically conditioned responses.

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

*Recall*is the ability to *retrieve*information not in conscious awareness; a fill-in-the-blank question tests recall. *Recognition*is the ability to *identify*items previously learned; a multiple choice question tests recognition. *Relearning*is the ability to*master*previously stored information more quickly than you originally learned it.

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

*Retrieval cues*are bits of related information we encode while processing a target piece of information. These bits are linked in some way to the context of the target, and they become a part of a web of stored associations. When one of these associated bits catches our attention, it is as though we are pulling on a strand in the web of associations, retrieving the target information into our conscious awareness. This process of activating associations (often unconsciously) is *priming.*

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**Objective 16**| **Cite some ways that context can affect retrieval.**

The context in which we originally experienced an event or encoded a thought can flood our memories with retrieval cues, leading us to the target memory. If we are in a different context that is very similar to the original one, we may experience déjà vu as many of these cues return and trick us into unconsciously retrieving the target memory.

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**Objective 17**| **Describe the effects of internal states on retrieval.**

Specific states or emotions can prime us to recall events associated with those states or emotions. While in a good mood, we tend to retrieve memories consistent—or congruent—with that happy state. When depressed, we more easily recall negative memories. Moods also prime us to interpret others’ behavior in ways consistent with our emotions.

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

Without an ability to forget, we would be overwhelmed by out-of-date and irrelevant information. Our memory can fail us through *forgetting*(absent-mindedness, transience, and blocking), through *distortion*(misattribution, suggestibility, and bias), and through *intrusion*(persistence of unwanted memories).

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

What we encode (whether automatically or through effortful processing) is only a very limited portion of the sensory stimuli around us. And as we age, our encoding grows slower and less efficient. Without encoding, information does not enter our long-term memory store and cannot be retrieved.

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**Objective 20**| **Discuss the concept of storage decay, and describe Ebbinghaus’ forgetting curve.**

Encoded memories may fade after storage. From his research on learning and retention, Ebbinghaus determined that the course of forgetting is initially rapid, then levels off with time; this principle became known as the forgetting curve.

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**Objective 21**| **Contrast proactive and retroactive interference, and explain how they can cause retrieval failure.**

One way retrieval failure happens is when old and new information compete for retrieval. In *proactive interference,*something we learned in the past (a friend’s old phone number) interferes with our ability to recall something we have recently learned (the friend’s new number). In *retroactive interference,*something we have recently learned (vocabulary in this semester’s Spanish course) interferes with something we learned in the past (vocabulary in last year’s French course). Pages: 378-380

**Objective 22**| **Summarize Freud’s concept of repression, and state whether this view is reflected in current memory research.**

Freud believed that we banish from conscious thought anxiety-arousing embarrassing thoughts, feelings, and memories—a concept he called *repression.*In his view, this motivated forgetting submerges memories but leaves them available for later retrieval under the right conditions. Memory researchers tend to believe that repression rarely occurs.

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**Objective 23**| **Explain how misinformation and imagination can distort our memory of an event.**

Memories are not stored or retrieved as exact copies of our experiences. Rather, we construct our memories, using both stored and new information. If children or adults are subtly exposed to misinformation after an event, or if they repeatedly imagine and rehearse an event that never occurred, they may incorporate the misleading details into their memory of what actually happened. Memory is thus best understood not only as a cognitive and a biological phenomenon, but also as a social-cultural phenomenon.

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**Objective 24**| **Describe source amnesia’s contribution to false memories.**

When we process memories, we encode and store various aspects of them in different locations in the brain. In reassembling a memory during retrieval, we may successfully retrieve something we have heard, read, or imagined, but attribute it to the wrong source. Source amnesia is one of two main components of false memories. (The other is the misinformation effect.)

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

False memories feel like true memories and are equally durable, so neither the sincerity nor the longevity of a memory signifies it is real. True memories contain more details than imagined ones, which tend to be the gist of an event—the meaning and feelings associated with it.

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**Objective 26**| **Give arguments supporting and rejecting the position that very young children’s reports of abuse are reliable.**

*A supporting argument:*Even very young children can accurately recall events (and the people involved) if a neutral person talks with them in words they can understand, asks nonleading questions, and uses the cognitive interview technique. *A rejecting argument:*Preschoolers are more suggestible than older children or adults, and they can be induced, through suggestive questions, to report false events.

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

Psychologists motivated to protect abused children and wrongly accused adults tend to agree on seven points: (1) Innocent people have been falsely convicted of abuse that never happened, and true abusers have used the controversy over recovered memories to avoid punishment. (2) Incest and abuse happen, and they can leave lasting scars. (3) Forgetting isolated past events, either good or bad, is an everyday occurrence for all of us. (4) Recovering good or bad memories, triggered by some memory cue, is commonplace, but memory researchers question whether we forcibly repress memories, in Freud’s sense, to avoid anxiety or pain. (5) Memories obtained under the influence of hypnosis or drugs are unreliable. (6) Infantile amnesia—the inability to recall memories from the first three years of life—makes recovery of very early childhood memories unlikely. (7) Both real and false memories cause suffering and can lead to stress disorders.

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

The psychology of memory suggests concrete strategies for improving memory. These include scheduling spaced study times; actively rehearsing information to be learned; aiding encoding by making well-organized, vivid, and personally meaningful associations; using mnemonic techniques; returning to contexts and moods that are rich

with associations; recording memories before misinformation can corrupt them; minimizing interference; and self-testing to rehearse information and find gaps in your memory.

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