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## Distortions of Memory

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There are two general classes of errors in remembering: omission and commission. In the former, people fail to recollect a prior event when they try to retrieve it. In the latter, people remember events quite differently from the way they happened, or they remember an event that never happened at all. No one doubts the reality of the first error; forgetting of needed information happens to everyone dozens of times each week. Psychologists have studied forgetting experimentally for 115 years, since Ebbinghaus's (1885/1964) meticulous studies showed the general nature of the forgetting function. However, errors of commission—memory distortions—are much more controversial and, over the years, have received much less attention. People would like to believe that their memories are more or less accurate renditions of the experiences that occurred to them in the past. How could a memory for an event be “false”? Where would the recollection come from, if not from stored traces of actual events? Demonstrations that such distortions can occur have thrust the issue of memory illusions and false memories onto center stage in contemporary cognitive psychology.

The aim of this chapter is to provide an overview of factors known to create memory distortions. We first provide a brief history of this field of study. Then, in the body of the

chapter, we review the literature on distortions by considering six factors that seem to be responsible for their occurrence. We conclude with a discussion of some of the implications of memory distortion for wider problems in society, particularly the issues of accuracy of eyewitness testimony and the recovery of memories of childhood abuse.

### History

The systematic experimental study of perception and memory began at roughly the same point in time—in the latter part of the nineteenth century. However, the study of errors and distortions received quite different treatment in the two domains of study. Researchers interested in perception quickly seized upon the phenomena of perceptual illusions and studied them assiduously. Coren and Girgus (1978) estimated that 200 scientific papers on perceptual illusions appeared before 1900.

The case was quite different in the study of memory. Most researchers examined correct performance, either directly (e.g., the number or proportion of events correctly recalled or recognized) or indirectly (e.g., through Ebbinghaus's ingenious relearning and savings technique). Not many researchers were interested in errors (also referred to as distortions of

memory or memory illusions; Roediger, 1996). However, just as perceptual illusions may aid in our knowledge of perceiving, so should memory illusions offer a vantage point to aid our understanding of remembering. Although they were few, some studies of memory errors did appear in the early memory literature (see Schacter, 1995, for a fuller historical treatment).

Early in this century, Binet (1900) in France, Varendonck (1911) in Belgium, and Stern (1910) in Germany all conducted studies of the fallibility of children's recollections (see Ceci & Bruck, 1995, chap. 5). Typically, these studies examined how children's recollections could be altered by suggestions from an adult. For example, Binet (1900) showed children 5 objects (e.g., a button glued onto a board) for 10 seconds and then tested their memories of the objects with various types of questions. When given free recall instructions ("Write down everything you saw"), the children made few errors. However, when asked suggestive questions about the objects ("Wasn't the object attached to the board by a string?"), many errors occurred, as the children complied with the researcher's suggestion. Neutral questions elicited fewer errors than did the suggestive questions. The research by Binet and others was relatively well known even to readers of English at the time, owing to reviews in *Psychological Bulletin* by Whipple (1909, 1913). In addition, Munsterberg's (1908) *On the Witness Stand* emphasized the erratic nature of eyewitness testimony through examples. However, this early research did not thoroughly permeate experimentalists' attempts to understand human memory, which mostly continued in the tradition begun by Ebbinghaus.

In 1932, Bartlett published his great book *Remembering*, in which he described recollection as being a reconstructive process driven by schemas, or general organizational schemes. Bartlett's idea was that specific experiences may not be remembered, but that overall themes would be. When people tried to recover distant memories, they would be guided by general themes or schemas and fill in details that were consistent with the schemas (but which might be quite wrong). He conducted rather informal experiments with English college students in which they were given a Native American story, "The War of the Ghosts," and asked on several occasions to recollect it. He interpreted the systematic errors the students made as evidence for his

schema theory. Although Bartlett's book is a milestone, it seems to have had curiously little impact on the field for many years. It was not until the 1970s that several lines of research began that were inspired in a general way by Bartlett's work, but which used much more rigorous techniques for eliciting errors of memory.

Another important contribution, published at the same time as Bartlett's book, was made by Carmichael, Hogan, and Walters (1932). They showed people ambiguous figures and labeled the figures with a single word. For example, one figure was labeled as either a rifle (for one group of subjects) or a broom (for a different group of subjects). Carmichael et al. later tested their subjects' abilities to accurately remember and draw the ambiguous objects they had seen. The form subjects drew was heavily influenced by the label given to the object: the ambiguous figure previously labeled a broom no longer looked ambiguous when recalled—it looked like a broom. In modern parlance, Carmichael et al. studied the effects of verbal recoding on remembrance of visual form: people do not remember objects as they exist in the world, but as their minds recode the objects (Miller, 1956; Schooler & Engstler-Schooler, 1990).

Analyses of errors in remembering were conducted from time to time in the next decades, but usually for some theoretical purpose rather than to study the fallibility of memory per se. For example, Melton and Irwin (1940) used intrusion analyses to identify what they called factor X (later identified as unlearning) in interference theory. Similarly, Deese (1959) examined errors in recall as a means of studying associative processes. Subsequently, other researchers used error patterns in attempts to identify the types of coding in short- and long-term memory. Conrad (1964) noted that errors in short-term memory represented acoustic confusions, even when the material was presented to subjects visually. Out of this observation grew the hypothesis that phonological codes underlie short-term retention (e.g., Baddeley, 1966). Errors in long-term retention seemed to be based more on meaning. Thus, error analyses were used to make theoretical points in two-store theories, but the study of errors in their own right and for showing the basic fallibility of human memory was not the purpose of these studies. In fact, errors were generally considered a nuisance by memory researchers, a factor that might indicate "guessing" on the part of the subjects and

that therefore needed to be eliminated, controlled, or factored out of performance to get a “true” memory score. The corrections could either be simple (subtracting errors from correct responding) or more complex, as in the theory of signal detectability, but the errors themselves were considered to be of little interest in most experimental studies of memory.

The situation changed in the late 1960s and early 1970s. Neisser’s (1967) *Cognitive Psychology*, which helped to launch and to name the cognitive revolution, revived Bartlett’s approach to remembering. At about the same time, other researchers (e.g., Bransford & Franks, 1971; Cofer, 1973) began to study errors in retention using prose materials. This work was inspired by Bartlett and provided more secure evidence than did his own work for many of his key points. Loftus and Palmer (1974) introduced a paradigm for studying eyewitness recollection that also markedly changed the course of the field. In the past 25 to 30 years the study of memory distortion has been a central topic in the field. The remainder of the chapter surveys what we have learned.

## Factors Creating Distortions of Memory

This part of the chapter is organized around six sets of factors that have been shown to cause distortions of memory. We categorize our review of the literature under the rubrics of relatedness effects in memory; interference effects; retrieval and guessing effects; effects of imagining; effects of social context; and individual differences in these processes—are some people more susceptible than others to memory distortion?

### *Relatedness Effects*

This term is intended to cover a variety of phenomena that all follow the same general rule: if people experience a series of items that are strongly related, they will tend to remember other (nonpresented) items as having occurred if these nonpresented items are strongly related to those that did occur. The relation among items in the series can be of a categorical nature, can involve associative relations among similar elements in lists of words or pictures or in videotapes, or can be among themes and schemas in prose. The general idea is that when a person tries to retrieve

a prior episode, his or her general knowledge (semantic memory) may strongly influence this recollection; thus, episodic memory and semantic memory interact (Tulving, 1972). General knowledge of the world can help people fill out their episodic recollections.

As mentioned previously, Bartlett (1932) was one of the first researchers to demonstrate the role of schemas on memory. In his classic demonstration using the “War of the Ghosts,” he noted that when people were asked to recall this story, which to them seemed rather disjointed and confusing, they seemed to engage in “effort after meaning.” That is, people reinterpreted the story in light of their world knowledge; they imposed order where none had been present to make a more logical story. Bartlett referred to this process as *rationalization*.

One type of relatedness effect is remembering things implied but not specifically stated. Implications received substantial attention during the 1970s. For example, Sulin and Dooling (1974) presented subjects with short paragraphs about a troubled girl and tested for false recognition of nonpresented ideas. The paragraphs studied by two groups of subjects were identical, with the exception of the name of the protagonist: Helen Keller or Carol Harris. Subjects who read about Helen Keller often later erroneously recognized “She was deaf, dumb, and blind” as having been present in the paragraph, whereas those reading about Carol Harris rarely made this error. In addition, the probability of making such an error increased with the retention interval, consistent with Bartlett’s informal observations.

Bransford and Franks (1971) and Johnson, Bransford, and Solomon (1973) made similar observations, showing that people often extract implications and remember them as having been explicitly stated. For example, Bransford and Franks (1971) presented subjects with short sentences such as “The rock rolled down the mountain” or “The rock crushed the hut.” There were four ideas altogether that would make up the sentence “The rock rolled down the mountain and crushed the tiny hut.” Bransford and Franks had people listen to sentences containing the ideas and then gave them a later test; they were asked to identify which sentences they had actually heard and which were new. The test sentences could themselves have 1, 2, 3, or 4 ideas and could either have been studied or not studied. However, even when the sentences per se had not been studied, other sentences representing the

larger idea had been studied. Subjects rated their belief that the sentences had been presented earlier on a 10-point scale, from -5 (sure the sentence was new or nonstudied) to +5 (sure the sentence was old or studied). The results are shown in figure 10.1, where it can be seen that the more ideas the test sentence contained, the higher the recognition rating for the sentences. This relationship held whether the sentences were ones that had actually been studied or were new. In addition, except for the sentences expressing only one idea, there was little difference in recognition confidence between sentences that had actually been studied and those that had not been studied (but which were consistent with knowledge built up from other sentences). Subjects seemed to retain the meaning of the simple ideas quite accurately, but not to know whether the particular sentence on the test had been previously presented.

Brewer (1977) added an interesting twist to this research in studying pragmatic implications of sentences. Pragmatic implications are made when the person hearing a sentence infers something that is neither stated explicitly nor logically necessitated by the sentence. For example, "The karate champion hit the cinder block" implies that the cinder block was broken. However, it is perfectly possible that the block was struck but not broken. Thus, "breaking" is pragmatically (but not logically) implied. Brewer found that when people were given the first part of the sentence (e.g., *The*

*karate champion*) as a cue to recall the rest of the sentence, people were more likely to recall the implied verb (in this example, *broke*) than the presented verb (*hit*).

Complex prose materials, leading to implications, are not necessary to obtain influences of semantic memory on episodic memory. In a classic study, Underwood (1965) demonstrated that recognition for lists of words can show similar effects. When presented with a continuous recognition task, in which words are presented one at a time and subjects must determine for each word whether it had been seen previously in the experiment, people sometimes erroneously recognized associates of previously presented words. For example, when *hard* was given in the list, subjects subsequently recognized *soft* as having occurred with probabilities greater than the background false alarm rate to unrelated words. Underwood proposed that implicit associative responses (IARs) were responsible for this effect. He believed that when a person encounters a word, he or she also thinks about a word (or words) related to it. That is, reading *hard* may elicit *soft*, either consciously or unconsciously. False recognition occurs as a result of a failure in what would, in current terminology, be called reality monitoring (Johnson & Raye, 1981); that is, false recognition arises when people confuse what they previously thought with what actually occurred.

Although Underwood (1965) is usually credited with discovering that associative processes can induce false memories in list-learning paradigms, there was an earlier demonstration that made a similar point. Deese (1959) showed that people sometimes erroneously recall a nonpresented word (e.g., *sleep*) when presented with 12 words associated to that nonpresented word (e.g., *bed, rest, awake, etc.*). Deese's contribution was largely overlooked, however. This neglect was probably due to the fact that the paper was not structured as a demonstration of false recall. Instead, Deese was interested in showing how associative processes contribute to memory; in addition, many of the lists he used did not produce false recall.

Roediger and McDermott (1995) adapted Deese's (1959) paradigm for the study of false recall and extended it to the study of false recognition and to meta-memory judgments. They showed that when presented with 15 words strongly associated to a critical, nonpresented word, people often recalled, recognized, and claimed to remember the specific instance of

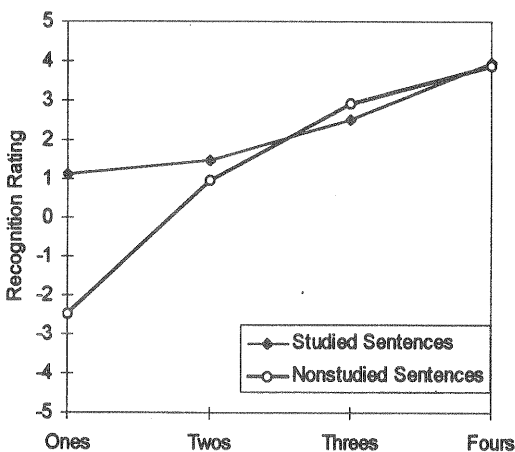


Figure 10.1 Mean recognition ratings for studied and nonstudied sentences as a function of number of propositions per sentence. Data from Bransford and Franks (1971).

presentation of the critical nonpresented associate (e.g., *sleep*). The recognition results from one experiment are shown in figure 10.2. The false alarm rate for the critical nonstudied words such as *sleep*, from the which the lists were derived, approximated the hit rate for words actually studied. In addition, the false alarm rate to the critical items was much higher than that for unrelated distracters. Considerable research on false recall and recognition has been developed through use of this paradigm (see Roediger, McDermott, & Robinson, 1998, for a review).

Although the relatedness effects discussed thus far are meaning based, preexisting semantic associations are not necessary to obtain these types of effects. Using a modified version of a pattern classification paradigm introduced by Posner and Keele (1968, 1970), Franks and Bransford (1971) showed that people will often erroneously recognize shape configurations that are the nonstudied prototypes of presented shape stimuli. Sommers and Lewis (1999) presented lists of words that were all from the same phonological neighborhood and found errors similar to those observed by Roediger and McDermott (1995). Therefore, relatedness effects need not arise from preexisting semantic representations.

In summary, relatedness is a powerful means by which false memories can arise. The relations can arise in the form of schemas, inferences, and associative bonds (both preexisting semantic or phonological links, as well as more abstract, figural prototypes). The presentation of related sets of information probably serves as a general means of producing false recollections for an event not in the original sets but strongly related to them.

### Interference Effects

Müller and Pilzecker (1900) showed very early that interference could be a potent source of forgetting. Indeed, theorizing about forgetting in the middle part of this century was dominated by the interference theory of forgetting, which stressed how events happening before and after some critical event could create forgetting of that event (proactive and retroactive interference, respectively). One mechanism for the forgetting was postulated to be response competition—the interfering event competes with the original event, and sometimes people remember the interfering event as the original event. Thus, interference can also be a potent source of false memories. The general principle is that an event that occurs

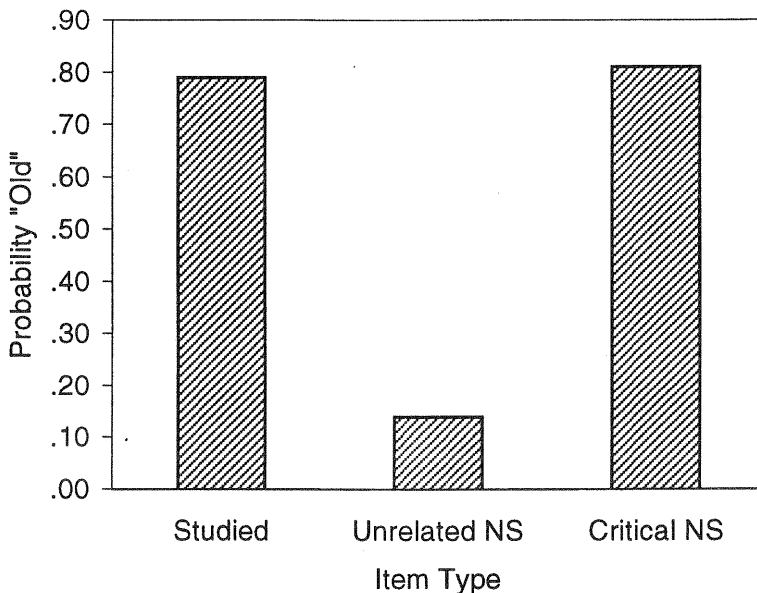


Figure 10.2 Mean proportion of studied, unrelated nonstudied, and critical nonstudied items classified as having been previously studied. Data from selected conditions of Roediger and McDermott (1995, experiment 2).

after (or before) some event of interest may later be retrieved as if it were the event of interest. Similarly, interference may influence the details retrieved regarding the original event. In general, the more similar the events (in content or in time of occurrence), the more likely these confusions will arise (see Crowder, 1976, chap. 10, for a review of interference theory).

Loftus and Palmer (1974) developed a tractable laboratory paradigm simulating an eyewitness viewing a traffic accident; the goal was to study how information could interfere with memory for an earlier event. People viewed a film in which a traffic accident was depicted. They were subsequently asked a question regarding how fast the cars had been traveling when the accident occurred. The critical aspect of the question was the verb used in the question. People who were asked "About how fast were the cars going when they smashed each other?" estimated a speed of 41 mph. When the critical verb was "hit" (instead of "smashed"), the estimates dropped to 34 mph. Not only did the leading question influence the quantitative estimation of speed, but it also tended to lead to the creation of distorted memories. When people were asked a week later whether they had seen any broken glass in the film, those who received the leading question containing "smashed" mistakenly reported having seen broken glass 32% of the time, whereas people receiving the "hit" question made this error only 14% of the time. Thus, a single word occurring in a single question in a series of questions was sufficient to interfere with peoples' memory for the witnessed event, both immediately and one week later.

In subsequent studies on the role of interference in producing false memories, Loftus and her colleagues have demonstrated the ease with which leading questions or misleading statements can alter subsequent recollections. Loftus, Miller, and Burns (1978) presented subjects with a series of slides; one of the slides depicted a car approaching an intersection with a stop sign. In a second phase of the experiment, subjects answered questions about the events, such as "Did another car pass the red Datsun while it was stopped at the intersection?" The subjects who received this question were given no information about the sign. For another group of subjects, the question was asked using the phrase "stop sign" in the question in place of "intersection" (the consistent information condition). A third

group of subjects were given the same question but with "yield sign" substituted (the inconsistent or misleading information condition). In a third phase of the experiment, subjects were given a two-alternative forced-choice recognition test in which they were asked which type of sign had appeared at the intersection: a yield sign or a stop sign. The results are shown in figure 10.3, where it can be seen that, relative to the neutral condition provided with no information about the sign, subjects who had been given the misleading information performed worse, whereas those given the consistent information performed better. The misleading information seemed to undermine subjects' recollections of the information they had seen, and they actually scored below chance on the test; they reported a yield sign had been in the slides rather than a stop sign. Repetitions of the misinformation create even greater distortions (Zaragoza & Mitchell, 1996). More recent experiments demonstrate the ubiquity of the phenomenon of misleading information causing errors in recollections of the original events (see Ayers & Reder, 1998, for a recent review). Many (but not all) of these interference studies can be interpreted under the source memory framework (e.g., Johnson & Raye, 1981; Johnson, Hashtroudi, & Lindsay, 1993). That is, people sometimes remember events as having occurred in one situation when they actually occurred in another context; in the previous example, people would remember the yield sign from the questionnaire as having been the sign in the original slide sequence.

Another powerful demonstration of the role of interference in producing false memories lies in the false fame experiments developed by Jacoby and his colleagues (Jacoby, Kelley, Brown, & Jasechko, 1989; Jacoby, Woloshyn, & Kelley, 1989). In this paradigm, people read a series of ordinary, nonfamous names (e.g., Lester Dillard) in a first phase and are informed that all names they read are nonfamous. In a second phase of the experiment, which is ostensibly unrelated to the previous phase, the subjects are given another set of names and asked to determine whether or not each name refers to a famous person. Some of the names in this series overlap with the nonfamous names encountered earlier (Lester Dillard, in this example, mixed in with Winston Churchill and other names that are either famous or nonfamous). The assumption is that people perform this fame judgment task partly by examining feelings of familiarity that

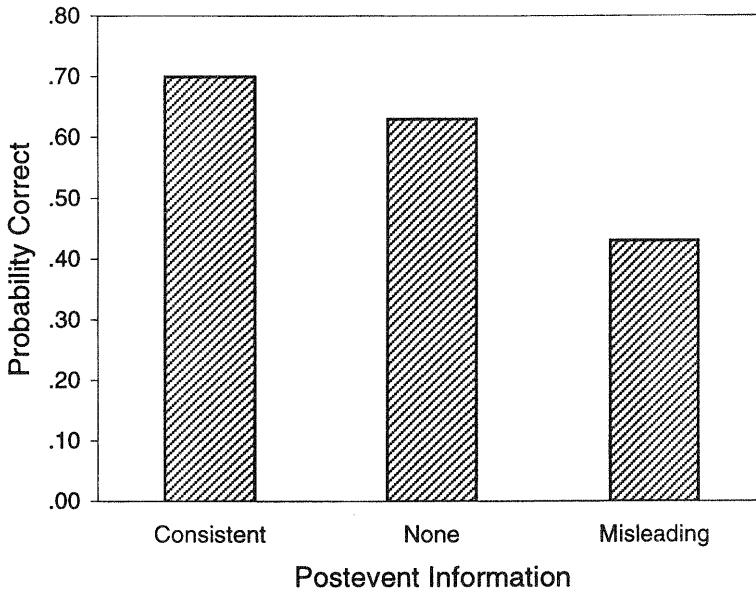


Figure 10.3 Probability correct (on a 2-alternative forced choice recognition test) as a function of whether subjects had received information consistent with what they had previously seen, information inconsistent with what had been seen, or no specific post-event information. Data from Loftus, Miller, and Burns (1978, experiment 2).

the names evoke. Therefore, if the recently encountered but nonfamous names seem familiar to subjects but are not recollected as having occurred earlier in the experimental setting, subjects may misattribute this strong feeling of familiarity as arising from fame. Consistent with these predictions, when people had read nonfamous names in a first phase, they sometimes incorrectly judged these nonfamous names to be those of famous people. The outcome in this paradigm is in some ways opposite that of the relatedness studies described in the previous section: In the false fame paradigm, researchers examine the interference exerted by a recent episode on semantic memory (fame) judgments, whereas in the relatedness studies, one observes the influence of semantic memory on memory for specific episodes.

In this section, we have reviewed some of the ways in which it has been shown that interference can induce false memories. In these cases, the interference has been external (e.g., leading questions or prior presentation of interfering information). Below we consider a related case, in which the interference is produced internally, by the rememberer. Specifi-

cally, we examine how imagination can induce false memories.

### *Imagination*

Psychologists have generally extolled the power of imagery in aiding memory. Indeed, telling people to form images in remembering verbal materials typically enhances performance, and some mnemonic devices reveal spectacular powers of imagery in promoting accurate memories. However, in these cases people form images of events that happened or that they want to remember. What if people imagine events that did not happen? Will they come to remember them as actually having happened?

Raye, Johnson, and Taylor (1980) presented words visually to subjects varying numbers of times; subjects were also induced to internally generate the words from conceptual clues (without seeing them), again for varying numbers of times. Later subjects were asked to judge the frequency of the actual occurrence (seeing, but not imagining, the words). Raye et al. (1980) found that internal generation of words inflated the frequency with which the



word was judged to have occurred. The more frequently a person had privately generated or imagined the word, the greater the inflation in estimating its frequency of actual occurrence.

Garry, Manning, Loftus, and Sherman (1996) asked subjects if they had experienced rather implausible childhood events. Garry et al. selected events that subjects believed had not occurred to them as children and later asked the subjects to vividly imagine these events. On a test given two weeks later, they once again asked subjects to rate the probability that the events had occurred in their childhood. The results showed what they termed *imagination inflation*: having imagined the occurrence of the event made subjects somewhat more likely to judge that it had previously occurred. Similar results have been reported by others (Heaps & Nash, 1999; Hyman & Pentland, 1996).

Because the studies just described used childhood events that were not under experimental control, the possibility exists that the imagining of the events reminded subjects of real events that had occurred in their childhood. If so, then the second estimate of whether the event happened might not reflect a memory illusion, but a more accurate recollection. Goff and Roediger (1998) developed a 3-phase laboratory paradigm to seek imagination inflation under controlled conditions, where this criticism is not possible. In an encoding phase subjects heard commands for action events, such as *push the toy car* or *break the toothpick*, a task widely used to study memory for actions (e.g., Engelkamp & Zimmer, 1984). Sometimes subjects performed the events as instructed, sometimes they only imagined doing so, and sometimes they just listened to the statements. In a second, imagination, phase, subjects imagined performing actions 0, 1, 3, or 5 times. Some imagined items had occurred in the encoding phase and others had not. Finally, in a test given two weeks after the first (encoding) session, subjects were asked to recognize action statements that had occurred in the first session and were also asked to judge whether they had actually performed the action, had imagined performing it, or had only listened to the statement.

The central issue in Goff and Roediger's (1998) experiments was whether repeatedly imagining an action during the second phase would lead to an inflation in recollections of having performed it in the first phase. In general, the answer was yes: the more frequently subjects had imagined performing the action,

the more likely they were both to falsely recognize the statement as having occurred in the original phase and to judge that they had actually completed an action that, in fact, they had only imagined completing. Imagination inflation was confirmed in a laboratory paradigm in which the problem of establishing what events actually had and had not occurred does not exist.

In brief, imagining events that never happened can lead people to remember them as having occurred. Just as imagining can enhance recollection of events that did happen, so can the process create memories of events that did not happen.

### *Retrieval Processes and Effects of Guessing*

Retrieval processes contribute to the development of false recollections in at least two different ways. First, the nature of the retrieval query or the retrieval cue can determine the remembrance that a person reports. As noted above, Binet's (1900) early research indicated that children tested with free recall made fewer errors than those asked suggestive questions. A clear example of the power of the type of test question is shown in a previously cited study by Loftus and Palmer (1974) on eyewitness memory. Subjects' recollections depended upon the precise wording of the question: in one condition subjects were asked "About how fast were the two cars going when they contacted each other?" Other groups of subjects saw the same videotape and were given the question, but with the verb changed to *hit*, *bumped*, *collided*, and *smashed*. The mean speed estimates for the five verbs are reported in table 10.1. The form of the retrieval query determined in part the subjects' recollection of the speed of the cars. The range from 32 to 40 miles per hour may greatly mat-

Table 10.1 The effect of leading questions on memory. Data from Loftus and Palmer (1974).

Verb	Mean Speed Estimates
Smashed	40.8
Collided	39.3
Bumped	38.1
Hit	34.0
Contacted	31.8

ter in testimony if the speed limit were, say, 30 mph.

A second way retrieval processes can lead to false recollections is through repeated retrieval attempts. Most attention in the literature has been given to how testing can facilitate retrieval of studied events (e.g., Thompson, Wenger, & Bartling, 1978), but if other (nonexperienced) events are recalled as having been experienced, their probability of later retrieval is enhanced and so is the probability that the events will be confidently remembered. The general rule seems to be that if an event is retrieved from memory (whether accurately or inaccurately), it will tend to be retrieved again more readily at a later time. Retrieval not only indexes remembered events but can also modify them (Bjork, 1975). For example, McDermott (1996) presented subjects with related lists of words, using the Deese/Roediger-McDermott paradigm discussed previously. Some subjects took an immediate free-recall test (in which both veridical and false recall were measured), whereas others did not. Two days later both groups took a free-recall test for material presented in the initial study session. Having taken the prior recall test boosted recall of list items (.17 for subjects who received the prior test relative to .04 for those who had not—the standard testing effect), and the same effect occurred for critical nonstudied items (.24 versus .12). Note that the probability of false recall in the delayed test exceeded that of veridical recall. In addition, other experiments have shown that the act of prior recall increases the probability that subjects claim they can remember the moment of occurrence of events, even when the events did not occur (Roediger & McDermott, 1995; Roediger, Jacoby & McDermott, 1996).

These same processes seem partly responsible for the findings that pseudomemories can arise during hypnosis. Although hypnosis is sometimes used by therapists and law enforcement officials attempting to aid the recall of their clients or of witnesses, research generally shows that hypnotic procedures do not produce any benefit in retrieval (Smith, 1983; Erdelyi, 1994) and may in fact induce false memories (Branier & McConkey, 1992; see also Lynn, Lock, Myers, & Payne, 1997). While under hypnosis people are typically given instructions to let their minds roam freely and to report whatever comes to mind. When people produce information under these instructions, the act of recall may make the information seem more real, and when it is retrieved again

later the person may accept the retrieved information as fact, even though it may have been produced earlier under the demands of hypnosis. Unwarranted confidence in the remembered events can also result from hypnosis (Sheehan, 1988).

Recent research shows that instructing people to guess on tests can produce results similar to those seen under hypnosis. Ackil and Zaragoza (1998) used a paradigm in which subjects watched a videotape and then were forced to answer questions about events that had never happened in the video. Subjects knowingly fabricated the details, following the experimenter's request. A week later subjects returned to have their memories tested. At this time, subjects recalled details they had generated a week previously as if the events had occurred in the videotape. Further, children were more likely to make this error than were young adults. The act of guessing about possible events causes subjects to provide their own misinformation, which they later come to retrieve as memories. Ackil and Zaragoza's (1998) study shows that this outcome can occur even without hypnosis.

### *Social Factors*

One area of inquiry that has received little investigation thus far is the influence that social factors can impose upon the memory of an individual. In a recent study of social factors on memory, which was modeled after Asch's (1956) studies on conformity in perception, Schneider and Watkins (1996) presented a list of words to pairs of subjects. One subject in each pair was a confederate. The subject's recognition response (yes/no) and confidence rating (on a 3-point scale) were influenced by the confederate's prior response. Interestingly, this bias was found to be greater for lures than for studied words, which leads to the conclusion that subjects might show greater social influence on false than on true memories.

Betz, Skowronski, and Ostrom (1996) provided converging evidence that social factors can influence veridical and false memories; further, they show that the degree of consensus among multiple confederates determines the extent to which memory distortion occurs. This outcome is similar to that in Asch's (1956) conformity paradigm in which the greater the number of confederates whose erroneous responses preceded that of the actual subject, the more likely the actual subject was to conform to the erroneous group judgment.

In some sense the experiments in the misinformation paradigm, in which people are given transcripts said to have been given by other witnesses of a stimulus event, can be thought of as demonstrations of social influences on memory, as well. This is especially true of such studies that have examined the credibility of the source providing the misleading information (Underwood & Pezdek, 1998). However, systematic studies manipulating social pressure and group consensus on false memories are just beginning to emerge.

### *Individual Differences*

The role of individual differences in susceptibility to false memories has been the topic of much recent research. Although we cannot take the space to review the evidence for the various populations here, we note some general trends that appear to be emerging from the literature.

The effects of age have been of great interest to memory researchers. In general, both young children (e.g., Ackil & Zaragoza, 1998; Poole & White, 1993) and older adults (Norman & Schacter, 1997; Balota et al., 1999) are more susceptible to memory illusions than are young adults. Within the population of younger adults, those who score high on the Dissociative Experiences Scale (a self-report measure of one's tendency to "space out") tend to be more likely to experience false memories than those scoring low on the measure (Hyman & Billings, 1998; Winograd, Peluso, & Glover, 1998).

Schacter, Verfaellie, and Pradere (1996) have found evidence that some amnesic patients seem to have "impaired" false memories. That is, when presented with associated words in the Deese/Roediger-McDermott paradigm, amnesics manifested impaired accurate recognition, accompanied by lower levels of false recognition, relative to matched controls. Schacter and his colleagues have interpreted these findings as evidence that the processes underlying false recognition overlap to a great degree with those underlying accurate recognition. Interestingly, neuroimaging studies of false memories have tended to support this conclusion (Schacter et al. 1996; Schacter, Buckner, Koutstaal, Dale, & Rosen, 1998). However, this pattern of reduced false memories does not occur in all memory-impaired populations. Norman and Schacter (1997), using the same paradigm, found that false recall

was greater in a sample of older adults than in young adults, despite the fact that memory for studied words was impaired for older adults. These results are shown in figure 10.4. Balota et al. (1999) also found a greater tendency of false memories in patients with diseases of the Alzheimer's type, as well as in older adults, relative to younger adults. Assuming similar results are obtained in other false memory paradigms, aging would seem to pull a particularly pernicious double whammy on memory: older adults are more likely to forget events that actually occurred, but more likely to remember events that did not occur.

The study of individual differences in memory distortions is relatively new, and much work remains to be done. However, from the early studies, it seems clear that some groups are more susceptible than others, and we suspect that the patterns seen across populations will inform us with respect to memory processes (both intact and as they break down).

### **False Memories Outside the Laboratory**

There are three primary arenas in which research on distorted memories has implications for issues arising outside the laboratory: eyewitness testimony for crimes, situations of possible child abuse in which children's testimony plays a critical role, and the possible delayed recovery of memories of abuse by adults. We discuss each issue in turn, albeit briefly, while providing references for fuller treatments for those interested in these applied issues.

Eyewitness testimony to crimes exerts powerful influence on a jury. If a witness can identify a person and say "That is the man who did it. I will never forget his face," most reasonable people will be persuaded that the defendant in a trial is the guilty party. However, eyewitnesses have no less fallible memories than subjects in memory experiments, and often their testimony comes under conditions known to lead to memory distortions: long delays since the event, many suggestions occurring during the interval, repeated recounting of the event (often with tacit demands to go beyond what the person remembers and to guess), and so on. The interfering effects of information introduced to the witness after an

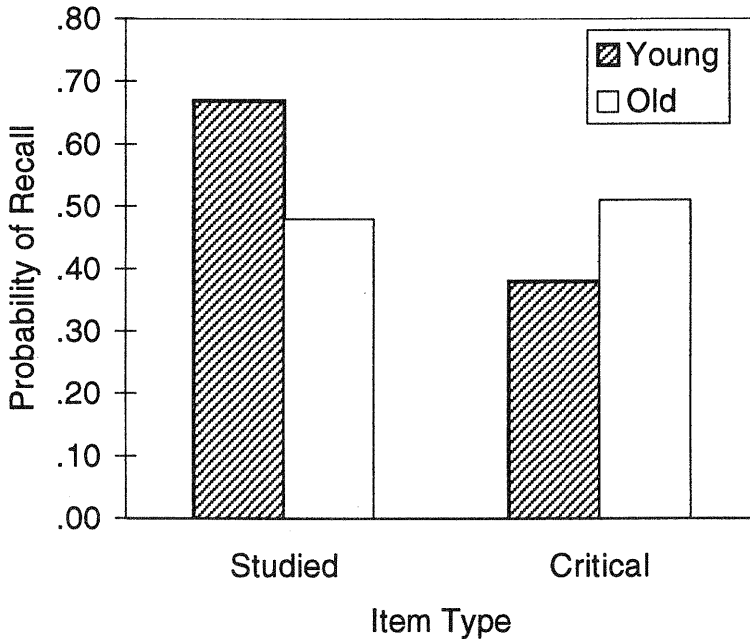


Figure 10.4 Probability of accurate recall (of studied items) and false recall (of critical nonstudied items) as a function of subject population. Data from Norman and Schacter (1997).

event can have a distorting effect, as in the misinformation experiments reported by Loftus and her associates, as well as many others. Indeed, these experiments were intended to model difficulties eyewitnesses may have in reporting on crimes. Loftus (1979) and Loftus and Ketcham (1991) air these issues more fully.

The child witness provides the judicial system with a difficult case. How well can children understand the questions presented to them? How well can they remember the events in question? Are children more suggestible than adults in response to leading questions and other forms of persuasion? These are difficult issues with which psychologists, social workers, lawyers, and judges must contend. Ceci and Bruck (1995) have reviewed the evidence at hand and, although the evidence is complex, the bottom line is that children do seem more susceptible to some forms of memory distortion (as mentioned above in the section on individual differences). In many experiments children's accurate memories for events have been shown to be less detailed than those of adults, and children also seem to be more easily misled.

A third type of case in which memory distortions must be considered is that of delayed or recovered memories of childhood abuse. Some adults, often women undergoing certain forms of psychotherapy, claim to recover horrific events of childhood sexual abuse, ones of which they had no inkling prior to the recovery of the memory. Often they remember a father, or uncle, or teacher having committed rape or other crimes; sometimes the people recovering the memories take the alleged perpetrators to court. These cases are very difficult because usually the alleged crimes were committed many years previously, and after this long delay, no physical evidence of abuse can reasonably be expected. Therefore, the entire case often hangs on the veracity of the recovered memories. However, the conditions in these cases seem particularly prone to memory errors. The retention interval is long and often the person recovering the memory has therapists and support groups recounting their own similar stories of recovered memories. Therefore, social influence processes may be at work, and often the therapeutic techniques used for memory recovery include imagination and the encouragement of guessing as to

what might have happened—factors that can lead to false memories. Loftus (1993) and Lindsay and Read (1994), among many others, have discussed the many psychological factors that can lead to the “recovery” of false memories.

## Conclusion

This chapter has provided a summary of what is known about memory distortions. At least six factors, and probably more, provide potent means of leading people to recollect events that never happened to them. False memories arise from inferences from series of related pieces of information, from interference from events surrounding the event of interest, from imagination of possible events that did not occur, from retrieval processes, and from social factors. Finally, there are individual differences in susceptibility to these memory illusions. The hope from studying memory illusions is that we can elucidate both the nature of these curious and interesting phenomena, but also shed light on processes occurring in “normal” remembering of events. In addition, the research on memory distortions has considerable implications for societal issues, particularly those of eyewitness testimony, children’s testimony, and the delayed recovery of memories of sexual abuse.

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