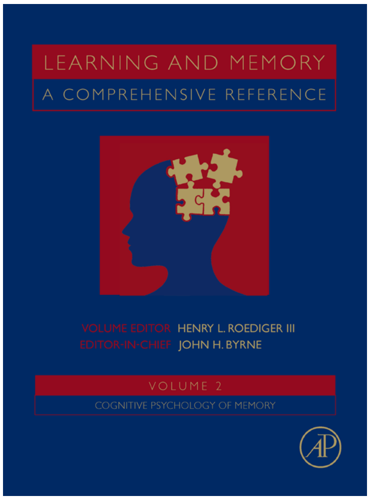

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2.14 False Memories

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Memory is impressive. People can recognize hundreds of pictures seen only once (Shepard, 1967) and recall hundreds of words in response to cues (Mäntylä, 1986). Memory's feats are not limited to short delays or to remembering simple materials in laboratory settings. People remember their high school classmates 15 years after graduation (Bahrick et al., 1975) and recall details about the German invasion of Denmark 50 years after they experienced it (Berntsen and Thomsen, 2005). This short list could easily be expanded.

And yet memory's failures can be equally impressive. For example, people's recognition memory for a penny is actually quite poor, even though they have likely handled hundreds (if not thousands) over the years (Nickerson and Adams, 1979). Similarly, the majority of people fail when asked to draw the layout of the number keys on a calculator, even though they could easily use such a device (Rinck, 1999). Memory failures are not limited to mundane objects, of course. Consider just a few examples: Parents misremember the way they raised their children (Robbins, 1963), eyewitness misidentifications occur (Wells et al., 2006), and people falsely remember being abducted by aliens (Clancy, 2005).

To understand human memory, we must understand memory's failures as well as its successes. What is more interesting than the fact that memory is fallible is that the errors are systematic. By systematic, we simply mean that the errors are not random. We understand something about the conditions under which errors are more or less likely; for example, delay is a manipulation that often increases memory errors. This systematicity occurs because errors are often byproducts of mechanisms that normally aid memory, meaning that memory errors can provide a window into the mechanisms of memory.

One of the classics in this tradition is Bartlett's 1932 study in which participants read and retold a Native American story entitled 'The War of the Ghosts.' When participants retold the story, they made systematic errors. They changed the unfamiliar Native American tale so that it made more sense to them and so that it fit better with their English culture. For example, in the retellings 'canoe' became 'boat' and the more supernatural parts of the story either disappeared or changed to be more consistent with a typical English story.

Bartlett concluded that our memories are reconstructive. We do not recall exactly what happened; rather, we reconstruct events using our knowledge, culture, and prior beliefs about what must have occurred. In other words, we use schemas to help reconstruct our memories. A schema is a knowledge structure that organizes what one knows and expects about some aspect of the world. Schemas are useful heuristics that allow us to fill in the gaps and to make predictions. Bartlett's participants possessed a schema about what happens in a typical story and they used this schema to reconstruct the atypical story that they had read.

Bartlett's ideas about reconstructive memory and the influence of one's prior knowledge have been modified only slightly through the years and are still thought to be the backbone of how our memory functions. Schemas have been repeatedly shown to have large effects on later memory. For example, consider a classic study in which participants read short passages, including one about an unruly child.

When told that the story was about Helen Keller, participants later falsely recognized sentences such as 'She was deaf, dumb, and blind.' When the protagonist was labeled as Carol Harris, however, participants rarely falsely recognized the same sentences (Dooling and Christiaansen, 1977). The familiar label presumably activated participants' prior knowledge of Helen Keller, which participants used to make sense of the passage and to fill in gaps in the story. One's schema of Helen Keller, for example, might include information about her childhood in Alabama and her disabilities, as well as how she blossomed into a successful speaker and writer with the help of her teacher Anne Sullivan. While this background knowledge is likely to aid comprehension of the passage, it also sets up the need to later discriminate between what was read in the passage versus what was inferred.

Schemas provide one example of a memory mechanism that can both help and hurt memory. Most of the time, schemas support accurate memory; however, in some instances (such as the Helen Keller example), they can lead us astray. In this chapter, we will consider several different memory mechanisms that, like schemas, can sometimes lead our memories astray. We will focus on memory errors that meet Roediger's (1996) definition of memory illusions. Specifically, the focus will be on "cases in which a rememberer's report of a past event seriously deviates from the event's actual occurrence" (Roediger, 1996: 76). We will place a particular emphasis on memory errors that are made with high confidence, are labeled as remembered, or otherwise appear phenomenologically real. To preview a few of the vivid memory errors we will discuss: they include high-confidence errors in eyewitness testimony, never-presented words 'remembered' as spoken by a specific person, and ease of processing mistaken for fame. In each case, we will describe a prototypical experiment and the results and discuss possible underlying mechanisms.

2.14.1 False Memory for Words: The Deese-Roediger-McDermott Paradigm

As already described, Bartlett emphasized the use of meaningful materials when examining reconstructive memory, to avoid studying memory that was "primarily or literally reduplicative, or reproductive . . . I discarded nonsense material because, among other difficulties, its use almost always weights the evidence in favor of mere rote recapitulation, and for the most part I used exactly the type of material that we have to deal with in daily life" (Bartlett, 1932: 204). Consistent with Bartlett's ideas, most of the studies we will describe in this chapter involve remembering videos, stories, slide shows, or personal memories. While words and nonsense syllables were frequently used in verbal learning experiments, Bartlett did not believe they would be useful in studying reconstructive memory since they did not encourage elaboration nor the use of schemas.

However, words have many properties that make them handy tools for the experimental psychologist. Tulving (1983) has made this argument eloquently: "words to the memory researcher are what fruit flies are to the geneticist: a convenient medium through which the phenomena and processes of interest can be explored and elucidated... words are of no more intrinsic interest to the student of memory than *Drosophila* are to a scientist probing the mechanisms of heredity" (Tulving, 1983: 146). Tulving goes on to point out that words have well-defined boundaries and are easily perceived, and that memories for words can easily be checked for accuracy. The point is that using word stimuli to study false memories would be very useful, if word stimuli could be selected that would encourage elaboration and the use of schemas. The argument is that the Deese-Roediger-McDermott (DRM) stimuli fit these requirements, and allow a simple and robust paradigm for studying false memories.

In a typical DRM experiment, participants learn lists of words, each related to a central non-presented word, the critical lure. For example, participants hear or see 'nurse, sick, lawyer, medicine, health, hospital, dentist, physician, ill, patient, office, stethoscope, surgeon, clinic, cure.' Even though the critical lure 'doctor' was never presented, subjects are likely to include it when recalling the list items. They are also likely to incorrectly call it 'old' on a recognition memory test. The DRM paradigm appeals to experimenters because of the incredibly high rates of false memories observed in both free recall and on recognition measures. For example, in one of Roediger and McDermott's (1995) experiments, participants recalled the critical lures 55% of the time, a rate similar to recall of studied items presented in the middle of the list! False recognition was also very robust; Roediger and McDermott observed a false alarm rate of 76.5% for critical lures as compared to a hit rate of 72% for studied items. Similarly high levels of false memories have been observed in dozens, likely hundreds, of experiments using this methodology.

Not only are DRM errors frequent, they are also phenomenologically compelling to the rememberer. Roediger and McDermott asked participants to label each word called 'old' as either 'remembered' or 'known.' 'Remembering' was defined as vividly recollecting details associated with a word's presentation (e.g., where it occurred on the list, what it sounded like, what one was thinking during its presentation), whereas 'knowing' meant simply knowing a word had been presented even though one could not recall the details of its presentation. As shown in **Figure 1**, the proportion of remember and know responses was very similar for the studied words and for the critical lures (Roediger and McDermott, 1995). That is, people were just as likely to claim they remembered the critical nonpresented lures as the studied words. People will also describe their false memories in some detail, attributing them to locations in the study list (Read, 1996) and to a particular speaker (Payne et al., 1996). They are also willing to estimate how frequently they rehearsed each false memory (Brown et al., 2000). In general, the false memory effect is very robust, persisting even when participants have been forewarned about the nature of the illusion (McDermott and Roediger, 1998).

Given the strength of the illusion, it is intriguing that not all lists of related words yield false memories (Deese, 1959; Gallo and Roediger, 2002). Listening to 'sour, candy, sugar, bitter, good, taste, tooth, nice, honey, soda, chocolate, heart, cake, tart, pie' is likely to yield a false memory for 'sweet,' whereas listening to 'sweet, sour, taste, chocolate, rice, cold, lemon, angry, hard, mad, acid, almonds, herbs, grape, fruit' is very unlikely to yield a false memory for the critical lure 'bitter.' Both lists were constructed from the same free-association norms, but only one yields high levels of false memories. A key difference between the lists involves backward associative strength (BAS); this is a measure of how likely the list items are to elicit the critical item in a free association task. In other words, BAS measures how likely participants are to report the critical lure as the first word that comes to mind in response to list items. Participants are likely to respond 'sweet' but not 'bitter' in response to words like 'sugar, sour, taste,' meaning that BAS is very high for 'sweet' but very low for 'bitter.' This difference is crucial; BAS is a major predictor of false recall ($r = 0.73$, Roediger et al., 2001b).

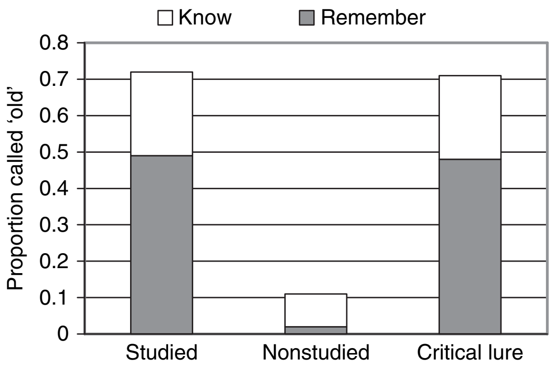

Figure 1 Recognition results for studied items and critical lures. Data from Roediger HL III and McDermott KB (1995) Creating false memories: Remembering words not presented in lists. *J. Exp. Psychol. Learn. Mem. Cogn.* 21: 803–814, Experiment 2.

In the activation monitoring framework's explanation of the DRM illusion, activation at encoding spreads through a preexisting semantic network of words, and the source of this activation is monitored at test. Hearing 'sour, candy, sugar' in the study list activates those nodes in the network. This activation spreads through the network (Collins and Loftus, 1975), activating related nodes. Because the critical lure is associated with so many study items (as indicated by its BAS value), it is activated from many different directions, leading to its heightened activation. If the participant fails to correctly monitor the source of that activation, a false memory will result.

According to the activation monitoring framework, manipulations that increase the amount of activation spreading to the critical lure should result in higher rates of false memories. Consistent with this, false memories increase as the study list increases in length, as longer lists mean that activation from a greater number of words spreads to the critical lure (Robinson and Roediger, 1997). Similarly, activation can spread from phonological associates. Listening to a list of words like 'bite, fight, rut, sprite, slight, rye' yields false memories for phonologically related nonpresented words such as 'right' (Sommers and Lewis, 1999). Intriguingly, lists that combine phonological and semantic associates (e.g., 'bed, rest, awake, tired, dream, scrub, weep, wane, keep') led to even higher rates of false memories than did purely semantic or purely phonological lists (Watson et al., 2003).

Activation alone cannot, however, explain all of the data. An interesting experiment on the effects of presentation rate highlights the need for both activation and monitoring components. McDermott and Watson (2001) presented DRM lists at five different presentation rates: 20, 250, 1000, 3000, and 5000 ms per word. As expected, veridical recall of list items increased with longer presentation rates. More interesting were the false recall data. When the presentation rate increased from 20 to 250 ms, false recall increased from 0.14 to 0.31. However, when the presentation rate was further increased, the rate of false memories decreased, from 0.22 at 1000 ms to 0.14 at 3000 or 5000 ms. The argument is that semantic activation is increasing as the presentation rate increases, hence the jump in false memories observed at 250 ms. However, with the longer presentation rates, participants encode more information about studied words, allowing them to invoke monitoring strategies during retrieval that help them to judge the source of the activation.

Monitoring is necessary to explain other DRM data, such as the finding that on average older adults remember fewer studied words but falsely remember just as many critical lures (or even more) as do college students (e.g., Balota et al., 1999). That is, because older adults have relatively preserved semantic memory, there should not be age differences in the activation of the critical lure. Rather, what is affected is the ability to monitor the source of activation, as older adults typically have difficulty on source-monitoring tasks (Hashtroudi et al., 1989). More direct support for the monitoring explanation comes from a study linking the age effect to problems with frontal functioning (Butler et al., 2004). In this study, older adults were classified as high versus low functioning on tasks known to require frontal functioning (e.g., the Wisconsin card sort task). Importantly, older adults who scored high on frontal tasks performed similarly to young adults in a typical DRM paradigm. Only older adults who scored poorly on frontal tasks showed reduced true recall and increased false recall. Because frontal areas are often implicated in monitoring tasks (e.g., Raz, 2000), these data suggest it is monitoring ability, not age, that is critical for avoiding false memories.

Even young adults can be placed in situations that make monitoring difficult, forcing them to rely on activation. Consider Benjamin's (2001) study in which he repeatedly presented the DRM lists. Young adults were less likely to incorrectly endorse critical lures from lists presented three times, presumably because they were able to monitor the source of that activation. However, when participants were required to respond quickly at test, they falsely recognized more critical lures from the lists presented three times. Repeating the list presumably increased the activation of the critical lures. When time was plentiful during the recognition test, participants used monitoring processes to correctly attribute the source of the activation (and thus reduce, but not eliminate, the illusion). When retrieval time was short, monitoring was not possible, and the increased activation resulted in high false alarm rates (see also Marsh and Dolan, 2007).

The distinctiveness heuristic is one monitoring strategy that has been investigated in detail. Schacter and colleagues defined the distinctiveness heuristic as "a mode of responding based on participants' metamemorial awareness that true recognition of studied items should include recollection of distinctive details" (Schacter et al., 1999: 3). Anything that makes DRM stimuli more distinctive should increase participants' standards for what they consider to be old. Thus, picture lists yield lower rates of false memories than do word lists (Israel and Schacter, 1997), and pronouncing and hearing the words at study lowers the false alarm rate as compared to only hearing the words (Dodson and Schacter, 2001).

Activation monitoring is the preferred explanation of many researchers, but certainly not all. Other explanations share in common a mechanism for the lures being encoded, and then a monitoring function at test. For example, fuzzy trace theory (Brainerd and Reyna, 2002) proposes that both verbatim and gist traces are encoded for events. Verbatim traces reflect memories of individual events, while gist traces reflect the extraction of meaning across experienced events. During the presentation of a DRM list, verbatim traces would be encoded for the individual words, while at the same time the meaning of the entire list would be extracted and encoded into a gist memory. Later, retrieval of the gist trace could drive false memory effects.

We turn now from false memories of never-presented words to errors when remembering events such as crimes or traffic accidents. More important than the switch in what is being remembered, though, is that different memory mechanisms likely underlie the two types of errors.

2.14.2 Eyewitness Suggestibility: The Misinformation Paradigm

Psychologists have long been interested in the reliability of witnesses. Early in the twentieth century, researchers such as Hugo Münsterberg and William Stern were publishing on the unreliability of testimony. The major methodological breakthrough in this area, though, did not appear until the 1970s when Elizabeth Loftus published her seminal work. She developed the misinformation paradigm (also known as the post-event information paradigm) that involves a twist on the basic retroactive interference paradigms that were popular during the verbal learning era (McGeoch, 1932). In retroactive interference studies, researchers examine the effect of a second, interfering event on memory for an original event (as compared to a control group that was not exposed to the interference). The typical design is shown in the top part of **Table 1**. In verbal learning terms, all participants study paired associates A – B in the first phase of the experiment (e.g., Table – Radio). Next, participants in the experimental group learn A – D associations (e.g., Table – Pencil), whereas participants in the control group rest or learn C – D (e.g., Purse – Pencil). Finally, all participants are tested on A – B (e.g., Table – ?), and memory is poorer in the group that learned two different associations in response to A. What does this have to do with eyewitness memory? The bottom portion of **Table 1** shows the connection between the standard retroactive interference design and eyewitness memory. The witness views an event (A – B), such as a traffic accident (A) occurring near a stop sign (B). After the event, the police will repeatedly interview the witness, the newspaper will publish accounts of the crime, and the witness will talk about the event with other people. All these have the potential to provide interfering information. For example, the police might erroneously suggest that the accident (A) occurred near a yield sign (D) when really it occurred near a stop sign (B). Later, when the witness tries to remember the details of the original event (A – ?), he or she may recall the interfering misinformation instead of what was actually witnessed. In contrast, misinformation production would be low for subjects in a control condition who heard a neutral reference to a traffic sign.

One of the most classic laboratory demonstrations comes from Loftus et al. (1978; see also Loftus and Palmer, 1974). All participants viewed a slide show depicting a traffic accident; in the critical slide, a red Datsun was approaching an intersection with a traffic sign. One-half of participants saw a stop sign; the other participants saw exactly the same slide except that the intersection was marked with a yield sign. After seeing the slides, all participants answered a series of questions about the accident. Embedded in one of the questions was a reference to the traffic sign; half of participants were asked 'Did another car pass the red Datsun while it was stopped at the stop sign?' whereas the others answered 'Did another car pass the red Datsun while it was stopped at the yield sign?' Twenty minutes later, participants examined pairs of slides and determined which one had been presented in the original slide show. The critical pair required participants to pick between the Datsun at a stop sign versus a yield sign. When participants had answered the question containing misinformation, they selected the correct slide 41% of the time (below chance), as compared to 75% when the question had referred to the correct sign.

Numerous studies have since replicated the basic finding: Information presented after an event can change what the eyewitness remembers. The original event may take the form of a film, slide show, staged event, written story, or a real event. The misinformation may be delivered in the form of presuppositions in questions, suggestive statements, photographs (e.g., mugshots), or narrative summaries. It can come from the experimenter, a confederate, or the witness herself. The misinformation effect qualifies as a false

Table 1 Experimental designs for studying retroactive interference (RI) and eyewitness suggestibility

	Condition	*Study target (A – B)*	*Interference (A – D) or (C – D)*	*Test target (A – B)*
RI				
	Experimental	Table – Radio	Table – Pencil	Table – ?
	Control	Table – Radio	Purse – Pencil	Table – ?
Eyewitness				
	Misled	Accident – Stop sign	Accident – Yield sign	Accident – ?
	Control	Accident – Stop sign	Accident – Traffic sign	Accident – ?

memory since participants generally endorse the misinformation quickly and with high confidence (Loftus et al., 1989). When participants described their erroneous memories, undergraduate judges were at chance at differentiating between real and suggested memories (Schooler et al., 1986).

One prerequisite for suggestibility is that participants fail to notice any problem with the misinformation when it is presented. This is called the discrepancy detection principle (Loftus, 1992). Participants are more likely to accept and reproduce misinformation about peripheral details than central characters or details (e.g., Christianson, 1992). In contrast, blatant misinformation not only is rejected, it also increases resistance to other peripheral misinformation (Loftus, 1979). Blatant misinformation may serve as a warning that the source is not to be trusted. This would be consistent with findings that warnings given before encoding of misinformation successfully reduce suggestibility, probably because warned participants read more slowly as they search for errors (Greene et al., 1982). In general, slow readers are more likely to notice (and resist) misinformation (Tousignant et al., 1986).

Given that participants do not detect the misinformation, manipulations that are generally known to enhance remembering lead to increased suggestibility, presumably because they increase memory for the misinformation. For example, suggestibility is greater if participants generate the misinformation (Roediger et al., 1996) and if the misinformation is repeated (Mitchell and Zaragoza, 1996; Zaragoza and Mitchell, 1996). Participants may also be more likely to rely on the misinformation if they have poor memory for the original events. For example, dividing attention during study (but not during the post-event information phase) increases suggestibility (Lane, 2006).

One important question is what happens to the original memory. It is easy to imagine the practical implications: If the original and post-event misinformation coexist in memory, it suggests the usefulness of developing strategies to help witnesses retrieve the original event. However, if the misinformation overwrites the original memory, it suggests that no retrieval strategy will allow access to the original event. Originally, there was much debate over this issue, but several lines of evidence suggest that the two memories may coexist. For example, consider what happens when misled participants are allowed to make a second guess after producing misinformation. If the original memories were completely unavailable, second-chance responses should be at chance (as what would they be based on?). Instead, second-chance guesses of misled participants are above chance (Wright et al., 1996), suggesting that some information about the original event is still available.

Compelling data for the coexistence hypothesis comes from experiments using source monitoring tests rather than recognition tests. Typically, in the 1970s and 1980s participants were required to make 'old/new' judgments about items. However, an 'old' judgment does not necessarily imply that participants remember seeing the misinformation in the original event. For example, participants may remember reading the misinformation in a post-event narrative and assume that remembering it from the narrative means it must have been in the video as well. To test these ideas, Lindsay and Johnson (1989) compared two groups of participants, all of whom studied the same photograph of an office. Afterward, half of participants read a narrative that mentioned eight office-related objects that were not actually in the original picture. Control participants read an accurate narrative description of the scene. The novel manipulation was at test; half of participants took a standard 'yes/no' recognition test, and half took a source monitoring test. For each item on the recognition test, participants indicated 'yes' if the object had been in the photograph and 'no' if it had not. On the source test, participants indicated whether each test object had been only in the picture, only in the text, in both the picture and the text, or in neither the picture nor the text. The results were dramatic: The misinformation effect was eliminated in the source condition! In later experiments, the advantage of the source test was replicated, although suggestibility was reduced rather than completely eliminated (Zaragoza and Lane, 1994).

Recent research on the misinformation effect has moved from the debate about the fate of the original memory trace to other interesting questions. One current trend is the examination of the effects of social context on suggestibility. This includes both the social context in which participants are exposed to misinformation, as well as the social context in which participants first intrude errors. For example, researchers are examining the effects of receiving misinformation from other people as opposed to reading it in narratives or embedded in questions (e.g., Roediger et al., 2001a; Gabbert et al., 2004; Wright et al., 2005). A related question involves the response the witness receives from other people after she (the witness) makes a mistake. The question of how feedback affects a witness' memory is an important one, as incorrectly telling the witness 'Good, you identified the suspect' can have many negative consequences (see Douglass and Steblay, 2006, for a review; *See* Chapter 2.44).

2.14.3 Verbal Overshadowing

Rehearsal (especially elaborative rehearsal) can be a useful mnemonic for remembering word lists and prose. But what happens when a rehearsal fails to adequately capture the original experience? For example, words rarely capture the richness of our perceptions. What are the memorial consequences of a description (a rehearsal of sorts) that is inadequate or even inaccurate?

Questions about the effects of language and memory are not new ones. Many undergraduates are familiar with a classic study in which labels influenced memory for pictures. A picture of two circles joined by a line was labeled as either 'glasses' or 'barbell,' and participants later redrew the pictures to be similar to the label (Carmichael et al., 1932). In the 1970s, there was much interest in how participants integrated verbal and visual information in memory (e.g., Pezdek, 1977; Gentner and Loftus, 1979). Depending on the study, opposite conclusions were reached. Sometimes labeling pictures and objects led to enhanced memory (e.g., Santa and Ranken, 1972), but other times labeling was associated with difficulty on later memory tests (e.g., Gentner and Loftus, 1979).

More recently, Schooler and Engstler-Schooler (1990) sparked interest in the question by contextualizing it within the eyewitness memory domain. After watching a 30-s video of a bank robbery, participants in their Face Verbalization condition wrote a description of the thief's face (participants in the control condition did an unrelated task during that time). At test, all participants saw eight similar faces (including the thief) and were asked to select the perpetrator from the video or to indicate if he was absent from the line-up. The intriguing finding was that 64% of control participants selected the target, as compared to 37% in the face verbalization condition. Schooler and Engstler-Schooler labeled their finding verbal overshadowing.

Verbal overshadowing is not limited to faces; it extends to other types of perceptual information. Describing a voice reduces the ability to later identify that voice from among six options (Perfect et al., 2002). The typical wine drinker shows verbal overshadowing for wines, as they are unable to verbalize the nuances of wine in the vocabulary of experts (Melcher and Schooler, 1996). After memorizing a map of a small town, participants who wrote about it later performed worse on distance estimation tasks than did control participants (Fiore and Schooler, 2002). That is, having described one's spatial mental model of the town led to confusion about the distances between the landmarks.

Several different explanations have been proposed. One possibility involves recoding (*See* Chapter 2.07). Specifically, when participants describe a visual stimulus from memory, they are effectively recoding it from a visual representation to a verbal one, and the more recent recoded memory then interferes with the original visual memory. Consistent with an interference account, inserting a delay between the description and the final test reduces verbal overshadowing (Finger and Pezdek, 1999), in the same way that a delayed test can reduce retrieval blocking in other interference situations (e.g., Choi and Smith, 2005).

The recoding account would predict that the quality of the new verbal representation (as measured by the description) should predict the effects of verbalization on later memory tasks. Although Schooler and Engstler-Schooler (1990) did not find a relationship between the quality of the descriptions and the ability to recognize the perpetrator, this may be because of the way the descriptions were scored. Descriptions were considered better if they described more features of the target; however, this dependent measure is not ideal, as face recognition depends on configural information rather than on recognition of individual features (e.g., Diamond and Carey, 1986). That is, while people may only be able to verbalize individual facial features (e.g., she has big eyes and she has freckles on her nose), face recognition depends upon hard-to-verbalize configural information about the relationship of features to one another (e.g., the relationship between the eyes and the nose).

Support for the recoding hypothesis comes from a meta-analysis of the literature about the type of instructions given to witnesses. Meissner and Brigham (2001) coded each study's instructions to participants as either standard or elaborative. Instructions were considered elaborative if "the authors explicitly encouraged their participants to go beyond their normal criterion of free recall and to provide more elaborative descriptions" (Meissner and Brigham, 2001: 607). Presumably, elaborative descriptions led to less accurate recodings; consistent with this, elaborative descriptions were more likely to lead to verbal overshadowing than were descriptions resulting from standard free recall instructions (Meissner and Brigham, 2001). One study published since the meta-analysis deserves mention here. MacLin (2002) compared the effects of several different types of instructions on the verbal overshadowing effect. When participants were told to describe facial features, the standard effect occurred: On a later test, participants were less likely to identify the target than were control participants who did not describe the target. However, when participants were told to write a description comparing the target to a famous person such as Julia Roberts (the exemplar condition), verbal overshadowing was reduced. The effect disappeared in a prototype condition in which participants described "what type of person you think he most looks like" (MacLin, 2002: 932) in terms of occupation and personality. Thus, verbal overshadowing was most likely in the condition in which recoding emphasized facial features rather than more holistic information about the target face.

A second explanation of verbal overshadowing also hinges on the fact that descriptions often emphasize individual facial features rather than configural information. However, rather than proposing that a feature-based description interferes with retrieval of the original memory, the argument is that verbalization induces a processing shift at test (Dodson et al., 1997; Schooler, 2002). That is, because descriptions of faces emphasize individual features (as it is hard to verbalize relations between features), the participant carries over this type of processing to test. This is considered a processing shift, as face identification is normally based on configural information rather than features; carrying over a featural orientation would constitute inappropriate processing. One interesting finding is shown in **Figure 2**. Dodson and colleagues had participants view a target face and then do one of three tasks: Describe the target face, describe a parent's face, or list U.S. states and capitals (a control condition). As shown in the figure, describing any face (e.g., a relative's) reduced participants' ability to identify the target (Dodson et al., 1997). This is hard to reconcile with the idea that a recoded representation (of the target) is interfering with access to the original memory. Rather, it suggests that anything that emphasizes featural processing will encourage that same type of processing at test.

Similar conclusions were reached by Finger (2002), who added a second factor to the typical verbal overshadowing experiment. She crossed description (describe vs. control) with a post-description task (verbal vs. mazes). When solving mazes followed the face description, verbal overshadowing disappeared. In a second experiment, Finger replicated the effect with a second nonverbal task, namely listening to music. Engaging in holistic processing can change the processing set from one that emphasizes individual features to one that does not, with consequences for face identification.

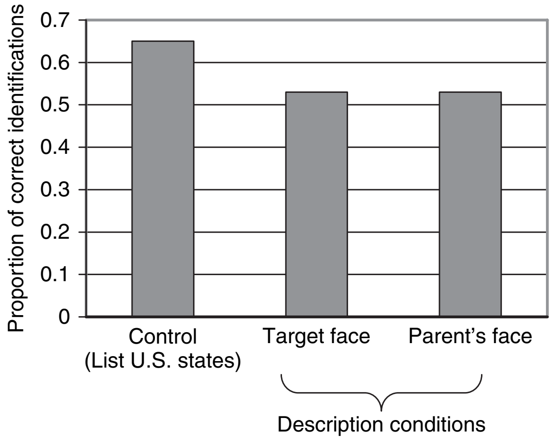

Figure 2 Recognition of target face after describing target face, parent's face, or listing U.S. states and capitals. Data from Dodson CS, Johnson MK, and Schooler JW (1997) The verbal overshadowing effect: Why descriptions impair face recognition. *Mem. Cogn.* 25: 129–139, Experiment 2.

Recent research suggests a number of relatively simple solutions to minimize the effects of verbal overshadowing of faces, such as inserting a delay between description and test (Finger and Pezdek, 1999) and preceding the test with a task that encourages configural processing (Finger, 2002). It remains to be tested whether these solutions are equally effective at reducing verbal overshadowing of other types of perceptual stimuli such as voices, wines, and maps.

2.14.4 Misattributions of Familiarity

Thus far, we have discussed misremembering laboratory events – be it misremembering a word that was never presented in a study list (in the DRM paradigm), incorrectly recalling a detail of a slide show (in the misinformation paradigm), or misidentifying a person from a video (in verbal overshadowing experiments). In contrast, in the next paradigm we will review, the memory error involves misattributing something learned in the laboratory to pre-experimental experience. More specifically, the paradigm is a recipe for fame; Larry Jacoby used straightforward experimental manipulations to make ordinary names appear famous.

The names Brad Pitt, Mark McGwire, and Sandra Day O'Connor are likely recognizable to you. In addition to agreeing that you have heard of these people before, you can probably justify your response by telling us Brad Pitt is an actor, Mark McGwire is an athlete, and Sandra Day O'Connor is a retired Supreme Court justice. You can also tell me whether or not other names are the names of famous people, even if you cannot say exactly why each person is famous. For example, try to identify the three famous people in the following list of six names: Zoe Flores, Minnie Pearl, Jessica Lynch, Joanna Emmons, Summer Foster, Hattie Caraway. Hopefully, at least one or two of the names will seem familiar to you, even if you do not know what accomplishments to associate with each name. Quite simply, the false fame paradigm increases the familiarity of nonfamous names (like Zoe Flores, Joanna Emmons, and Summer Foster) and places the respondent in a situation where familiarity is interpreted as fame.

In the typical paradigm, participants read a list of names explicitly labeled as nonfamous. In a second phase, participants judge the fame of each of a series of names; the test list includes moderately famous names like Minnie Pearl, new nonfamous names, and old nonfamous names that were read in the first part of the experiment. Critically, half of the participants are required to do a secondary task (e.g., monitoring an auditory stream of numbers for a series of three odd numbers in a row) at the same time as the fame judgment task. In the full-attention (control) condition, old nonfamous names are less likely to be judged famous than are new nonfamous names; in this condition, if participants can remember a name is old, then they can assume it is not famous. In contrast, in the divided-attention condition, participants are more likely to call old nonfamous names famous ($M = 0.28$) than new nonfamous names ($M = 0.14$) (Jacoby et al., 1989b). The logic is that under divided attention, participants are forced to base their judgments on the familiarity of a name, and that the cognitive load interferes with their ability to recollect whether names were presented in the first part of the experiment.

The false fame effect requires conditions that force participants to rely on familiarity rather than recollecting information about the names. For example, the false fame effect also occurs when attention is divided during encoding, as presumably that prevents encoding of item-specific information (Jacoby et al., 1989a). Similarly, under conditions of full attention, the illusion requires a delay between study of the nonfamous names and the fame judgments. Consistent with the idea that the false fame effect is familiarity driven, the effect is stronger in populations that are more likely to rely on familiarity, such as older adults (Bartlett et al., 1991; Multhaup, 1995).

This illusion is related to a more general framework on how people interpret feelings of familiarity. Vague feelings of familiarity are not specific to names; there are many situations in which familiarity is experienced and the perceiver must attribute that familiarity to something. In an impressive series of studies, Jacoby has shown that how that familiarity is interpreted depends on the experimental context. Familiarity can be interpreted as fame, but it can also lead to illusions of duration and noise level, for example. At test, previously studied words are judged to be presented longer than are new words (Witherspoon and Allan, 1985) and background noise is judged to be quieter for old sentences than for new sentences (Jacoby et al., 1988). The familiarity of the items causes them to be processed fluently, and in the context of perceptual judgments, this fluent processing is interpreted as perceptual conditions that aid identification of the items.

Familiarity may also play a role in the déjà vu experience (Brown, 2003, 2004). In the prior examples in this section, familiarity was successfully attributed to a source, albeit incorrectly: Familiarity was misinterpreted as fame and longer presentation durations, among other things. In contrast, déjà vu occurs when something feels familiar but the familiarity cannot be attributed to any prior experience. It is this unexplained familiarity with a situation that yields the puzzling déjà vu reaction. One hypothesis is that the individual previously experienced all or part of the present situation or setting, but cannot explicitly remember it. Thus implicit memory yields a familiarity response that is puzzling given the lack of episodic memory. Because déjà vu is a relatively infrequent phenomenon (Brown, 2003, 2004), it is difficult to capture in the laboratory. Some support for the implicit memory hypothesis, however, has been found in a laboratory paradigm (Brown and Marsh, in press). In this study, students from Duke University and Southern Methodist University viewed photos of the away campus in an initial exposure phase (none of these students reported having visited the other campus in real life). During the initial session, participants made a simple perceptual judgment about each of 216 photos, which included the target away-campus photos as well as many filler photos. One week later, participants made judgments about whether or not they had visited each of a series of test photos. Critically, in addition to familiar places from their home campus, participants judged photos from the prior session. Prior exposure to away-campus scenes boosted participants' beliefs that they had visited the places in real life. Intriguingly, almost half of participants reported experiencing something like déjà vu in the study. In this case, familiarity with a scene influenced belief that the place had been visited in real life, and sometimes this familiarity was puzzling enough to be labeled as déjà vu (*See* Chapter 2.21).

In this section, we described how familiarity could be interpreted as fame as well as perceptual attributes such as the volume of noise. In the next section, we will consider whether familiarity with an event can increase people's beliefs that an event happened in their pasts.

2.14.5 Imagination Inflation

The relationship between imagery and perception has a long intellectual history, reaching back to philosophers such as Hume and Mills. In the 1970s, the key question involved the nature of the representation underlying images. In this context, Johnson and colleagues asked how we separate memories for images from memories based on perception. More generally, reality monitoring involves deciding whether a memory originated from an internal or external source, with internal sources being cognitive processes such as imagery, thought, and dreams. Johnson argued that internally generated and externally presented memories tend to differ in prototypical ways, and that these differences in qualitative characteristics were the basis for attributing memories to thought versus perception (e.g., Johnson and Raye, 1981). Compared to memories based on perception, memories of images were postulated to be less vivid and to be associated with the cognitive operations involved in their generation. Reality monitoring errors occur when memories contain characteristics atypical of their class. For example, easily generated images are more likely to be misattributed to perception than are difficult-to-imagine objects. Easily generated images are likely atypically vivid; in addition, their easy generation means they are not associated with a record of cognitive operations (Finke et al., 1988).

Misattributions of imagined events to perception have been documented with many different kinds of stimuli, including imagined voices (Johnson et al., 1988), imagined rotations of alphanumeric characters (Kahan and Johnson, 1990), and imagined pictures (Johnson et al., 1982). But can imagery cause confusions beyond these types of simple laboratory stimuli? That is, if you imagine an event, will you later come to believe that it really happened?

Garry and colleagues (1996) created a three-stage procedure to answer this question. In the first part of the experiment, participants rated the likelihood that they had experienced each of a series of life experiences (the Life Events Inventory; LEI), including winning a stuffed animal at a fair and breaking a window with one's hand. Two weeks after reading descriptions of the target events, participants imagined both the setting and the action of events in response to specific prompts. For example, in the broken window event, participants spent 20–60 s imagining the following setting: "It is after school and you are playing in the house. You hear a strange noise outside, so you run to the window to see what made the noise. As you are running, your feet catch on something and you trip and fall" (Garry et al., 1996: 210). After the imagination phase was finished, the experimenter pretended to have lost the original LEI and asked participants to fill out the questionnaire for a second time.

There were eight critical events judged unlikely to have occurred for a majority of the participants, and each participant imagined four of those during phase 2. Of interest was whether participants were more likely to change their beliefs about events they had imagined in phase 2, as compared to the control events not imagined. Garry et al. examined the percentage of critical items that were rated as more likely to have happened at time 2 (after the imagery phase) than at time 1. Increases in likelihood ratings were more common for imagined events than for control events. For example, consider the effect of imagining on people's beliefs that as a child they broke a window with their bare hand. The likelihood ratings increased from time 1 to time 2 for 24% of participants in the imagery condition, as compared to only 12% of control participants.

It is possible, of course, that participants had actually experienced these unusual events and that imagining them helped to cue the previously forgotten memories. One solution to this criticism is to control the original events in the laboratory, to allow certainty about what actually occurred. Because this is not possible with childhood memories, Goff and Roediger (1998) brought the encoding phase into the laboratory. The experiment had three sessions; during the first session, participants enacted, heard, or imagined simple events. For example, when the experimenter read aloud the sentence 'bounce the ball,' one participant would simply listen; another would imagine bouncing the ball, and a third would actually bounce the ball. Twenty-four hours later, participants returned for a second session in which half of participants imagined events and half did math problems. In the imagery condition, participants were guided to imagine each event zero, one, three, or five times; the events included ones from the first session as well as completely new events. Participants in this condition rated the vividness of each image. Finally, 2 weeks after the initial session, participants were given recognition and source monitoring tests. Participants were explicitly told that their memory was being tested for the first day only. They were first asked if they remembered hearing certain events. If they answered no, they gave a confidence rating in their answer. If they answered yes, they specified the format of the remembered event (heard and enacted, heard and imagined, or heard only) and rated their confidence in that judgment. Of interest was whether imagining new events in session 2 would increase beliefs that the events had been performed in session 1. Replicating findings from studies using LEI measures, Goff and Roediger found that events that were only imagined during the second session were later misremembered as having been performed during the first session. Imagining a bouncing ball in the second session increased participants' beliefs that they had actually bounced a ball in the first session. Furthermore, as the number of imaginings in session 2 increased, participants were more likely to incorrectly label a never-performed action as having been performed in the first session, as shown in **Figure 3**.

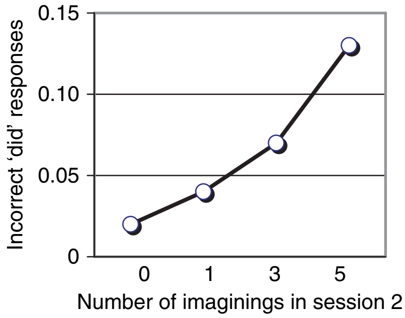

Figure 3 False 'did' judgments for never-performed actions as a function of number of imaginings in session 2. Data from Goff LM and Roediger HL III (1998) Imagination inflation for action events: Repeated imaginings lead to illusory recollections. *Mem. Cogn.* 26: 20–33.

The finding of imagination inflation for laboratory events supports the idea that imagination can yield false memories and that the effects observed with the LEI cannot be attributed solely to recovery of previously forgotten events. Why do these effects occur? In their original demonstration of imagination inflation, Garry and colleagues favored a reality monitoring explanation, whereby an imagined memory was misattributed to perception. Specifically, Garry et al. argued that imagination increased the perceptual information associated with the events, thus increasing the similarity of these imagined memories to performed events. This account predicts that imagination inflation should be greater when images are detailed, as they will be more readily confused with perception. Consistent with this hypothesis, Thomas and colleagues (2003) found that elaborative imagery instructions increased the imagination inflation effect, as compared to standard imagery instructions. Like Goff and Roediger, Thomas' participants completed an initial encoding phase and returned a day later for the imagination phase. Instructions in the simple imagery condition paralleled Goff and Roediger; for example, participants were asked to 'imagine getting up and opening the door.' Participants in the elaborative imagery condition were to imagine two additional statements, which included two sensory modalities; for example, 'Imagine getting up and opening the door. Imagine how the door handle feels in your hand. Imagine how the door sounds as you open it.' If the event was not imagined in the middle session, participants were very good at identifying new events. However, imagining events in the middle session led to imagination inflation, and this effect was bigger (12%) following elaborative imagery than simple imagery (7%).

To recap, imagining events may increase their vividness, a key characteristic of perceived memories. This is not the only explanation for the imagination inflation effect, however. Imagining events may also increase their familiarity, which can also lead to memory misattributions (as described in the previous section of this chapter). The imagination scripts used to guide the imagery also usually contain a lot of suggestive information over and above the vivid images generated by the participant. In short, does imagination underlie the effect, or is the effect at least partly driven by familiarity (as discussed in the section on false fame), as opposed to imagination?

Several data points suggest that imagining vivid details is not necessary to increase beliefs that events occurred in childhood. For example, similar effects are observed when participants paraphrase the script normally used to guide imagery (Sharman et al., 2004). The data also look similar when participants explain how the events might have happened in one's childhood (Sharman et al., 2005). Of course, in both of these cases, it is possible that participants might spontaneously generate images even though they were not explicitly directed to do so. However, Bernstein and colleagues observed inflation in a study in which spontaneous generation of images was quite unlikely. Their study extended the revelation effect to autobiographical memory (Bernstein et al., 2002). The revelation effect is the finding that requiring participants to unscramble a stimulus (to reveal it) increases the likelihood that it will be judged 'old' (Westerman and Greene, 1996). Bernstein et al. found that participants were more likely to believe childhood events had in fact occurred if they had to unscramble the events before judging them (e.g., 'broke a dwniwo playing ball'). Unscrambling presumably does not encourage imagery, and thus it suggests that LEI ratings can be based on factors other than image vividness, such as familiarity.

It should be clear that the just-described results do not negate the role of imagination in false memory creation. Finding that explaining, paraphrasing, and unscrambling events can all inflate confidence in remembered events does not preclude imagination also playing a role. Rather, such results emphasize the importance of isolating the contribution of imagination, as imagination is often combined with other factors that yield false memories.

2.14.6 Implanted Autobiographical Memories

It is possible to make a person remember a word that was never presented, to misjudge the fame of a name, or to misremember a detail from a witnessed event. But do people ever falsely remember entire events? The answer is yes. Consider the case of Shauna Fletcher, who came to believe her horrible memories of childhood sexual abuse were false memories (Pendergrast, 1996). How could this happen? Shauna traced her memories to several different sources, blaming her therapist for suggesting that the events occurred, and books and movies for providing the images she remembered. Shauna's experiences parallel the findings from laboratory studies: Implanting memories is possible, but not simple. A single misleading statement does not yield the kind of false memories experienced by Shauna. Correspondingly, the laboratory procedures for implanting entire memories tend to be much more complicated than those described earlier in the chapter, oftentimes combining multiple suggestive techniques.

Loftus and Pickrell (1995) demonstrated that false autobiographical memories can be implanted using laboratory techniques. The critical false memory involved being lost in a shopping mall as a child. To camouflage the purpose of the experiment, participants were also interviewed about childhood events that had actually occurred; a close relative of the participant provided the true memories. The relative also provided plausible details to aid in constructing the false memory (e.g., stores the family shopped, other family members likely to have been present, etc.) and verified that the participant had not been lost in a shopping mall around the critical time period (age 5).

Participants reviewed four events: three that were true and the critical false event. Each event was described in a booklet, and participants were instructed to remember the events and to write about the specific details of each. If participants did not remember the event, they were to indicate that on the form. Approximately 1–2 weeks later, participants were interviewed about the events. In addition to recalling details of the events, participants rated each memory for clarity (1 = not clear; 10 = extremely clear) and confidence that additional details could be remembered later (1 = not confident; 5 = extremely confident). A second interview, conducted 1–2 weeks later, was similar to the first interview.

Did participants come to remember being lost in the shopping mall at age 5? Critically, seven out of 24 participants claimed to remember the false memory (fully or partially) while writing about it in the initial booklet. Although their descriptions of the false events were shorter than those of true memories, the clarity ratings given to these false memories increased across interviews. At the end of the experiment, five participants were unable to pick out the false event and instead guessed that one of the true events had never happened.

The reader may be wondering why we consider the Loftus and Pickrell (1995) study to be an example of successful memory implantation. After all, most participants never believed the lost-in-the-mall memory and were able to identify it as the false event. What is crucial is that the implantation rate was above zero. That is, to argue that implanting false memories is possible, one only needs to show one successful implantation.

False memories are not limited to erroneous memories of being lost in the mall as a child. Experimenters have been successful at implanting many different types of events in participants. Participants have come to falsely remember participating in a religious ceremony (Pezdek et al., 1997), riding in a hot air balloon (Wade et al., 2002), putting the gooey toy Slime in an elementary school teacher's desk (Lindsay et al., 2004), and being admitted to the hospital (Hyman et al., 1995). Different approaches have been taken to ensure a false memory was in fact implanted, as opposed to a true memory being recovered. One is to confirm events with parents, as Loftus and Pickrell (1995) did. Another is to choose events that are very implausible, or even impossible. Braun and colleagues (2002) used the latter approach, implanting false memories for meeting a Warner Brothers character, Bugs Bunny, at Disneyland.

The procedures for implanting false memories are often elaborate, far beyond the simple suggestions typical of eyewitness misinformation studies. Successful studies typically follow three rules of thumb (Mazzoni et al., 2001; Lindsay et al., 2004). First, the target event must be deemed plausible. For example, it is easier to implant a false memory for being lost in the mall than it is to implant a false memory of an enema (Pezdek et al., 1997; see also Hart and Schooler, 2006). Second, the target event must be elaborated upon. For example, suggestibility was greater for participants who were required to imagine and describe the target events, probably because the guided imagery task led to more detailed memories (Hyman and Pentland, 1996). Third, the products of this elaboration must be attributed to memory, as opposed to other sources.

Although this framework is generally useful for thinking about memory implantation, one difficulty is that many manipulations likely affect more than one process. Consider, for example, Pezdek and colleagues' difficulty in implanting a false memory involving a Catholic ceremony (the Eucharist) in Jewish participants. Were the Jewish participants able to reject the event because it was implausible to them or because they were not familiar enough with the event to elaborate upon the suggestion? Similarly, consider what happens when a participant sees a doctored photograph depicting her engaged in the target false event. In this type of study, after a relative verifies that the participant has never ridden in a hot air balloon, Photoshop is used to insert a real childhood photo into a photograph depicting a hot air balloon ride (Wade et al., 2002). Such a procedure yields false memories in about half of participants (a high rate) – but is unclear at a cognitive level how the photograph has its effect on memory. The very existence of a photograph of the event increases the plausibility of the event, as well as providing vivid details about the supposed event.

The aforementioned examples illustrate the challenge of doing research in this area, namely the difficulty of linking manipulations to specific cognitive processes. We do not, however, intend to be pessimistic. The demonstrations of memory implantation were critical first steps, and they are being followed by systematic manipulations aimed at better elucidating the underlying cognitive processes. Rather than trying to equate different events with different levels of an independent variable, one approach is to try to implant the same event while experimentally manipulating a variable that affects only one possible factor, such as plausibility. Mazzoni and colleagues took this approach when examining memories for demonic possession (Mazzoni et al., 2001). Keeping the target event constant, they showed that reading articles about possession dramatically increased later beliefs that one had witnessed a demonic possession (as compared to the control group).

One of the major puzzles in this research area is why vivid false memories can be successfully implanted in some participants but not others. For example, across eight well-cited studies, Lindsay et al. (2004) observed that the implantation rate ranged from 0% to 56% of participants! We know of no study in which the false memory was successfully implanted into 100% of participants. Thus we predict one fruitful avenue for future research will be investigating individual differences in suggestibility. In the best study to date, Hyman and Billings (1998) looked for relationships between rates of false memory implantation and scores on four cognitive/personality scales. Two interesting results emerged. First, false memory scores were higher for participants who scored higher on the Creative Imagination Scale (CIS), a scale that measures imagery ability as well as suggestibility. In other words, participants who were better able to elaborate upon the suggestion were more likely to come to remember the false event. Second, false memory scores were higher for participants who scored higher on the Dissociative Experiences Scale (DES), a scale that measures both normal experiences such as distraction as well as less normal experiences such as hearing voices. Scoring higher on the DES may be related to difficulties with source monitoring.

In short, implanting detailed false memories is a complex process. It combines many of the techniques described earlier in the chapter in the context of other false memory paradigms, including imagery instructions, misleading suggestions, and a test situation that does not encourage participants to evaluate the source(s) of their memories. In this context, we turn to a discussion of how the various memory errors relate to one another.

2.14.7 Connections Across False Memory Paradigms

We have described six different paradigms that yield memory errors: The DRM paradigm, the eyewitness misinformation paradigm, verbal overshadowing studies, misattributions of familiarity, imagination inflation, and implanted autobiographical memories. What is the relationship between these very different paradigms?

We linked each memory error to possible mechanisms: Spreading activation (and monitoring of that activation) in the DRM paradigm, interference and failure to monitor source in the misinformation paradigm, an inappropriate shift in processing at test in the verbal overshadowing paradigm, a misattribution of familiarity in the false fame effect, increased familiarity and vividness (and possibly reality monitoring failures) in imagination inflation, and elaboration and source misattribution in the implanted memory studies. Sometimes, the same mechanism is implicated across illusions; for example, source monitoring failures are implicated in the misinformation effect and in implanting false autobiographical memories. Imagination inflation likely involves reality-monitoring errors, a specific type of source error. Misattributions of activation (in the DRM paradigm) and familiarity (as observed in the false fame paradigm) can also be interpreted as source errors. In other cases, the mechanisms appear qualitatively different, as in the case of the transfer inappropriate processing shift in verbal overshadowing studies. Of course, one issue is that likely more than one mechanism is involved in each illusion (and the convergence of mechanisms is probably why the errors are so robust). For example, imagination inflation likely depends on both vivid encoding (which may also increase familiarity) and some kind of monitoring failure at test. One other point worth noting is that even if the same mechanism is implicated in two different illusions, the instantiations of that mechanism may be quite different. For example, even though source errors are implicated in both the DRM illusion and the misinformation effect, giving participants a source test has very different effects in the two cases. As already mentioned, a source test can reduce susceptibility to post-event information (e.g., Lindsay and Johnson, 1989; Zaragoza and Lane, 1994). However, source tests yield more puzzling results when used in the DRM paradigm; depending on the features of the source test, the rate of false memories may be higher (Hicks and Marsh, 2001), lower (Multhaup and Conner, 2002), or similar (Hicks and Marsh, 1999) to that observed on item memory tests.

More generally, comparing the effects of standard manipulations on the different measures of suggestibility is a useful way of examining similarities and differences across false memory paradigms. For example, many researchers are interested in differences in suggestibility between children and college students. This comparison has been made in at least three of the six paradigms we described – DRM, eyewitness misinformation, and implanted memories – and the conclusion about age is not the same across paradigms. For example, younger children are normally more suggestible in eyewitness misinformation paradigms than are older children (Bruck and Ceci, 1999), but older children are more suggestible than younger children in the DRM paradigm (e.g., Brainerd and Reyna, 2007). That is, even though there are clear age differences in source monitoring abilities (e.g., Lindsay et al., 1991), with older children doing better than younger, older children are more suggestible in the DRM paradigm. Why is this, given that we already alluded to the role of source monitoring in the DRM paradigm? The paradox can be resolved by attributing the key age difference to encoding, rather than to retrieval-based processes such as source monitoring. Specifically, because younger children have difficulty noting semantic relations between items (Brainerd and Reyna, 2007), they may be less likely to encode the critical lure. In the terms of activation-monitoring theory, activation will be less likely to spread to the critical lure from related studied items; in the terms of fuzzy trace theory, younger children will be less likely to extract the gist of the list. By either account, the result is the same: It does not matter if younger children are poor at source monitoring if there is no trace for them to attribute to a source! Again, this example highlights the inadequacy of simply attributing DRM and eyewitness errors to difficulties with source; the full picture is more complicated.

There are at least two other approaches for connecting false memory paradigms. One is to test the same participants in multiple paradigms, and another is to link false memory in different paradigms to the same standardized measures of individual differences. The logic is that if comparable mechanisms underlie the errors, then the same individuals (or the same types of people) should perform similarly across paradigms. For example, Clancy and colleagues (2002) examined suggestibility in the DRM paradigm in control participants and in people who believed aliens had abducted them. Memories of alien abduction are of interest since the scientific community views alien abductions as impossible occurrences, leading these memories to be classified as false memories (although not implanted in the laboratory, of course). Interestingly, false recognition of nonpresented words was higher for people with alien abduction memories ($M = 0.67$) than for control participants ($M = 0.42$). In this same study, correlations between false memory and scores on individual difference scales were also observed. The rate of false memories was greater for individuals who scored highly on scales measuring absorption and dissociative experiences (DES) and reported more symptoms of post-traumatic stress disorder. The reader will recall that the DES is a scale that measures both normal experiences such as distraction as well as less normal experiences such as hearing voices, and that higher scores on the DES may be related to difficulties with source monitoring. Higher DES scores predicted implantation of a false childhood memory for spilling punch on the mother of the bride, although absorption did not (Hyman and Billings, 1998). Scores on the DES have also been related to imagination inflation (Paddock et al., 1999), and pathological scores on this scale have been linked to suggestibility in the eyewitness misinformation paradigm (Eisen et al., 2001). However, DES scores are not related to susceptibility to the false fame illusion (Peters et al., 2007). Understanding such individual differences will likely be an important part of future research on memory errors and suggestibility.

We end with a note on another approach we believe will help elucidate the relationships between different false memory paradigms: neuroimaging. Consider a study by Cabeza and colleagues (2001), in which participants watched two very different sources (a Caucasian male and an Asian female) read DRM-like lists, followed by a recognition memory test. At test, studied words and critical lures yielded similar activation in anterior medial temporal lobe (MTL) areas, but activation in posterior MTL differentiated true and false memories. Cabeza et al. associated anterior MTL with retrieval of semantic information and posterior MTL with perceptual information. What would the pattern be like for familiarity-driven illusions, such as false fame? To the extent that the same mechanisms underlie different memory errors, similar patterns of activation should occur.

2.14.8 Conclusions

In this chapter, we reviewed just six of the many published paradigms for creating false memories. Together, the data highlight the constructive nature of memory, as proposed by Bartlett (1932). We have also tried to stress that not all memory errors are equal. Not surprisingly, given the complexity of memory, there are many different ways that error can enter the system, from encoding to retrieval.

While we have focused on errors, we would be remiss not to point out that reconstructive memory is often very useful. For example, familiarity often is an excellent cue that something has been experienced before, and it is only in certain situations that this heuristic leads to error. More generally, errors are often the by-product of processes that support veridical memory. Memory errors are more than intriguing illusions. A thorough understanding of memory's errors will provide insight into the processes that normally aid memory.

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