

## CHAPTER 6

# MEMORY DISTORTIONS

Each day, one has countless thoughts, fantasies, and recollections about the events of earlier in the day, last week, or years ago. When we fantasize about events that may happen in the future, there is no confusion about whether the mental experience accurately reflects reality. However, when we think back on events from the past, the possibility of confusing our memory of events with the actual events that transpired is quite real. Where is the line that separates fantasies about the past from accurate recollections? How does one know that an event is not distorted in minor or even major ways? Memory distortion can be more pernicious than forgetting because the rememberer may not be able to tell that the recollection is in error.

As will be seen in this chapter, there are several ways in which encoding, storage, and retrieval processes can lead to inaccurate, distorted episodic memory. This chapter also documents the role of organized sets of concepts or schemas in constructing episodic representations at encoding and in reconstructing them at retrieval. An episodic memory is influenced by the general knowledge of the world stored in semantic memory. The rich warehouse of semantic memory is necessary for the abstract thinking capacities of humans, but it can get in the way of perfectly accurate memories of past events.

## RECONSTRUCTIVE RETRIEVAL

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Schemas play a critical role in perception by providing expectations, as discussed in Chapter 2. They play a similar crucial role in memory. The schemas of long-term memory represent everything that we know. These schemas are intricately organized in a complex web of relations. The concepts and facts of semantic memory and the specific autobiographical events of episodic memory are linked in countless ways.

Imagine a scenario of a cat prowling for mice. Where might the cat find mice? In a barn on a farm, of course. Immediately, images of farms come to mind. You might recall the farm you grew up on, one you visited as a child, or one you saw in a movie last week. In turn, images of cows, pigs, horses, and other farm animals might then come to mind. The thought of a horse would perhaps bring to mind the time you went horseback riding with friends. More images pop into your mind as you reflect on each of the friends on the trip. The possibilities of such free association are endless because the schemas of long-term memory are massively interconnected. As a result of such organization, virtually any thought, through some chain of associations, can lead to any other thought.

Much, if not all, of what we learn and retrieve from memory passes through the organizational web. The schemas provide expectations that help us to learn but also, at times, to miss events that do not fit with these expectations. The schemas help us to remember but also, at times, to distort memories in order to conform to momentary expectations. The key point here is that schemas enable us to fabricate how past events most likely unfolded. The term **reconstructive retrieval** refers to schema-guided construction of episodic memories that interpret, embellish, integrate, and alter encoded memory representations.

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Many experiments have documented that recall may, at times, be driven by a schema-based reconstructive process. For instance, Brewer and Treyens (1981) showed how our recollections of places are schema based. After waiting in an experimenter's office for 35 seconds, people were taken to another room and asked to recall the office (see Figure 6.1). Virtually everyone recalled that the office had a chair, a desk, and walls, but only about one of four participants recalled

unexpected items such as a skull. Moreover, items that fit preconceptions about a psychologist's office, such as books, were falsely recalled by some participants.



**Figure 6.1** Office scene used in a study of reconstructive retrieval.

SOURCE: From Brewer, W. F., & Treyens, J. C., Role of schemata in memory for places. *Cognitive Psychology*, 13, 207-230, copyright © 1981. Reprinted with permission.

### Reconstructing Laboratory Events

The role of schemas in text comprehension and memory is particularly well-researched (Bower, Black, & Turner, 1979; Dooling & Christiansen, 1977; Spiro, 1980). These and numerous related experiments took as their starting point the classic work by Bartlett (1932) on schemas and reconstruction. Particularly well-known are Bartlett's studies in which participants tried to recall a folk tale of North American Indians—the War of the Ghosts. Before discussing the results, try reading the story shown in Box 6.1. Then, after 15 minutes or so, test yourself by trying to write down the story from memory, without going back and rereading it.

**BOX 6.1****The “War of the Ghosts”  
Story Used by Bartlett**

One night two young men from Egulac went down to the river to hunt seals, and while they were there it became foggy and calm. Then they heard war cries, and they thought, “Maybe this is a war party.” They escaped to the shore and hid behind a log. Now canoes came up, and they heard the noise of paddles and saw one canoe coming up to them. There were five men in the canoe, and they said, “What do you think? We wish to take you along. We are going up the river to make war on the people.”

One of the young men said, “I have no arrows.”

“Arrows are in the canoe,” they said.

“I will not go along. I might be killed. My relatives do not know where I have gone. But you,” he said, turning to the other, “may go with them.”

So one of the young men went, but the other returned home.

And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water, and they began to fight, and many were killed. But the young man heard one of the warriors say, “Quick, let us go home; that Indian has been hit.” Now he thought, “Oh, they are ghosts.” He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac, and the young man went ashore to his house and made a fire. And he told everybody and said, “Behold, I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick.”

He told it all, and then he became quiet. When the sun rose, he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.

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SOURCE: From Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Reprinted with permission of Cambridge University Press.

Several features of Bartlett’s results indicated that recall took place through an attempt to fabricate or reconstruct the original story. Within 15 minutes of reading the story, people recalled an abstracted summarized version. Three kinds of errors occurred through reconstructive retrieval.

**Leveling** refers to a loss of details. The story was leveled to a shorter version. In particular, unfamiliar terms and ideas were omitted. For example, the place called “Kalama” might be forgotten in describing the warriors’ journey. Or, the number of men in the canoe might be dropped. Or, the term “town” might be remembered as “village” because our knowledge about Indians includes the assumption that they reside in villages.

The reconstruction also resulted in the assimilation of events into a schema. **Assimilation** means that the recollection was rationalized or normalized to fit with preconceived notions. For example, the Indian who had been shot might be described as “hurt” or “wounded” because these terms are more in keeping with our general knowledge. The actual term used (i.e., “sick”) might be assimilated to a schema about battles and being shot. Or, one might falsely remember that the two young men were going fishing on the river rather than hunting seals.

Finally, besides losing details and altering them to fit expectations, the participants embellished some facts. **Sharpening** refers to remembering details that were not actually stated but that could be inferred from general knowledge. For example, one might remember that “they told him he was hit by an arrow.” The story did not actually say anything about an arrow hitting the Indian, but it could be

readily inferred from the facts given in the story and from general knowledge about battles among Indians. Remembering that many were wounded in the battle is another example of drawing inferences from a schema. All that was stated is that many were killed; it was not stated directly that some were injured but not killed. The battle schema might again support an inference that not all of the wounds were fatal.

Thus, reconstructive recall causes the loss of some details and the erroneous inclusion of other details. Inferences were drawn based on general knowledge rather than on what was actually stated in the story. Other facts were assimilated into the schema so that it reflected general knowledge rather than the original story. Over hours, weeks, months, and years, repeated attempts to recall the story magnified all of these distortions. Each retelling of the story provided yet another opportunity for a creative reconstruction of a story that bore less and less resemblance to the original narrative.

For comparison purposes, consider the recall of an individual who lacked normal reconstructive processes. Shown in Panel (a) of Box 6.2 is the story as it was recalled by “S.,” who, as you may remember from Chapter 5, recalled events verbatim in remarkably accurate detail. Astonishingly, this recall protocol was collected one year after S. heard the story. In Panel (b) is a typical recall protocol from a college student after a retention interval of only 15 minutes. Examine the story for examples of leveling, assimilation, and sharpening, and notice their conspicuous absence from the recall of S.

Bartlett’s pioneering research was strong on theory but weak on methodology. Yet his basic findings stand up under rigorous experimental design and

### BOX 6.2

#### a. Recall of the “War of the Ghosts” by a Mnemonist (V.P.) One Year After Hearing the Story

One day two young men from Egliac went down to the river to hunt seals. While there, it suddenly became very foggy and quiet, and they became scared and rowed ashore and hid behind a log. Soon they heard the sound of paddles in the water and canoes approaching. One of the canoes, with five men in it, paddled ashore, and one of the men said, “What do you think? Let us go up-river and make war against the people.”

“I cannot go with you,” said one of the young men. “My relatives do not know where I have gone. Besides, I might get killed. But he,” said he, turning to the other young man, “will go with you.” So one of the young men returned to his village, and the other went up-river with the war party.

They went to a point beyond Kalama, and the people came down to the river to fight them, and they fought. Soon the young man heard someone say, “This Indian has been wounded.” “Maybe they are ghosts,” he thought, because he felt perfectly okay. The war party suggested leaving, and they left, and the young man went back to his village.

There he lit a fire in front of his abode, sat down to await the sunrise, and told his story to the villagers. “I went with a war party to make war with the people. There was fierce fighting, and many were killed, and many were wounded. They said I was wounded, but I did not feel a thing. Maybe they were ghosts.”

He had told it all, and when the sun came up, he gave a little cry. Something black came out of his mouth. He fell over. He was dead.

SOURCE: Hunt and Love (1972).

**BOX 6.2****b. Recall by an Undergraduate Student 15 Minutes After Hearing the Story**

Two men went down to the water to fish for seals. It became calm and foggy. They heard noises, so they went to shore and hid behind a log. They heard the sound of paddles and saw a canoe coming closer. The canoe had five men in it, and they asked the two men to come fight with them. The man first said he had no arrows, but the men in the canoe said there were plenty in the canoe. Next he said he could not go because his relatives did not know where he was, but he told the other man he could go. So the other man went with them to fight, and the first man went home. When they got to the village, the people came down to the water to fight. Then the man heard the Indians say to hurry up and leave because he had been shot. He thought they were fighting ghosts, and he told the village he was in the presence of ghosts because they had shot him and he did not feel sick. When he finished his story, he became silent. The next morning, he fell over. Something black came out of his mouth. The people watched him as he died.

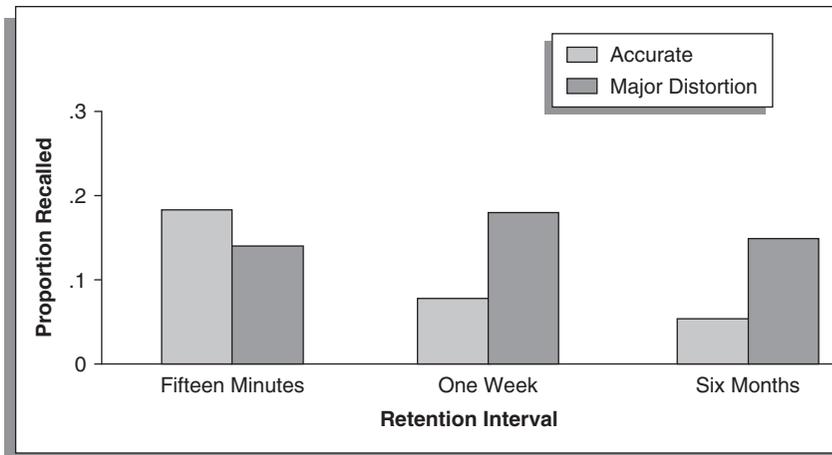
data analysis procedures (Bergman & Roediger, 1999). With instructions to recall the story in a verbatim manner, participants got less than 20% right after a delay of only 15 minutes. As shown in Figure 6.2, the degree of accuracy dropped by half after a week and by half again after six months. By contrast, major distortions in elements of the text propositions held constant over these time intervals. The latter included normalizing events to fit a schema (e.g., replacing “canoe” with “boat,” replacing “hunting seals” with “fishing”) or using a schema to infer a missing detail (e.g., recalling the Indian was hit by an “arrow” even though the story fails to specify this detail).

### Reconstructing Autobiographical Events

Much is now also known about the way we reconstruct autobiographical memories of personal, as opposed to public, events (Conway, 1992). The terrorist attack on the World Trade Center was a public event. You know about the events in New York City on September

11, 2001 because of news accounts, even if you were not there to experience them firsthand. The events of your 10th birthday, on the other hand, are known only by you, your parents, and perhaps a few other people. An autobiographical event is one that you personally experienced.

Conway (1992) found that people remembered autobiographical events in terms such as “when I lived in X” or “when I worked for Y.” Such lifetime periods as these extended over years or even decades. These periods are the first level of retrieval cues that serve to orient us in autobiographical time and trigger more specific recollections. A lifetime period might evoke moods, significant goals, or general themes of the period but not concrete events. A second level of retrieval cues is general events. These are chronologically organized personal experiences that cluster about thematically important



**Figure 6.2** Proportions of text propositions recalled of the War of the Ghosts after varying retention intervals.

SOURCE: From Bergman, E. T., & Roediger, H. L., III., Can Bartlett's repeated reproduction experiments be replicated? *Memory & Cognition*, 27(6), 937-947, copyright © 1999. Reprinted with permission of the Psychonomic Society.

landmarks in time. First-time experiences such as falling in love, taking a first job, graduating from high school, and moving away to college serve to remind one of related general events. A third level of retrieval cues consists of concrete images or sensory replays of a specific event. In Conway's view, these detailed recollections are always integrated with schema-based representations of general events. What seems like a discrete recollection is, in fact, tied into higher levels of memory structure.

Recalling one's life inevitably uncovers the significant general events or episodes that define the self. They are recalled not as isolated events but rather as part of a narrative that gives life meaning (Bruner, 1990). Life narratives provide us with a sense of who we are, but that says nothing about their accuracy. In addition to life narratives, people recall flashbulb memories of public events, such as the 1986 *Challenger* explosion, and unique personal experiences (Neisser & Libby, 2000). Personal experiences can be particularly well-remembered. Individuals who experienced the 1989 Loma Prieta earthquake in California provided accounts written a year and a half after the event that were highly similar to those written only a few days after the earthquake (Neisser, Winograd, Bergman, Schreiber, Palmer, & Weldon, 1996).

Historians are often faced with the task of weighing autobiographical accounts against other known information. For example, John Adams, at 86

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years of age, recalled with remarkable clarity his conversation, 50 years earlier, with Thomas Jefferson over the authorship of the U.S. Declaration of Independence. Adams wrote in a letter to Thomas Pickering that Jefferson asked him to draft the declaration and demanded to know why Adams would not do so. “Reasons enough,” Adams declared. “Reason first—You are a Virginian, and a Virginian ought to appear at the head of this business. Reason second—I am obnoxious, suspected, and unpopular. You are very much otherwise. Reason third—You can write ten times better than I can.” “Well,” Jefferson replied, “if you are decided, I will do as well as I can.” Jefferson, for his part, denied Adams’s story and insisted that a five-member committee of the Second Continental Congress had appointed him to author the most famous document in American history (McGlone, 1998, p. 413).

The verbatim detail of Adams’s account is worrisome, suggesting that it might reflect a schema-based sharpening of details that were in error. In fact, McGlone (1998) noted that Adams had recalled the story differently 20 years earlier in another letter to Pickering. Moreover, in working on his autobiography in 1805, Adams could not recall what he had said. What is more, in his earliest account in 1779, Adams explained to a French diplomat that a committee of five members had appointed Jefferson to draft the document. His first account, closest in time to the actual events, accorded with Jefferson’s recollection! Thus, Adams’s later fabrication about Jefferson offering the authorship to him illustrates how an event representation becomes integrated with schemas representing general autobiographical knowledge (Conway, 1992). Over the years, Adams’s story changed as he entered new periods in his life, with some elements dropping out as novel elements were added.

## ENCODING DISTORTIONS

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In addition to reconstructive retrieval, schemas sometimes constructively distort memory during encoding in multiple ways. The strength and generality of these effects are in dispute (Alba & Hasher, 1983; Mandler, 1984). So, we focus on three that are reasonably well-supported to illustrate constructive effects: **selection**, **interpretation**, and **integration**.

### Selection

The selective encoding of information that fits with prior knowledge defines selection. This idea was well-illustrated in an experiment by Bransford and Johnson (1972). They presented people with the following obscure text:

The procedure is actually quite simple. First you arrange items into different groups. Of course one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities, that is the next step; otherwise, you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important, but complications can easily arise. A mistake can be expensive as well. At first, the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then, one never can tell. After the procedure is completed, one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more, and the whole cycle will then have to be repeated. However, that is part of life. (p. 722)

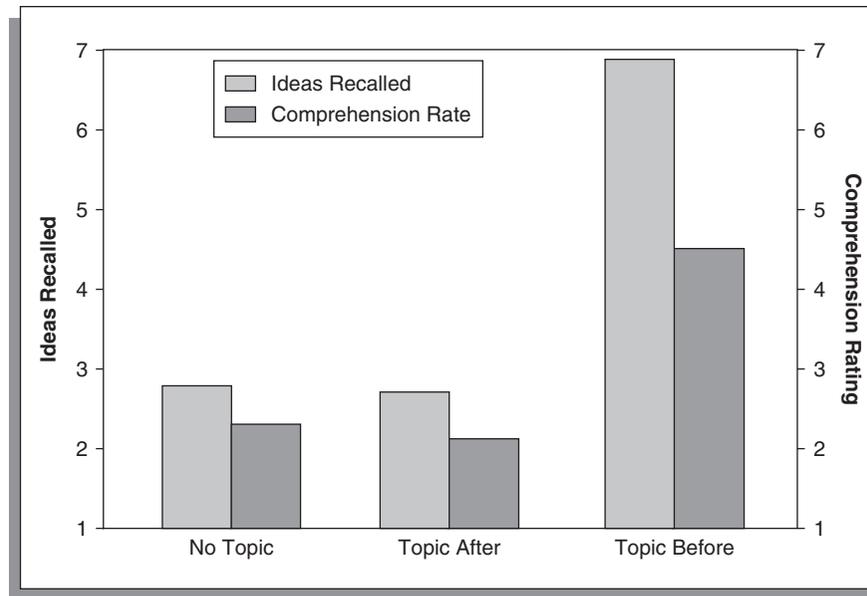
In first reading this, you likely felt what Bartlett (1932) called an “effort after meaning” as various schemas actively struggled to shape the sentences into a comprehensible pattern. Without knowing the title or topic of the text in advance it is difficult to select the sentences to fit into a preconceived schema, and therefore comprehension is poor and so is subsequent recall. The data from Bransford and Johnson’s (1972) experiment show this plainly in the first column of Figure 6.3. However, when given the topic of “washing clothes” before reading the text, participants’ ratings of comprehension and recall scores both improved greatly. Notice that receiving the topic after reading failed to help. The schema must be active to select details at the time of learning.

## Interpretation

Inferences and suppositions are made to conform new material to activated schemas; these define interpretation. Prior knowledge provides a basis for interpreting the meaning of events, and these interpretations become part of memory. Johnson, Bransford, and Solomon’s (1973) results illustrate interpretation well. Consider these two versions of a brief passage that were presented to different groups of people:

1. John was trying to fix the birdhouse. He was pounding the nail when his father came out to watch him and to help him do the work.
2. John was trying to fix the birdhouse. He was looking for the nail when his father came out to watch him and to help him do the work.

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**Figure 6.3** Recall and comprehension of the “washing clothes” story.

SOURCE: From Bransford, J. D., & Johnson, M. K., Contextual prerequisites for understanding: Some investigations of comprehension and recall. *Journal of Verbal Learning and Verbal Behavior*, 11, 717-726, copyright © 1972. Reprinted with permission.

The two passages were the same but for a minor change. Johnson et al. (1973) later gave a recognition test that included the following novel sentence:

- John was using the hammer to fix the birdhouse when his father came out to watch him and to help him do the work.

The researchers found that the group of individuals who had read Passage 1 was much more likely to say that they had previously seen Passage 3 in the experiment. The false recognition of Passage 3 indicates that these individuals inferred that John was using a hammer, an assumption that fits well with the expectations of schemas activated by the passage.

### Integration

The third type of encoding distortion, integration, refers to combining features of different events into a unified memory representation. As a result

of integration, we remember the main idea or gist of an event rather than the details of its occurrence. Bransford and Franks (1971) investigated integration by presenting people with a long list of sentences. In Figure 6.4, you can read a sample of these sentences. Answer the question after each one to ensure that you comprehended each sentence.

Now take a moment to decide whether the sentences in Figure 6.5 are old sentences that appeared earlier in Figure 6.4 or are new sentences. Check old or new for each one before reading further in the text. After finishing the recognition test, count the number of items that you checked as old sentences.

Typically, people indicate that well more than half of the 30 sentences in Figure 6.5 are old sentences. In fact, none of the test sentences occurred earlier. The test sentences, however, represent plausible sentences based on the schemas that were activated in reading the original sentences. The individual features or ideas of the original sentences become integrated into larger organized ideas. The integration is so compelling that people actually are more confident that they saw a sentence containing all related ideas than they are about having seen sentences containing fewer ideas. This is exactly opposite of what one would expect if we stored the individual sentences in memory verbatim.

Bransford and Franks's (1971) results are plotted in Figure 6.6. The number of ideas in the test sentence increased from one to four. Noncase sentences were totally novel and unrelated to the schemas activated during reading. They were readily rejected as new sentences. As you can see, the participants falsely recognized new sentences that contained more than one idea, and their confidence increased with each additional idea. The same result occurred for actual old sentences. These results plainly show how integration can distort memory by giving us the gist of the original events.

Selection of a subset of event features, interpretation of events to fit preexisting schemas, and integration of features from multiple events are encoding failures that cause memory distortions.

## SOURCE MONITORING

Why is it that our fantasies, conjured during daydreams, are not later routinely confused as memories of real events? The vivid hallucinatory dreams of rapid eye movement (REM) sleep are still more puzzling. Given that they seem so real at the time, why are dreams not later remembered as having really occurred? One reason is that memory involves **source monitoring** processes (Johnson, Hastroudi, & Lindsay, 1993).

Source monitoring refers to evaluative processes that attribute mental experiences to either external sources (i.e., perceived events) or internal sources (i.e., thoughts, fantasies, and dreams).

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<i>Instructions:</i> Read each sentence, count to five, answer the question, and go on to the next sentence.	
<i>Sentence</i>	<i>Question</i>
The girl broke the window on the porch.	Broke what?
The tree in the front yard shaded the man who was smoking his pipe.	Where?
The hill was steep.	What was?
The cat, running from the barking dog, jumped on the table.	From what?
The tree was tall.	Was what?
The old car climbed the hill.	What did?
The cat running from the dog jumped on the table.	Where?
The girl who lives next door broke the window on the porch.	Lives where?
The car pulled the trailer.	Did what?
The scared cat was running from the barking dog.	What was?
The girl lives next door.	Who does?
The tree shaded the man who was smoking his pipe.	What did?
The scared cat jumped on the table.	What did?
The girl who lives next door broke the large window.	Broke what?
The man was smoking his pipe.	Who was?
The old car climbed the steep hill.	The what?
The large window was on the porch.	Where?
The tall tree was in the front yard.	What was?
The car pulling the trailer climbed the steep hill.	Did what?
The cat jumped on the table.	Where?
The tall tree in the front yard shaded the man.	Did what?
The car pulling the trailer climbed the hill.	Which car?
The dog was barking.	Was what?
The window was large.	What was?
STOP. Cover the preceding sentences. Now read each sentence in Figure 6.5 and decide whether it is a sentence from the list given above.	

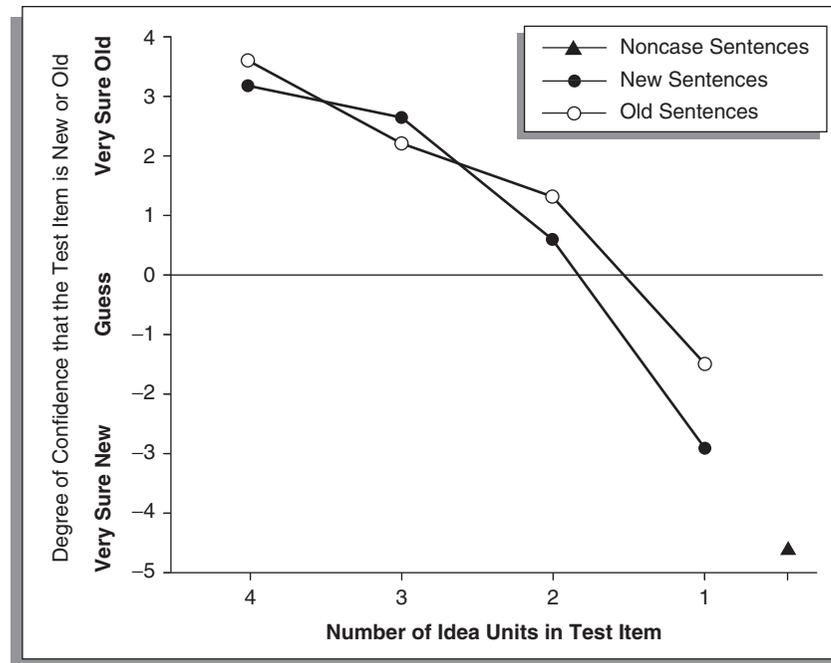
**Figure 6.4** A memory experiment: Part 1.

SOURCE: From Jenkins, J. J. (1974). Remember that old theory of memory? Well, forget it! *American Psychologist*, 29, 785-795, copyright © 1974, The American Psychological Association. Reprinted with permission.

<i>Instructions:</i> Decide whether each sentence is old or new.		
<i>Sentence</i>	<i>Old</i>	<i>New</i>
1. The car climbed the hill.		
2. The girl who lives next door broke the window.		
3. The old man who was smoking his pipe climbed the steep hill.		
4. The tree was in the front yard.		
5. The scared cat, running from the barking dog, jumped on the table.		
6. The window was on the porch.		
7. The barking dog jumped on the old car in the front yard.		
8. The tree in the front yard shaded the man.		
9. The cat was running from the dog.		
10. The old car pulled the trailer.		
11. The tall tree in the front yard shaded the old car.		
12. The tall tree shaded the man who was smoking his pipe.		
13. The scared cat was running from the dog.		
14. The old car, pulling the trailer, climbed the hill.		
15. The girl who lives next door broke the large window on the porch.		
16. The tall tree shaded the man.		
17. The cat was running from the barking dog.		
18. The car was old.		
19. The girl broke the large window.		
20. The scared cat ran from the barking dog that jumped on the table.		
21. The scared cat, running from the dog, jumped on the table.		
22. The old car pulling the trailer climbed the steep hill.		
23. The girl broke the large window on the porch.		
24. The scared cat which broke the window on the porch climbed the tree.		
25. The tree shaded the man.		
26. The car climbed the steep hill.		
27. The girl broke the window.		
28. The man who lives next door broke the large window on the porch.		
29. The tall tree in the front yard shaded the man who was smoking the pipe.		
30. The cat was scared.		
STOP. Count the number of sentences judged "old."		

**Figure 6.5** A memory experiment: Part 2.

SOURCE: From Jenkins, J. J. (1974). Remember that old theory of memory? Well, forget it! *American Psychologist*, 29, 785-795, copyright © 1974, The American Psychological Association. Reprinted with permission.



**Figure 6.6** Confidence in recognition judgments for both old and new sentences varies with the number of idea units expressed.

SOURCE: From Bransford, J. D., & Franks, J. J., Abstraction of linguistic ideas. *Cognitive Psychology*, 2, 331-350, copyright © 1971. Reprinted with permission.

Source monitoring refers to evaluative processes that attribute mental experiences to different sources. External sources are perceived events in the environment, whereas internal sources are thoughts, fantasies, and dreams.

### Memory Illusions

Discriminating external from internal sources is essential to avoid falling victim to false memories of events that never happened. One of the most disturbing kinds of memory distortion is when one has the illusion of remembering an experience that in fact never happened (Roediger, 1996). Before reading any further, try the demonstration given in Box 6.3. Read the list of words one at a time at a rate of about one each second. Then look away from the list and count backward from 60 at a slow and steady pace. Finally, try to recall as many of the words from the list as you can in any order you like.

Numerous experiments using word lists similar to the one in Box 6.3 have enabled researchers to study an interesting illusion of memory (Deese, 1959; Roediger & McDermott, 1995). Check for yourself the accuracy of your recall. Were you able to recall words from the beginning of the list, showing the classic primacy effect? What about a recency effect? Were the final few items in the list remembered accurately? Typically, the middle items of the list are not particularly well-recalled. Many participants have trouble remembering “sill,” “house,” “open,” “curtain,” and “frame” but have no trouble at all remembering “window.” The problem is that “window” was not, in fact, an item on the list. Remembering

“window” is an illusion of memory. It illustrates what is called a **false verbal memory**, created as a result of hearing or reading a list of words that are semantically related to the falsely remembered word. The words actually presented in the list are “window’s” top 15 associates in semantic memory—the words that come to mind in free-associating to the target word. People in such experiments may falsely recall the target word as often as half the time, at about the same level of accuracy as they recall words actually presented in the middle of the list.

The nonpresented target word (e.g., window) is activated as a result of seeing or hearing close semantic associates. As we will see in Chapter 7, semantic memory is organized according to similarity. A close associate of “window” is likely to activate the representation of “window” itself. With 15 close associates at work, “window” is strongly active in memory, creating an illusion of its having been actually presented. To avoid false recall, it is necessary to monitor items generated as potential targets and to distinguish between those with sensory plus semantic activation and those with only semantic activation. Thus, effectively monitoring the source of a memory can prevent the illusion. If one remembered “window” and then attributed this experience to an internal source (e.g., thinking about “window” as the other words were read or heard), then the intrusion could be edited from recall. An internal source presumably lacks the sensory features of sound and sight that ought to be available for true memories with external origins.

### BOX 6.3

#### A Memory Demonstration

Read each word in the following list at a rate of about one word per second. Next, count backward from 60 to 0 at a rate of about one number per second. Finally, without looking again at the list, write down as many of the words as you can remember.

door	sill	view
glass	house	breeze
pane	open	sash
shade	curtain	screen
ledge	frame	shutter

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There is strong evidence that the availability of perceptual details helps people to avoid the illusion. For example, when a picture is presented along with each aurally presented word in the list, false recognition of the critical items is substantially reduced (Schacter, Israel, & Racine, 1999). The visual features of the pictures of actually presented words were distinctively different from internally generated intrusions of critical items, allowing participants to tell the two apart. In addition, Smith and Hunt (1998) found that reading the list of words, as compared with hearing the list, also helps participants to discriminate true memories from false memories of the critical items. As will be discussed in Chapter 8, reading activates representations of both the visual appearance of the words and the sound of words. Thus, participants have two kinds of perceptual details available in memory when reading the list of words. If you failed to experience the memory illusion after reading the list in Box 6.3, then try reading it aloud to a few friends and see whether they experience the illusion as a result of aural presentation.

Despite the strong behavioral evidence that distinctive perceptual details help one to avoid verbal false memories, it has proved difficult to capture these differences in brain activation patterns using neuroimaging methods (Curran, Schacter, Johnson, & Spinks, 2001). Attentional monitoring failures result in exceptionally high levels of false memories in patients with lesions in the prefrontal cortex (Melo, Winocur, & Moscovitch, 1999). Recall that the prefrontal cortex is a necessary region for the executive functions of working memory, such as attending to errors and inhibiting inappropriate responses.

Memory distortions can arise from reconstructive retrieval, flawed encoding, and failures to attribute mental experiences to the proper source. These factors are not unrelated, however. If the binding of features together into a cohesive event during encoding is disrupted, then errors in source memory can become more likely (Kroll, Knight, Metcalfe, Wolf, & Tulving, 1996). When researchers gave participants a list of words to study in which certain syllables could be combined differently to make new words, they sometimes observed binding failures. As shown in Figure 6.7, if the first and second syllables of “fiction” and “buckle” are not bound successfully, then the parts might be recombined into a word not actually presented—“fickle.” Such a mistake is called a **conjunction error** because two syllables are incorrectly conjoined during recall and not noticed as a novel word. In this case, the conjunction error arises partly because of a failure (a) to encode the words properly and (b) to realize that “fickle” came from an internal rather than an external source. Kroll et al. (1996) discovered that patients with lesions in the hippocampal regions of the left hemisphere were three to four times as likely to make conjunction errors as were normal controls. Recall that this region is critical in encoding words for long-term storage.

Study	Binding Success	Binding Failure	Recall
decade	decade		decade
fiction		fic____	fickle Conjunction error
island	island		island
meeting	meeting		meeting
buckle		____kle	
police	police		police

**Figure 6.7** Conjunction errors of memory.

## Confabulation

Because cognition is so actively constructive, it is understandable that people can falsely recognize an event or include false intrusions in their otherwise accurate recollections of past events. However, can the constructive nature of cognition also cause one to generate a false past—an autobiographical history that never happened? Providing a narrative account of autobiographical events that never happened is called **confabulation**.

Serious pathological degrees of confabulating a past that never happened are characteristic of a variety of confusional states, including Korsakoff's syndrome, which is caused by chronic alcoholism (Kopelman, 1999). A key feature of Korsakoff's syndrome is severe anterograde amnesia, and poor memory for recent events usually accompanies this condition. Confabulations appear as spontaneous outpourings of recollections that the patient cannot control and cannot monitor as false. Sometimes, confabulations include bizarre events that could not possibly be true, and yet the patient appears perfectly satisfied that the events really happened.

Confabulation is, at least in part, a breakdown in the ability to attribute fantasies to an internal imagined source and to edit this content to prevent false recollections. The spontaneous confabulation seen in neurological patients is, indeed, associated with prefrontal cortical damage to the executive functions of working memory (Kopelman, 1999). The delusional memories seen in patients suffering from schizophrenia may appear to be similar to confabulations, but they do not arise from lesions in the prefrontal cortex. For example, Kopelman described a garage mechanic who claimed to have been responsible for a well-publicized murder of an aristocrat living in London eight years earlier. Although completely convinced of the truth of

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this story, the man had no other signs of memory problems and lived a seemingly normal life until he became preoccupied with the delusional “murder.” It was his preoccupation with this false memory that led to his hospitalization and eventual diagnosis of schizophrenia.

## EYEWITNESS TESTIMONY

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Researchers are keenly interested in how constructive processes influence the accuracy of eyewitness testimony. Criminal trials in courts of law often depend on the firsthand testimony of witnesses to crimes. Assuming that a witness is not intentionally lying but rather is trying to provide an accurate account, just how certain can the judge and jury be that the testimony is correct?

Neisser (1981) analyzed the testimony of John Dean regarding meetings Dean had with President Nixon during the Watergate scandal of the early 1970s. Because Nixon had secretly taped conversations with Dean in the Oval Office, there was a transcript (with a few gaps) against which Dean’s recollections could be checked. At the time of the congressional hearings at which Dean recounted his conversations with the president, news commentators found Dean’s memory quite remarkable, given the many details he confidently offered in his testimony. Yet by comparing Dean’s sworn testimony to the tape transcripts that the president eventually was forced to turn over to Congress, Neisser could identify the errors in Dean’s testimony.

### Reconstructive Retrieval

On the whole, Dean did very well in recalling the gist of what Nixon had said. Dean integrated information about different meetings and conversations into broad themes. Yet he also added faulty details. Regarding the September 15 meeting that had taken place nine months before Dean’s testimony, Neisser (1981) observed,

Comparison with the transcript shows that hardly a word of Dean’s account is true. Nixon did not say any of the things attributed to him here: He didn’t ask Dean to sit down, he didn’t say [H. R.] Haldeman had kept him posted, . . . he didn’t say anything about [G. Gordon] Liddy or the indictments. Nor had Dean himself said the things he later describes himself as saying. (p. 9)

All of these faulty details were reconstructions of what Dean believed he must have heard, said, and done. Schemas most likely sharpened these details as Dean reconstructed the original events for his testimony.

Attorneys in criminal trials are well aware that the testimony of an eyewitness exerts a powerful influence on jurors. The members of a jury typically believe that eyewitness reports are accurate unless, for some reason, deliberate lying by the witness is suspected. In reality, eyewitnesses can fall victim to distortions of memory because of inaccurate encoding and retrieving of episodes (Loftus, 1979). Errors can and do occur, even when witnesses are confident that their testimony is accurate, leading in turn to wrongful convictions. According to some estimates, roughly 8,500 such miscarriages of justice occur each year in the United States alone, with as many as half attributable to incorrect eyewitness testimony (Loftus, 1986).

Besides focusing on reconstructive retrieval, efforts to explain these inaccuracies have focused on (a) selective encoding by the witness, (b) attempts to mislead the witness through slanted questioning, and (c) implanted memories. Adult eyewitness testimony is given substantial weight in criminal court proceedings despite the laboratory evidence documenting the potential for error (Ross, Read, & Toglia, 1994; Thompson, Hermann, Read, Bruce, Payne, & Toglia, 1998).

### Selective Encoding

The scene of a crime might not be plainly visible because of poor lighting and fleeting glimpses of the perpetrator (Buckhout, 1974). Moreover, eyewitnesses to violent crimes, particularly when they are the victims, may experience such a tremendous level of stress that they fail to encode the events adequately. Selective encoding could, theoretically, diminish recall of a crime scene. To illustrate the principle in a less severe situation, the social anxiety of being the next in line to give a public address can lower subsequent recall of the speech given just before one's own speech (Bond & Omar, 1990). Because attention is focused inward on worries about taking the stage next, the previous speech is not encoded very well.

Not all scholars agree that emotional duress while witnessing a crime weakens encoding, however. For example, Christianson (1992) concluded that only the peripheral details of the crime tend to get lost under high levels of stress. The central features or gist of the event are often remembered especially well through effects of selective attention, elaboration, and distinctiveness. At a neurological level, the amygdala is involved in heightening memory for the gist of emotionally negative experiences (Adolphs, Denburg, & Tranel, 2001). Neurologically normal individuals better recall the gist of negative stimuli, accompanied by poorer memory for peripheral details, compared with neutral stimuli. In patients with bilateral damage to the amygdala, this normal pattern is reversed, such that the details of negative stimuli are remembered well but not

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the gist. It appears that the amygdala assists in selectively encoding the gist as opposed to the details of negative emotional events. Finally, as noted in Chapter 5, whatever information is encoded during emotional duress, it is likely to be consolidated well in long-term memory. Emotional arousal enhances the consolidation process (McGaugh, 2004). Thus, most errors in eyewitness testimony are likely to be caused by factors other than selective encoding.

In particular, memory for facial appearance is often remarkably accurate (Bairick et al., 1975), possibly because face perception is served by a specialized module, as discussed in Chapter 2. However, a witness may still fail to recognize a stranger who has just committed a crime if the witness attended to, say, the weapon carried by the perpetrator rather than his or her face. The unexpected and rapid occurrence of the events in a crime may cause selective encoding that interferes with accurate identification (Naka, Itsukushima, & Itoh, 1996).

Errors in eyewitness identification are particularly likely when the police lineup is not properly composed (Wells, 1993). “Fillers” are individuals whom the police do not regard as suspects in the crime. If the fillers selected do not match the general description of the suspect given by the eyewitness prior to the lineup, then they do not serve as useful control cases. In the most extreme case, suppose that in a six-person lineup the five fillers look nothing at all like the person described by the witness. If an innocent suspect is the only one in the lineup who fits the description, then chances of misidentification are strong. Experiments using staged crimes have shown that misidentifications can exceed 90% when conditions at the time of the crime plus conditions at the time of the lineup conspire against the eyewitness.

The problem of misidentification in lineups is particularly acute when the witness and suspect are of different racial and ethnic backgrounds (Wells & Olson, 2001). For example, Asians recognize other Asians better than they recognize Caucasians, and the reverse relation also holds for Caucasians. Same-race identification is better than other-race identification. One explanation for this finding is that people attend more to the faces of people of their own race than they do to the faces of people of different races (Anthony, Copper, & Mullen, 1992; Chance & Goldstein, 1981). Recent evidence indicates that the greater familiarity of same-race faces results in a greater degree of holistic processing, which is known to mediate successful face recognition (Michel, Rossion, Han, Chung, & Caldara, 2006).

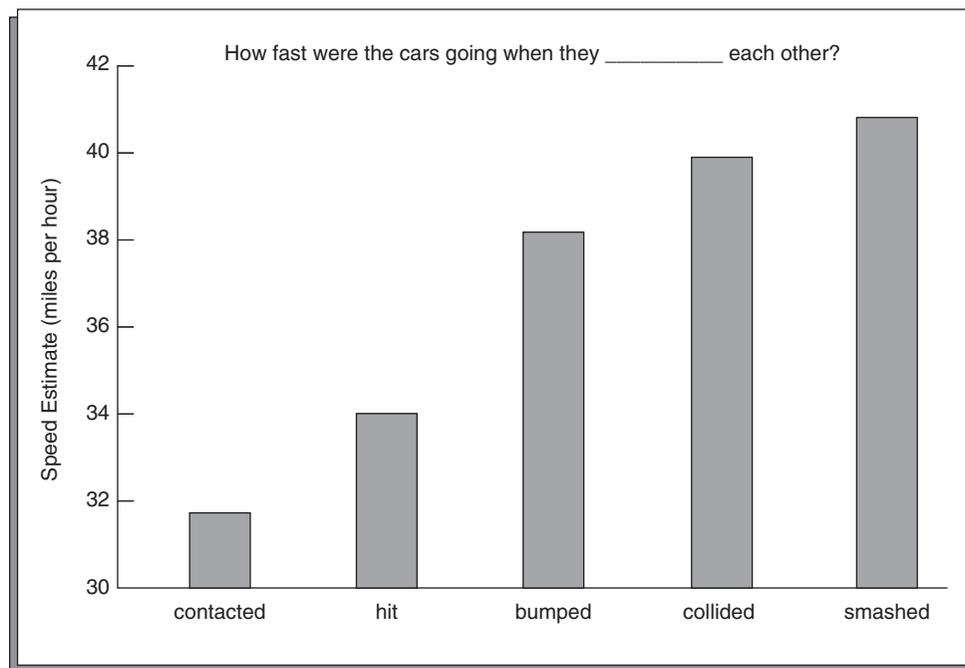
### The Misinformation Effect

Work by Loftus and her colleagues has shown that the questions asked of eyewitnesses after an event can potentially influence their memory. When the questions contain misleading information they may distort memory, a

finding called the **misinformation effect**. For example, Loftus and Palmer (1974) presented people with a film of a traffic accident and then questioned them, as might an investigator or an attorney, about what they had witnessed. One of several questions asked was “How fast were the cars going when they hit each other?”

In the various conditions of the experiment, the verb “hit” was replaced by more or less violent words, as shown in Figure 6.8. Later on in the experiment, the participants gave estimates of how fast the cars were traveling when the accident occurred. The results showed that the average speed estimate varied in direct relation to the wording of the question. By using the word “smashed,” the interrogator apparently distorted the participants’ memory representation of the accident, causing people to give high estimates of vehicle speed.

Moreover, a week later, new questions were posed such as “Did you see broken glass?” In fact, no broken glass appeared in the film, and 80% of the



**Figure 6.8** Data illustrating the misinformation effect.

SOURCE: From Loftus, E. F., & Palmer, J. C., Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior*, 13, 585-589, copyright © 1974. Reprinted with permission.

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participants correctly answered “no” to this question. Yet most of those who answered “yes” were in the condition that had been asked about the cars smashing into each other. As time wore on, the leading question continued to shape the nature of the recollection.

The misinformation effect can be strikingly large. Loftus, Miller, and Burns (1978) showed people a series of slides portraying an accident in which a red car stops at an intersection, turns the corner, and hits a pedestrian. Some participants saw a yield sign at the intersection but were asked either 20 minutes or a week later whether a second car passed the red car “while it was stopped at the stop sign.” After providing the misleading information, Loftus et al. administered a recognition test that required participants to say which of a pair of slides had been part of the accident series. The key pair showed the red car at either a stop sign or a yield sign. When the misinformation occurred 20 minutes after the accident, the participants incorrectly picked the stop sign about 60% of the time. This rose to 80% when the misleading question was asked after a week.

When misleading information is given long after the witnessing of the event, it is likely to be more highly accessible and easy to retrieve at the time of test. The ease of retrieving the misinformation thus effectively blocks the retrieval of the original correct information (Eakin, Schreiber, & Sergeant-Marshall, 2003). Besides misleading questions from a police interrogator, there is other misinformation to which eyewitnesses are susceptible, according to Eakin et al. For example, if the witness does not report the event right away and then discusses it with other witnesses, misinformation might come from the reports of those other witnesses. Misinformation might also come from news reports about the incident on television, for example.

The misinformation effect refers to distortions in memory created by misleading information introduced through the questions used by an interrogator of a witness.

### Implanted Memories

During criminal investigations, it is not uncommon for authorities to state repeatedly that a suspect was involved in a crime. *Memory implantation* refers to an individual creating a false memory in the mind of another person by means of suggestions and questions about the imagined event. Is it possible to implant false memories in an eyewitness to the crime by suggesting a suspect’s guilt?

By intermixing true and false information, Loftus and Pickrell (1995) discovered that memory implantation is, in fact, theoretically possible. Adults

were told by a close family member about three true events from their past plus one false event that they supposedly had experienced when they were between four and six years of age (e.g., getting lost in a shopping mall). The researchers found that some of the participants began to recall, from the suggestion alone, that they had been lost in a mall. Indeed, a few provided explicit accounts of how terrifying they had found the experience to be. The false recollections, in some cases, grew more detailed over time. Zaragoza and Mitchell (1996) found that repetitions of the suggestion increased the chances of participants' consciously recollecting the false event as actually having occurred. Thus, it is indeed possible to implant a memory, at least in laboratory circumstances, and the effects of repeated exposure to suggestions can be consistent across individuals and persistent over time.

Because of their suggestibility, children may be the most vulnerable to memory implantation when they are eyewitnesses to a crime (Ceci & Bruck, 1993, 1995). Laboratory research indicates that preschool-aged children are especially vulnerable to suggestion as compared with older children and adults. But clinical psychologists who specialize in working with abused children contend that such findings do not apply to important actions, particularly those involving a personal bodily experience. It is common for experts in clinical psychology, social work, and psychiatry to testify in court that children do not lie about events as traumatic as physical abuse and could not be falsely led through suggestion to believe abuse occurred. Although young children may be highly suggestible regarding unimportant peripheral events, there is reason to doubt that they are equally suggestible when it comes to sexual abuse.

Ceci, Leichtman, Putnick, and Nightingale (1993), however, reported that a false memory of having been kissed during a bath can indeed be planted in the mind of a young child. In an anatomical doll study, nearly a quarter to a third of 3-year-olds inaccurately answered abuse questions such as "Did he touch your private parts?" and "How many times did he spank you?" (Goodman & Aman, 1990). Such findings may imply that suggestion has led to a false memory, but Ceci and Bruck (1993, 1995) noted that children might also lie for social reasons (e.g., avoiding punishment, game playing, personal gain). Ceci, Crossman, Gilstrap, and Scullin (1998) reported seven experiments showing that the suggestibility of young children is not constricted to a single domain of unimportant peripheral events. They demonstrated children's suggestibility about embarrassing genital touching and painful events during checkups at a pediatrician's office. Ceci et al. concluded that "there is no event domain that is impervious to the deleterious effects of suggestions, especially when they are repeatedly delivered over long retention intervals" (p. 29).

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Thus, memory implantation in eyewitnesses to a crime is a possibility, particularly for young eyewitnesses. Is it also possible to implant false memories in the mind of a confused, tired, and fearful suspect? Kassin and Gudjonsson (2004) explained that an interrogation of a person is undertaken only after an information-gathering interview has taken place to ascertain whether the person committed the crime. Once the person is identified as a suspect, the next step of interrogation is undertaken with the purpose of obtaining a confession. The methods used can be highly confrontational and accusatory. Repeated suggestions that the suspect committed the crime are a routine part of the interrogation procedure. It is not uncommon for the interrogator to claim he or she has evidence of the suspect's involvement and knowledge of the suspect's past. Through the process of social influence, it is theoretically possible that an innocent suspect may not only make a false confession, but also come to believe or internalize his or her guilt in committing the crime. A few murder cases have been identified as examples of such internalized false confessions, according to Kassin and Gudjonsson. Other exonerating evidence later came to light in the investigations that showed the suspect could not have committed the crime and proved the falsehood of the confession believed even by the suspect.

### Recovered Memories

The tabloid press frequently reports cases of seemingly sane individuals who recall being abducted by aliens and taken aboard unidentified flying objects (UFOs), living past lives as other persons, being sexually abused during satanic rituals, or witnessing cannibalism of children (Loftus & Ketcham, 1994). From a scientific viewpoint, such reports are difficult to accept as anything other than false because they are so bizarre and implausible. How, then, might they be understood? One reasonable explanation is that such recollections are delusional false memories instilled through sociocultural mechanisms (Spanos, 1996). A **delusional false memory** is a false memory of an event experienced by an individual who has strong beliefs that a bizarre event could actually occur. It is not well-understood how a delusional belief originates, but the culture and social circles of the individual play a role, according to Spanos (1996). The delusional memory is implanted by suggestions coming from the sensational stories covered in tabloids; bizarre stories reported on television; and statements made by friends, family, and oneself, much as occurs under the effects of hypnosis.

Consider stories about encounters with a UFO, for example. Betty Hill was an avid believer in UFOs before the night that she and her husband, Barney,

claimed to have seen a strange light following their car (Klass, 1989). Betty's sister suggested that she and her husband may have been "irradiated" by the light, and soon Betty began to have nightmares in which she and Barney were abducted by aliens who took them on board a UFO, communicated with them telepathically, performed medical tests, and showed Betty a star map. A psychotherapist who treated Betty for her nightmares used hypnosis to elicit detailed reports of these events from both her and Barney, who had heard these accounts from his wife numerous times. The psychotherapist concluded that the reports were delusional false memories shared by the couple. Such false memories, then, are likely similar to confabulations but differ in that the individuals do not suffer from lesions in prefrontal cortical regions. The power of their belief system constructs the delusional memories (Kopelman, 1999).

*Repression.* During the 1990s, numerous allegations of child abuse were reported by the victims as adults, years after the incidents had taken place. These forgotten memories of abuse sometimes surfaced while an adult was in therapy for severe emotional distress and an inability to cope with daily life (Olio, 1989). A famous case involved Eileen Franklin's recovered memory that her father, George, not only sexually abused her and her sisters but also abused and murdered her best friend 20 years earlier (MacLean, 1993). A clinician testified that Eileen had recovered a repressed memory of the murder. The trauma of the murder had caused Eileen to repress the memory throughout her childhood, according to the testimony in the trial. The defense cited the laboratory evidence that misleading questions and other factors can cause distortions in memory. The jury convicted George Franklin of murder. He served five years behind bars before his conviction was reviewed by an appeals court and overturned on the grounds that Eileen's recollections were probably false memories.

Therapists working with individuals who experience recovered memories typically have attributed these individuals' forgetting to **repression**. Repression generally refers to an inhibitory process of excluding events from retrieval. Although today repression is usually thought to occur unconsciously, in Freud's original conception of this process the term also referred to the conscious suppression of unwanted material (Erdelyi, 2001). According to classical Freudian theory, repression is a defense mechanism that protects the ego from anxiety by preventing unpleasant memories from entering consciousness. One can readily see why a person would be motivated to repress traumatic experiences and exclude them from consciousness to avoid the anxiety that traumatic memories provoke.

Another possibility suggested by memory researchers—and, interestingly, by Freud himself—is that supposedly lost and then recovered memories of

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Recovered memories may reflect either the retrieval of a previously repressed event or an inaccurately reconstructed false memory.

sexual and other abuse are false memories. They may reflect the reconstructive processes of schemas, leading one to recall vividly events that never transpired. We have seen that strong laboratory evidence shows that false memories are possible. Do such findings have **ecological validity**? Do they generalize to actual real-world events? People can have false memories about a wide variety of everyday events that they hear or read about as well as those they personally experience (Neisser & Libby, 2000). It is unclear whether events as traumatic as child abuse can be falsely remembered, but it is certainly possible that suggestions from therapists and others may prompt the reconstruction of false memories.

A vocal debate over these issues has divided the therapeutic community and the academic research community (Lindsay & Read, 1994). Therapists, for their part, have generally maintained that the trauma of rape or other forms of child abuse can, indeed, produce amnesia for the events. Through the course of psychotherapy, the victim recovers these forgotten events as part of the healing process. Academic researchers, on the other hand, have generally argued that trauma-induced amnesia is rarely, if ever, the correct explanation. The recollections brought to consciousness are far more likely to be false memories inadvertently induced by the suggestions and practices of the therapist. The therapeutic techniques used to help an individual often include memory work; the individual regresses to an earlier age under hypnosis, receives sexually suggestive questions or dream interpretations from the therapist, or tries to remember childhood events while drugged with sodium amytal. The therapist tries to break through the defense mechanism of repression with these techniques. The client is not consciously trying to suppress thinking about the traumatic event. Rather, the client has no recollection of the event even occurring, although the trauma may be causing him or her anxiety or depression or may be responsible for an eating disorder, a sleep disorder, alcohol or drug abuse, or other significant difficulties. Abuse as a child is horribly traumatic, and so repression as well as conscious efforts to forget about the event are anticipated by the therapist (Olio, 1989).

The problem is that there is little sound empirical evidence that adults can forget traumatic events for years and then recover them accurately (Loftus, 1993; Spanos, 1996). Traumatic memories are notoriously difficult to suppress consciously and are a defining feature of posttraumatic stress syndrome. Victims recall trauma all too easily and frequently, possibly as a way of coping with what has happened to them. In some cases, traumatic memories are stored in a fragmented form that is susceptible to being forgotten (Shimamura, 1997). However, in these circumstances the memory fragments

are highly susceptible to distortions and inaccuracies if they are reconstructed later. Thus, the repression and subsequent accurate recovery of sexual abuse memories is unlikely. This does not mean, however, that it is impossible. Some cases have been substantiated in which prior abuse was apparently forgotten and later recovered (Schooler, Bendiksen, & Ambadar, 1997).

Hypnosis and other techniques of recovered memory therapy have the strong potential of convincingly suggesting events that might never have taken place (Spanos, 1996). Normally, adults can monitor reality in order to draw a clear line between events stemming from memory and those generated in fantasy (Johnson, 1988), but this line can be tragically erased in so-called recovered memory cases by the methods of the therapy itself (Loftus, 1993). In some cases, the clients later came to realize that the recollections of sexual abuse uncovered through the practices of therapy were, in fact, false memories. The lives of everyone involved were shattered by the false accusations.

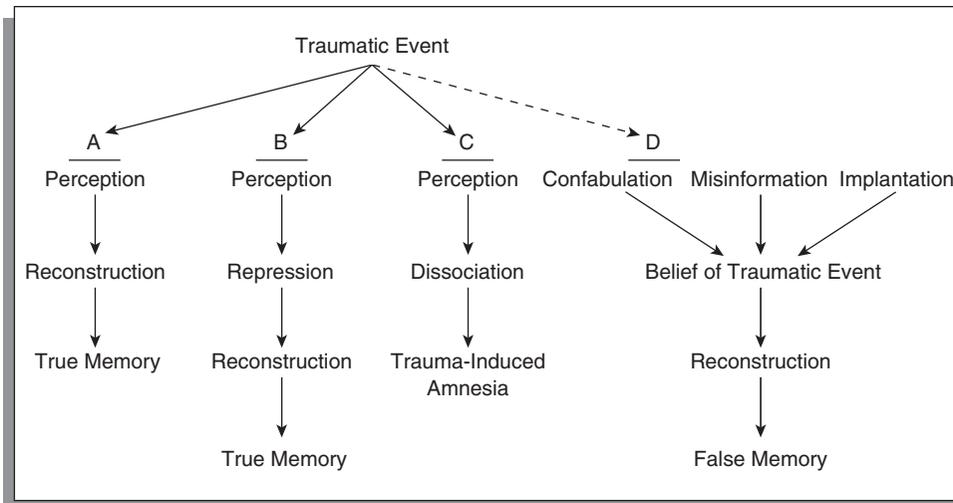
*Trauma-Induced Amnesia.* Recovered memory is not the only possible response to a real traumatic experience. According to Yuille and Daylen (1998), the impact of trauma on memory may well be complex, affecting different individuals in different ways. In some extreme cases, there may be a dissociation of consciousness, producing **trauma-induced amnesia**. This could cause the victim to experience the trauma as if it were happening to someone else or to travel mentally to a different place and time to psychologically avoid the trauma altogether. Dissociation may also affect the storage and retrieval phase by causing amnesia for events that were at one time remembered. Trauma-induced amnesia is rare, but cases have been documented (Schacter & Kihlstrom, 1989).

Trauma-induced amnesia is a rare kind of dissociated consciousness. The victim experiences the trauma as if it were happening to someone else or psychologically avoids the trauma by mentally traveling to a different place and time.

*Conclusions.* As illustrated in Figure 6.9, there are several possible causes of recovered memories and different possible responses to traumatic events. As noted in Path A, one may remember the trauma all along or possibly repress the memory for a period of time before it is recovered (Path B). Another possible response to trauma is to forget the event altogether as a result of a dissociation of consciousness at the time of encoding (Path C). As shown in Path D, a recovered memory might also be false, the result of a belief that an event occurred (dotted line) rather than a perception of the event (solid line). Confabulation, misinformation, and memory implantation are possible sources of such false beliefs.

There are two important conclusions to draw from the controversy surrounding recovered memories. First, therapies used in clinical practice must

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**Figure 6.9** Four possible scenarios for the recollection of a traumatic event.

be critically examined to make certain that they do no harm. A technique may promise benefits, but these must always be weighed against its costs. Second, the ecological validity of laboratory studies on false memory must also be critically examined when drawing conclusions. The laboratory research demonstrates that false memories are real and helps to explain the experiences of patients in therapy. But this does not mean that trauma-induced amnesia never occurs or that forgotten trauma never resurfaces in or out of therapy. It is difficult, if not impossible, to examine in the laboratory the effects of severe physical or psychological trauma on human memory. For ethical reasons, the experiences of individuals who have been raped, beaten, shot at, or otherwise traumatized in real life can never, in principle, be evaluated in laboratory settings. Field and case studies of assault victims, combat veterans, and concentration camp survivors may offer insights into such effects, but they are never as definitive as well-controlled laboratory experiments.

## SUMMARY

1. Schemas shape how events are retrieved from long-term memory. A schema is a set of organized concepts that provides expectations about the world. Just as schemas guide human pattern recognition from the top down, conceptually driven processes also guide the reconstruction of events from

memory. As a result, details of an event may be dropped from recollection, a process called leveling. Details may also be assimilated or normalized in order to fit the expectations provided by the schema. Finally, a schema-based reconstruction of an event may also sharpen details, elaborating a point by using general knowledge about the world rather than information actually encoded and stored.

2. Schemas also influence what is encoded and stored in episodic memory in the first place, causing memory distortions. They establish expectations that result in selection of the features of events that are encoded in the first place. Schemas also constructively guide the encoding of events through a process of interpretation. Inferences are drawn at the time of encoding as well as during reconstructive retrieval. Finally, schemas influence encoding through integration, which means that features of different events are combined into a unified memory representation. As a result of integration, we remember the main idea or gist of events rather than the details of their occurrence.

3. Source monitoring refers to evaluative processes that attribute mental experiences to different sources. External sources are perceived events in the environment, whereas internal sources are thoughts, fantasies, and dreams. A laboratory demonstration of a memory illusion shows that after a list of words closely associated with a target word is viewed, the target itself is falsely remembered as being on the list. In the illusion, the target word is activated internally but is incorrectly attributed to an external source. Normally, source monitoring processes enable us to easily differentiate between a fantasy and a real memory. These processes break down in Korsakoff's syndrome, which is associated with chronic alcoholism. The patient makes up false memories out of thin air. Confabulations appear as spontaneous outpourings of recollections that the patient cannot control and cannot monitor as false.

4. The constructive and reconstructive properties of human memory have important implications for our legal system. The reliability of eyewitness testimony has been studied extensively. Selective encoding, misleading questions used by interrogators, and the implantation of memories through hypnosis and therapy have been shown to distort recall in laboratory settings. The ecological validity of this research has been challenged. In particular, there is still considerable controversy over whether traumatic events, such as sexual abuse, can produce amnesia for an event that is later recovered. The suggestibility and credibility of young children as witnesses, or of adults who have recovered supposedly repressed memories of sexual abuse, are at the center of this debate.

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**KEY TERMS**

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reconstructive retrieval

leveling

assimilation

sharpening

selection

interpretation

integration

source monitoring

false verbal memory

conjunction error

confabulation

misinformation effect

delusional false memory

repression

ecological validity

trauma-induced amnesia