

The Seven Sins of Memory

Implications for Self

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ABSTRACT: We examine the relation between memory and self by considering errors of memory. We draw on the idea that memory's imperfections can be classified into seven basic categories or "sins." Three of the sins concern different types of forgetting (*transience, absent-mindedness, and blocking*), three concern different types of distortion (*misattribution, suggestibility, and bias*), and one concerns intrusive memories (*persistence*). We focus in particular on two of the distortion-related sins, misattribution and bias. By describing cognitive, neuropsychological, and neuroimaging studies that illuminate these memory sins, we consider how they might bear on the relation between memory and self.

KEYWORDS: memory; self; forgetting; distortion; misattribution; bias

Scientists and philosophers have long recognized an intimate connection between memory and the self. Ideas about the nature of this relationship can be found as early as 1829 when James Mill underscored not only the strong interdependence between self and memory, but went so far as to suggest that the two are actually one and the same:

The phenomenon of Self and that of Memory are merely two sides of the same fact, or two different modes of viewing the same fact ... This succession of feelings, which I call my memory of the past, is that by which I distinguish my Self (Mill, [1829/1982], p. 175).

The strong relation between memory and self has not escaped the attention of modern theorists, either. Indeed, in his recent book *Synaptic Self*, Joseph LeDoux (2002) has made the case for the close interplay between memory and self by contending that in the absence of learning and memory processes,

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the self would only be “an empty, impoverished expression of our genetic constitution” (p.9). From a different perspective, Greenwald (1980) argued for a similarly tight link between memory and self, claiming that the past is remembered “as if it were a drama in which the self is the leading player” (p. 604). Thus, not only is our sense of self based on memories of past experiences, as Mill contended, but our retrieval, recollection, and reconstruction of the past is, reciprocally, influenced by the self. Given these links between memory and self, it seems that we cannot make much progress in thinking about the self without first trying to understand memory and how it contributes to the online narrative that comprises one’s sense of self.

In its attempt to contribute to such an understanding, this paper takes a somewhat counterintuitive tack. Rather than trying to tackle memory head-on by examining the ways in which it typically blends into the fabric of our everyday lives, we try to gain insight into the self by instead looking at the imperfections, foibles, and quirks of memory. If memory and self are related, it follows that an understanding of the self will benefit from, or even depend on, a better understanding of memory’s imperfections and failures. To this end, we describe memory failures within the context of recent proposals by Schacter (1999, 2001) that memory’s imperfections can be organized into seven basic categories or “sins” (by analogy to the seven deadly sins). We first briefly summarize the seven sins of memory and then focus on a pair of the sins that, we believe, have direct and important implications for the self.

THE SEVEN SINS OF MEMORY: A BRIEF OVERVIEW

In the ancient world, and later as part of Catholic theology, the seven deadly sins were those transgressions fatal to spiritual progress. When applied to memory, the seven sins describe those ways in which the normal, everyday operations of our mind may occasionally produce suboptimal or flawed memory experiences. TABLE 1 outlines these seven sins of memory. The first three of the seven memory imperfections can be thought of as sins of omission, that is, different types of forgetting. *Transience* refers to the decreasing accessibility of memory over time. This fundamental feature of memory was first documented in the laboratory by Ebbinghaus (1885/1964) over a century ago, but examples of transience are also plentiful in everyday experience; try, for example, to recall where you were this time exactly one year ago. To the extent that our sense of self is built, at least in part, on these kinds of recollections about what has happened to us, transience will have important implications for self. Indeed, which aspects of our experience remain available to us and which, in contrast, fade away over time will contribute importantly to how we think of ourselves. The second sin, *absent-mindedness*, refers to lapses of attention that result in forgetting to do things. We all experience this kind of irritating, everyday forgetfulness when we cannot recall where we

TABLE 1. The seven sins of memory

Sin	Description	Example
<i>Transience</i>	Decreasing accessibility of memory over time	Simple forgetting of long-past events
<i>Absent-mindedness</i>	Lapses of attention that result in forgetting	Forgetting location of car keys
<i>Blocking</i>	Information is present but temporarily inaccessible	Tip-of-the-tongue
<i>Misattribution</i>	Memories are attributed to an incorrect source	Confusing a dream for a memory
<i>Suggestibility</i>	Implanted memories about things that never occurred	Leading questions produce false memories
<i>Bias</i>	Current knowledge and beliefs distort our memories of the past	Recalling past attitudes in line with current attitudes
<i>Persistence</i>	Unwanted recollections that we can never forget	Traumatic war memories

placed our eyeglasses or when we temporarily lose our car in a crowded parking lot. However, this sin does not appear to be strongly related to the self. The third sin, *blocking*, refers to cases in which information has not faded out of memory but is temporarily inaccessible for a variety of reasons. The most common example of blocking is probably the “tip of the tongue” experience, where we temporarily cannot retrieve a name or word that, nevertheless, we are certain that we know (e.g., Schwartz, 1999; Maril, Wagner & Schacter, 2001). Examples of blocking of more direct relevance to the self can be found in rare, but fascinating, cases of amnesia in which people are unable to recall large aspects of their past and even their own identities (Kihlstrom & Schacter, 2000; Klein, Rozendal & Cosmides, 2002).

In contrast, the next three sins can be thought of as sins of commission: instances in which memory is present but wrong. *Misattribution* occurs when we remember that something happened to us, but attribute the memory to an incorrect source. We might recall, for example, that we heard a fact on the radio, when it was instead told to us by a friend. Or, we might have only imagined doing something but then mistakenly come to believe that we’ve actually done it, sometimes resulting in a phenomenon called false recognition. The second sin in this group, *suggestibility*, refers to implanted memories, often generated by leading questions or suggestions that lead us to believe things about ourselves, sometimes entire events, that never actually occurred. Dramatic examples of suggestibility have been documented, such as the bizarre story of Paul Ingram. Ingram, a Washington State sheriff’s deputy, came to believe that he had sexually abused his daughters as part of his participation in a satanic cult (Wright, 1994). Although all indications are

that the incidents in question never happened and that his beliefs were formed largely in response to suggestive questioning, Ingram came to a radically different view of his past—and self—than was warranted by actual events. Ingram eventually came to reject his suggested memories, but such examples of suggestibility (for review, see Loftus & Ketcham, 1994; Pendergrast, 1995; Schacter, 1996, 2001) illustrate the wide-ranging implications of memory distortion for the sense of self. The third of the distortion-related sins, *bias*, refers to the ways in which our current knowledge and beliefs can distort our memories for the past. Indeed, what we know and believe about ourselves in the present can be a powerful lens through which we view the past (Ross & Wilson, 2000).

Finally, *persistence*, the seventh sin, refers to unwanted recollections that people cannot forget. These tend to be traumatic experiences that haunt our memories and that cannot be expunged from our mind. Persisting memories can, in extreme cases, become self-defining recollections that permanently color how we view the present, past, and future, such as the intrusive memories sometimes experienced by war veterans or survivors of sexual assault (Applebaum, Uyehara & Elin, 1998; Holman & Silver, 1998).

This brief overview suggests a number of intriguing points of contact between self and the memory sins. As mentioned above, the connection between memory and self is most obviously apparent for two of the memory sins—misattribution and bias—and we now turn to highlighting the implications of these two sins for an understanding of the self. Our laboratory has begun to examine both of these sins using a combination of cognitive, neuroimaging, and neuropsychological approaches, and we briefly describe some of this work in the context of related observations made by others.

MEMORY SINS: MISATTRIBUTION

As he did about most topics of psychological inquiry, William James had something interesting to say both about memory distortion in general as well as about how inaccurate memories are related to the self. In his classic *Principles of Psychology*, James (1890) made an explicit link between memory errors and the self:

Alterations of memory are either losses or false recollections. In either case the me is changed. False memories are by no means rare occurrences in most of us, and, whenever they occur, they distort the consciousness of the me. Most people, probably, are in doubt about certain matters ascribed to their past. They may have seen them, may have said them, done them, or they may only have dreamed or imagined they did so. (James, [1890/1950], p. 373)

According to James, then, errors in remembering not only produce memory distortions but also result in self-distortions. Knowing whether we actually did something—or only dreamed or imagined it—clearly has significance for

how we understand both our autobiographical history and our general sense of self. When we mistake a dream or a fantasy for an actual event in the past, we are committing a classic misattribution error with the potential to change how we view ourselves and our relationships with others (Jacoby, Kelley & Dywan 1989; Johnson, Hashtroudi & Lindsay, 1993; Schacter, 2001).

One striking illustration of how a distorted memory can result in a distorted—or even false—self comes from an extreme case of misattribution following brain damage. Moscovitch (1989) described the interesting case of H.W., who sustained damage to the ventromedial aspects of the frontal lobes (the basal forebrain area) as a result of a burst aneurysm. The location of the brain damage caused H.W. to be amnesic for previous events, rendering him unable to recall his past experiences. More interestingly, however, H.W. filled in the gaps in his memory by confabulating. This fabrication of a new past that makes sense of the self can be seen in the following excerpt (Moscovitch, 1989, pp. 135–137):

MOSCOVITCH: Can you just tell me a little bit about yourself? How old are you?

H.W.: I'm 40, 42. Pardon me, 62. [the latter is correct]

MOSCOVITCH: Are you married or single?

H.W.: Married.

MOSCOVITCH: How long have you been married?

H.W.: Oh, about 4 months.

MOSCOVITCH: What's your wife's name?

H.W.: Martha. [correct]

MOSCOVITCH: How many children do you have?

H.W.: Four [he laughs]. Not bad for four months.

H.W. goes on to talk a little bit about his children, accurately naming all of them, and then Moscovitch asks the patient if everything he had been saying sounds a little strange. Laughing, H.W. said he did think it a little strange. But then the depth of H.W.'s conviction becomes clear:

MOSCOVITCH: I think when I looked at your record it said that you've been married for over 30 years. Does that sound more reasonable to you if I told you that?

H.W.: No.

MOSCOVITCH: Do you really believe that you have been married for four months?

H.W.: Yes.

MOSCOVITCH: You have been married for a long time to the same woman, for over 30 years. Do you find that strange?

H.W.: Very strange.

Although H.W. has manufactured what appears to be a false self, he still has the general sense of his past right. He knows that he has been married and the names of his four children, but he is wrong on one critical dimension, the temporal context of his past. He lacks appropriate information regarding the relative timing of life events, and therefore misattributes some key experienc-

es that have occurred over the past thirty years to the past four years. In addition, he also seems to have a defective ability to monitor the appropriateness of this information.

Clearly, H.W. represents an extreme case of misattribution (for other cases in which damage to frontal regions is associated with heightened misattribution, see Parkin, Ward, Binschaedler, Squires & Powell, 1999; Schacter, Curran, Galluccio, Milberg & Bates, 1996). Recently, we have been examining more prosaic forms of misattribution in the laboratory, to help explain both the extreme cases like H.W., as well as how misattribution may be relevant to understanding's one's own past—and hence, self—more generally.

One method recently developed by psychologists to study misattribution and its neural bases is known as the Deese–Roediger–McDermott (or DRM) paradigm (Roediger & McDermott, 1995). In the DRM paradigm, participants study a set of associated words that all converge on a non-presented theme word, which is never seen or heard during study list presentation. For example, participants might hear the following list of words: *candy, sour, sugar, bitter, good, taste, tooth, nice, honey, soda, chocolate, heart, cake, eat, and pie*. Later, participants perform a recognition test consisting of words from the study list, such as *taste*, along with completely unrelated words that were not presented earlier, such as *point*. Critically, the recognition test also includes a nonstudied theme word on which all the studied associates converge, such as *sweet*. Numerous studies using the DRM procedure show that, after having studied lists like the one above, participants exhibit extremely high levels of false alarms to the theme word—sometimes indistinguishable from hit rates to studied words—and that these false alarms are often accompanied by extremely high confidence. Even in this straightforward experimental paradigm, then, people can feel certain that they recently experienced an event—hearing the word *sweet* on the study list—that, in fact, had never occurred (e.g., Gallo & Roediger, 2002; Norman & Schacter, 1997; Payne, Elie, Blackwell & Neuschatz, 1996; Roediger & McDermott, 1995).

One way to think about this misattribution error is that it represents memory for the general sense, or gist, of what was presented. Indeed, these misattributed memories are “accurate” at the semantic or gist level (cf., Brainerd & Reyna, 1998; Payne et al., 1996; Schacter, Verfaellie & Pradere, 1996), since participants in these types of experiments heard words that referred to just about everything to do with sweetness, except the word *sweet* itself. Thus, false recognition in the DRM procedure may be one way of getting a handle on memory for general or gist-like information and its contributions to misattribution more generally.

To understand the brain basis for these kinds of misattribution errors, we have taken several complementary approaches, including the study of amnesic patients. Such patients typically have experienced damage to the hippocampus and related structures in the medial temporal lobe or to regions of the diencephalon. As a result, these patients are unable to remember their recent

experiences explicitly, despite otherwise normal cognitive functions (for review, see Kopelman, 2002; Squire, 1992). The studies in our laboratory included a mixed group of amnesics that included cases of Korsakoff's disease, as well as patients with damage to the medial temporal lobe as a result of anoxia, encephalitis, and stroke. Using the DRM procedure, these studies (Schacter, Verfaellie & Pradere, 1996; Schacter, Verfaellie & Anes, 1997; Schacter, Verfaellie, Anes & Racine, 1998; Verfaellie, Schacter & Cook, 2002) have consistently shown that amnesic patients are less susceptible to this form of misattribution error than are healthy controls (for similar findings from related procedures, see Koutstaal, Schacter, Verfaellie, Brenner & Jackson, 1999; Koutstaal, Schacter & Verfaellie, 2001). This finding is reliably observed despite the fact that amnesics tend to false alarm *more* often than controls to unrelated words that had no associative links to words presented earlier.

One way of framing these results is to suggest that the medial temporal lobe and diencephalic structures damaged in amnesic patients play a critical role in remembering the general sense or gist of what has recently taken place. We know that such regions are, of course, critical for remembering the particular words on a study list or the specifics of past events, and these results would suggest that the same regions may also contribute importantly to gist memory. In other words, because of damage to medial temporal lobe and diencephalic regions, amnesics may lose out on both specific memory as well as gist memory.

This framework is supported by neuroimaging studies in which we scanned participants during the recognition component of the DRM procedure, after having studied a series of associate lists. Our initial studies revealed activation in the vicinity of the medial temporal lobes during both true recognition and false recognition as compared to a low-level fixation baseline (Schacter, Reiman, et al., 1996; Schacter, Buckner, et al., 1997). Interestingly, there were no differences in the medial temporal regions during true recognition and false recognition, highlighting the strength of participants' false memory for the critical lures.

In a more recent study (Cabeza, Rao, Wagner, Mayer & Schacter, 2001), we again presented DRM lists (along with similar categorized lists) during study. Lists were presented on videotape by either a male or female source, and participants were instructed to try to remember both the words and by whom they were presented. This slightly different experimental design was used to increase the amount of visual/perceptual processing in which participants engaged during study list presentation: previous behavioral research has indicated that when participants focus on perceptual information during study of DRM lists, false recognition is reduced relative to true recognition (e.g., Schacter, Israel & Racine, 1999). Following our "perceptual" study conditions, fMRI was used to scan participants during a recognition test. Replicating and extending previous results, we found that the hippocampus

showed activation during both true and false recognition compared with a control condition in which subjects responded to new words that were unrelated to previously studied words; there were no differences in hippocampal activation during true and false recognition. In contrast, a different structure within the medial temporal lobe, the parahippocampal gyrus, showed greater activation during true recognition than during false recognition, perhaps reflecting memory for perceptual aspects of the study context. This idea is consistent with several lines of evidence implicating the parahippocampal gyrus in visual processing and memory (for discussion, see Cabeza *et al.*, 2001).

Together, the neuropsychological and neuroimaging data suggest that the hippocampus may be involved in making semantic or associative information available to support memory for the general gist of previously studied items. Although the studies we considered used word lists in laboratory settings, it is nonetheless interesting to think about the potential role of the hippocampus for the larger issue of memory and self. Clearly, a brain region that plays a role in memory for the gist of the past should contribute importantly to the maintenance of a sense of a consistent self over time. However, because neuroimaging investigations of the self have only recently begun, we can only speculate at the present time about the critical role played by the hippocampus in maintaining a sense of self.

MEMORY SINS: BIAS

As mentioned above, bias can be defined as retrospective distortions produced by current knowledge and beliefs. Schacter (2001) delineated five different types of memory biases (consistency, change, egocentric, hindsight, and stereotypic biases). The bias most directly relevant to the present discussion is *egocentric bias*, a pervasive tendency to remember the past in a self-enhancing manner. The existence of such a bias is, of course, no surprise: one need only look to the quintessential “fish tale,” in which the incredible size of an earlier year’s catch is extolled. The existence of such egocentric biases has also been demonstrated empirically in elegant studies conducted by Michael Ross and his colleagues (see, for example, Ross & Wilson, 2000), who have demonstrated a variety of ways in which people distort past recollections in order to enhance the present self (see also Taylor’s [1988, 1991] work on positive illusions).

Egocentric bias reflects, in part, the strong role played by the self in the encoding and retrieval of episodic memories. Beginning with the work of Rogers and colleagues (Rogers, Kuiper & Kirker, 1977), and since replicated and extended by many others (for review, see Symons & Johnson, 1997), it has been shown that when information is encoded in relation to ourselves, it is usually better remembered than other types of semantic information. These findings, often referred to collectively as the “self-reference effect,” suggest

that the self serves as a potent knowledge structure with a powerful influence on what we retain and later recall from our everyday experiences.

Recently, Kelley et al. (2002; see also Craik et al., 1999) have used fMRI to elucidate some of the brain regions that play a role in the self-reference effect. In this study, participants were scanned while they either decided whether a series of trait adjectives (e.g., *honest, friendly*) described themselves or decided whether they described a familiar other person (in this case, George Bush). The first condition has been used extensively to engage processing in relation to the self, while the latter condition is assumed to involve semantic, but not self-referent, encoding. These conditions were compared to a nonsemantic encoding condition in which participants judged whether words appeared in upper or lower case. Semantic, but non-self, encoding (compared with the nonsemantic control condition) was associated with activation in the left inferior prefrontal cortex, an area implicated in semantic encoding by a number of earlier fMRI studies (e.g., Wagner et al., 1998). In contrast, self-referent encoding was associated with activation in a distinct frontal region, the medial prefrontal cortex. These findings therefore suggest a link between the medial prefrontal region and encoding of information relevant to the self, although the nature of that link is not well understood. However, because self-referent encoding did not simply produce more activation in the same brain regions as semantic, non-self encoding, these data strongly suggest that self-referent encoding is not merely a stronger form of semantic encoding. Rather, self-referent and semantic encoding engaged distinct brain regions, suggesting a qualitative difference between the two types of memory encoding.

Likewise, a form of bias closely related to egocentric bias, called *consistency bias*, also bears on our understanding of the self. Consistency bias refers to our tendency to reshape the past to make it consistent with present knowledge and beliefs. The work of Ross and colleagues (Ross & Wilson, 2000) indicates that this kind of bias is often used to help preserve self-stability, allowing us to remember the past in a way that supports our current self. A classic study by Marcus (1986) on political attitudes illustrates the point. Individuals were asked to rate their attitudes towards various political issues in 1973 and then again in 1982. In the 1982 session, they were also asked to recall what their attitudes had been back in 1973. Critically, people demonstrated a systematic tendency to misjudge their past attitudes in a particular direction; specifically, people tended to misremember their past attitudes in line with the attitudes they currently held. For instance, if a person had expressed liberal views on drug use in 1973 but had grown more conservative over the intervening decade, they were likely to recall their earlier stance as more conservative than it had actually been. According to Ross and others, this type of consistency bias allows us to present ourselves as being stable and consistent over time, even though, in fact, we have changed.

Consistency bias is also related to an interesting phenomenon with clear relevance to the understanding of the self, namely *cognitive dissonance*,

which has been studied extensively by social psychologists. Cognitive dissonance refers to the psychological discomfort that results from conflicting thoughts and feelings. For example, an unhappily married person who believes that her marriage should be successful may try to distort the past to make the present seem more palatable. A man who purchases an expensive car, but then reads a negative review asserting that the car has serious problems, might try to belittle the reviewer as a misinformed or ignorant amateur who should not be writing about cars.

Social psychologists have traditionally assumed that the experience of cognitive dissonance requires the ability to recall the behavior that produced conflict in the first place. If the man who bought the car does not remember making the purchase, the bad magazine review should not bother him and he should not experience dissonance. This rationale assumes that the past can influence the present only through conscious or explicit recollection of past happenings. However, more than two decades worth of research on implicit memory (Schacter, 1987) has demonstrated that past experiences can influence subsequent experience and behavior despite an absence of conscious or explicit recollection. This effect is revealed most clearly in studies of amnesic patients, who often exhibit intact implicit memory for recent experiences despite reduced or completely absent explicit memory (for reviews, see Schacter & Curran, 2000; Squire, 1992; Verfaellie & Keane, 2002).

Can cognitive dissonance occur in the absence of explicit memory? If so, then amnesic patients should be susceptible to the effect, just like healthy participants in earlier studies. Lieberman, Ochsner, Gilbert & Schacter (2001) have provided relevant data. This study was based on earlier work in which consistency bias and dissonance were created by asking participants to choose one of two art prints that they had previously rated as equally desirable. After making this somewhat difficult choice, people later claim to like the chosen print more and the rejected print less than they had indicated earlier. Presumably, people act to reduce the dissonance that arises from choosing one print over the other by indicating that they had liked the preferred print better all along. The question that Lieberman *et al.* (2001) asked is whether this type of bias requires explicit recall of which print was chosen.

To address this question, amnesic patients and control participants first ranked art prints according to how much they liked them. Both groups of participants then made a choice between two prints, indicating which one they would prefer to hang in their homes. Later, they ranked all the prints a second time according to how much they liked them. Finally, all participants were given an explicit memory test in which they were asked to indicate which prints they had chosen earlier. As one would expect, amnesic patients showed no explicit memory for which prints they had chosen earlier, whereas controls remembered their choices well. Nevertheless, both groups of participants inflated how much they liked the chosen print relative to the print they had passed over. That is, amnesic patients—just like control participants—ranked

the chosen print higher and the rejected print lower during the second ranking compared with the first ranking; in contrast, there was no change in the rankings of control prints about which subjects made no choice. These results suggest that amnesic patients were trying to reduce the dissonance created by choosing between the two prints even though they lacked conscious memory for making the choice that produced dissonance in the first place.

To the extent that the type of cognitive dissonance examined in this paradigm is related to a consistency bias that people use to maintain stability between current and past selves, the results suggest that considering implicit forms of memory is critical for understanding the relation between memory and self. Indeed, this is a key point made by LeDoux (2002) in *Synaptic Self*; where he argues that much of what we call "self" is the product of implicit learning and memory processes that occur without awareness. We concur with this assessment and suggest that future research on memory and self explore this link more fully.

CONCLUDING COMMENTS

We have considered a variety of ways in which imperfections of memory, especially misattribution and bias, may relate to the self. Although still in its infancy, existing cognitive, neuropsychological, and neuroimaging research on the self has already begun to illuminate relevant issues. Against the backdrop of these recent attempts to understand the link between memory and self, we are impressed by the prescience and cogency of Williams James' observation that false memories "distort the consciousness of the me." Since it is never a bad idea to refer back to James when speculating about broad psychological topics, we conclude by offering one of his general reflections about the relation between memory and self as food for thought:

If a man wakes up some fine day unable to recall any his past experiences, so that he has to learn his biography afresh, or if he only recalls the facts of it in a cold abstract way, as things that he is sure once happened, or if, without this loss of memory, his bodily and spiritual habits all change during the night, each organ giving a different tone, and the act of thought becoming aware of itself in a different way, he feels and he says that he is a changed person (James, [1890/1950], p. 336).

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