Warning: Your Most Treasured Childhood Memory May Be False

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Autobiographical memory is the "diary that we all carry about" said Oscar Wilde. Autobiographical memory defines us. And because autobiographical memory is the foundation on which we build our identity, we like to believe that our memories are accurate, comprehensive and robust. Anything else would challenge our sense of self. But over the previous decade, psychological scientists have shown that autobiographical memory can be inexact, sketchy and frail. Various suggestive techniques can encourage people to generate memories of whole events that never happened. And these illusory memories are often held with great confidence, emotion, clarity, and vividness—but they are not real. In this article, we discuss research showing that suggestion can create false memories and change our autobiography.

Suggestive Interviews

Studies on false autobiographical childhood memories have used various techniques, including a method that involves multiple highly suggestive interviews (Loftus & Pickrell, 1995). In these studies, adults (usually undergraduates but sometimes members of the public) are asked to read descriptions of events that they experienced as children, however, unbeknownst to them, one event is fabricated by the experimenter. Loftus and Pickrell's participants, for instance, read a fictional story about getting lost in a shopping mall when they were five, and being rescued by an elderly person who reunited them with their family[1]. Over two or three sessions, the participants are encouraged to recall their unremembered events, sometimes using techniques that are purported to aid memory, such as guided imagery or context reinstatement. Once the study is over, independent judges are

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[1] The false events in suggestive interview studies are always moderately significant, personal experiences that participants' family members can verify never happened.

trained to code transcripts of participants' memory reports and to determine which subjects reported false memories of the target event. Some studies have differentiated between participants who reported "partial" and "complete" false memories: Although these categories have been operationalised differently across studies, the gist of the distinction is that participants who provide evidence that they genuinely believe they are remembering the false event ("I remember feeling scared when I couldn't find my mum") and details beyond those that are provided in the false description, are classified as having *complete false memories*. Participants who merely accept that the event occurred or speculate about it ("Well, it might have happened in the mall down the road from our house") are classified as having *partial false memories* (See also the recent debate on distinguishing between false memories and false beliefs; e.g., Scoboria, Mazzoni, Kirsch, & Relyea, 2004; Wade et al., 2007).

So how many participants report partial or compete false memories? We calculated that 153/560 (33%) of participants in 10 published studies were scored as having partial or complete false memories. And in the studies that differentiated between partial and complete, 49/290 (17%) were scored as partial and 48/290 (17%) as complete. The highest rate of complete false memories in an individual study was 26% (Porter, Yuille, & Lehman, 1995), but recent studies have modified the suggestive interview procedure and revealed even more dramatic rates of false recall (for a brief review see Wade & Garry, 2005). We return to this point later.

The content and qualities of these false memories vary widely between participants and studies. Sometimes the false memories are emotional (e.g., Porter et al., 1999), sometimes they are held with great confidence (Hyman & Billings, 1998), sometimes they are extremely detailed (though on average they tend to be somewhat less detailed than comparable true memories; see Heaps & Nash, 2001). That is, false memories tend to vary

in the same sorts of ways that true memories do (see Heaps & Nash, 2001; Laney & Loftus, 2007). Considered as a whole, the suggestive interview research shows that false memory creation is a robust phenomenon.

How is it then, that simply thinking about an event can lead people to create false memories? There is some debate amongst researchers about the exact mechanisms involved in false memory formation. On the one hand, according to the Fuzzy Trace account (see Brainerd & Reyna, 2005), people create two kinds of memory traces: *verbatim* traces that record surface-level sensory details (smell, colour, sound) and *gist* traces that record more abstract details (meanings, interpretations, elaborations). Verbatim traces are thought to be susceptible to interference and to fragment quickly over time, whereas gist traces are more robust. False memories then, according to Fuzzy Trace proponents, arise when people rely on gist memories alone or when verbatim memories from one source are mistaken as memories from another source (see Brainerd & Reyna, 2005 for a detailed description).

On the other hand, the Source Monitoring Framework (SMF) argues that the process ultimately comes down to an error in *source monitoring*—sometimes people mistake imagined details for genuine memories (Johnson, 2006; Johnson, Hashtroudi, & Lindsay, 1993). According to the SMF, people do not know the source of a memory outright. Instead, we use a variety of cues to infer the source of every thought, image and memory we experience. This process works well, most of the time, because there are noticeable systematic differences between externally perceived (real) memories and internally generated (imagined) memories. Real memories, on average, contain more sensory details (colours, sounds, smell) and conceptual details (spatial, temporal) than imagined events. Real memories also tend to be more coherent, logical, and consistent. Together these differences allow us to make accurate judgments about the source of our memories, but,

when an image or thought has the hallmarks of a real memory, we sometimes confuse imagined events for genuine experiences.

In the suggestive interview technique, the act of imagining a counterfactual childhood event presumably causes participants to generate perceptually rich and coherent false details about the suggested event. Over time, these images and thoughts become increasingly like real memories, and participants become confused about what is imagined and what is real. Support for this premise comes from studies that show the more times people imagine performing an action, the more likely they are to incorrectly claim that they actually did perform it (Goff & Roediger, 1998).

Suggestive Interviews and Props

Recently, one team of false memory researchers extended the suggestive interview technique to include props, specifically childhood photographs (Lindsay, Hagen, Read, Wade, & Garry, 2004). Trauma-oriented psychotherapists sometimes encourage clients to peruse photographs to help cue long-forgotten memories of upsetting experiences. Lindsay and colleagues predicted that personal photographs, when combined with suggestive interview techniques, might foster the creation of false memories. The researchers were right. They asked some adults to try to remember three childhood events; as usual, one event was false, describing how the participant was reprimanded at school for sneaking Slime® (the gooey green toy) into their teacher's desk. All of the participants heard descriptions of the *slime* event, but half also received a class-group photo from the relevant school year. About a quarter (23%) of those subjects who did not receive the class photo formed false memories of the slime event. But with the aid of a photograph, the false memory rate soared to 65%. The *slime* event used by Lindsay and colleagues differs dramatically from the types of events clients recall in therapy. Yet these findings warrant concern about the riskiness of encouraging people to review photographs during attempts to

cue suspected but forgotten memories of childhood trauma. Indeed, there are good reasons to believe that the mechanisms responsible for false memories in the laboratory may also contribute to other types of false memories (Wade et al., 2007).

In a series of related studies, one of the authors (KW) and a team of researchers have used digitally altered photographs to implant false childhood memories (Garry & Wade, 2005; Wade, Garry, Read, & Lindsay, 2002). They showed some adults three real childhood photos, and one fake photo depicting the participant taking a hot air balloon ride as a child (Figure 1). Wade et al. created the doctored photos using Photoshop and they chose hot air ballooning because it is a moderately significant personal experience that typically requires parental consent; thus, family members could verify it never happened. Participants considered their set of childhood photos and tried to remember the depicted events in three sessions over a maximum of two weeks, and by the end of the study, 50% remembered something about the hot air balloon ride. The false memory reports were often rich with detail. One participant said:

> I'm still pretty certain it occurred when I was in form one (Year 6) at um the local school there - Um basically for $10 or something you could go up in a hot air balloon and go up about 20 odd meters - it would have been a Saturday and I think we went with, yeah, parents and, no it wasn't, not my grandmother. I'm not certain who any of the other people are there. Um, and I'm pretty certain that mum is down on the ground taking a photo.

In addition, participants were surprised during the debriefing to learn that one of their photos was a fake.

The studies by Wade and colleagues show that a doctored photograph, without any accompanying verbal description, is enough to lead people to report entirely false memories of significant childhood events (Garry & Gerrie, 2005 provide a comprehensive review of how photographs affect memory). But a new study by Nash and Wade (2007) shows how powerful false evidence can really be.

Significant advances in digital technology mean that fake video evidence can be highly compelling and almost impossible to refute. Indeed, in the last 5 years, computer scientists having begun developing complex mathematical and computational techniques (called *digital forensics*) to detect alterations in digital media (Dreifus, 2007). This led Nash and Wade (2007) to examine whether tampered video evidence could lead people to believe they committed an act they never did: cheat on a psychological experiment. The experimenters filmed participants carrying out a computerised gambling task. The task required participants to answer a series of general-knowledge multiple-choice questions and to bet (fake) money on their answers every time they responded to a question. When they answered a question correctly a green tick appeared on the monitor and they were instructed to collect money from the "bank", whereas when they answered a question incorrectly a red cross appeared on the monitoring and they were instructed to return money to the bank. Two hours later participants returned to the lab and the experimenter accused them of taking money in the first session when they should have returned it. Half of the participants were told that incriminating video evidence existed, and half were exposed to a doctored video that depicted them committing the act. Nash and Wade created the false videos using state-of-the-art video-editing software. They took a clip that depicted the participant answering a question correctly and being presented with a large green tick on the computer monitor. Next, they digitally replaced the green tick with a red cross so that the doctored video ostensibly showed the participant taking money from the bank when an error message appeared (Figure 2). In two studies, almost 100% of participants who viewed the fake video falsely confessed to the act. Over 70% told a research confederate that they had made the mistake, indicating that they genuinely believed the false act occurred. This is the first study to demonstrate the dangers of modern digital-manipulation technology when encouraging people to remember *recent* autobiographical experiences. This study also

mimics real world situations that may lead to false memories. For instance, police interrogators can and do lie about the existence of evidence during interrogations and this oft-used tactic is legal in the United States (Kassin & Gudjonsson, 2004).

False Feedback

Another, even simpler procedure has been used recently to implant false memories. In the false feedback paradigm, participants are first given a series of questionnaires on a particular topic, such as childhood experiences with food (Bernstein, Laney, Morris & Loftus, 2005; Laney, Morris, Bernstein, Wakefield & Loftus, in press). Participants are then told that their data will be analysed by a sophisticated computer programme, which will produce a profile of their results. On a subsequent visit to the laboratory, participants are given "feedback profiles" which say that, for example, they once got sick after eating hard-boiled eggs as a child. But these profiles are not actually created by a sophisticated computer programme. Instead, there is just one version of the profile per experimental group. After they read their profiles, participants complete a second series of questionnaires. The data typically show that this very simple manipulation, basically "the computer says you had this experience," can produce false memories in approximately half of manipulated participants. In addition, these participants also demonstrate false memory consequences: To continue with the egg example, participants often claim to like hard-boiled eggs less, and to want to eat them less in the future.

In a more complicated twist on this false feedback theme, another group of researchers gave participants false feedback that was designed to mimic information that they might receive in certain kinds of therapy. Mazzoni, Lombardo, Malvagia and Loftus (1999) assessed participants' confidence that they had been bullied as children, along with other childhood events, using a paper-and-pencil questionnaire. Some participants who were initially confident that they had *not* been bullied were then asked to participate in an

additional study (actually the second phase of the same study) in which a recent dream was interpreted for them by a clinical psychologist. Participants reported a wide range of dreams to the study's two clinical psychologists, but the content of the dreams was irrelevant to what happened next. All participants were told (regardless of the content of their reported dreams) that their dreams were actually evidence of a repressed memory of being bullied at a young age. After the dream interpretation phase, participants' confidence that they had been bullied as children was again assessed. Compared to control participants (whose dreams were not interpreted), experimental participants became more confident that they had been bullied, and those whose confidence increased were also likely to produce concrete (false) memory reports of being bullied.

We have shown how direct suggestive methods can play havoc with memory. But a less direct method, and a relatively new area of research in the false autobiographical memory domain, is the role of social influence in creating false memories.

Social Influence

Discussion plays an integral part in our lives. We reminisce with family members about shared experiences and attempt to agree on what 'really' happened (Ross, 1997). When we witness surprising or spectacular events we talk to other witnesses and consider whether our versions of events match up. These discussions in the name of accuracy testing can have serious implications for eyewitness memory (see Gabbert, Memon, & Allan, 2003). But can discussion like this influence autobiographical memory? French, Sutherland, and Garry (2006) showed that it can. The experimenters used an Internet-based version of the suggestive interview technique to examine how discussion influenced both genuine and false memories for childhood events. Pairs of adult siblings attempted to recall some real childhood events plus a fake childhood event, which was a hot air balloon ride. At first, the siblings recalled the events independently, but then they discussed their memories with

each other (using the online learning environment *Blackboard*) before reporting, independently once again, what they could remember. The results showed that participants incorporated snippets from each other's real and false memories into their own recollections, and although almost 25% of participants reported false memories, the false memory rate dropped dramatically after participants discussed their memories. One explanation for this drop could be that sceptical participants—those who doubted the authenticity of the false event—pressed their siblings to carefully consider the true source of their memories. As a result, participants became more conservative when accepting and reporting images and thoughts as genuine experiences.

Discussion does not only affect autobiographical memories for middle- and late-childhood experiences, it also affects memories for early childhood. Peterson, Kaasa, and Loftus (2007) asked adult participants to describe their earliest memories, but beforehand, half were exposed to confederates who described their own earliest memories, including their second birthday or first few steps. The participants who were exposed to confederates' very early memories reported memories that were, on average, one year younger than the memories reported by the control participants. Together, the French et al. (2006) and Peterson et al. results show that simply listening to others share their own memories might be enough to transform autobiographical memory.

Conclusions

If memory is the diary we carry about, then it is likely to include truths, half-truths, gaps and falsities. We have shown that memory can be inexact and unreliable—various suggestive techniques can lead to wholly false memories for personal experiences.

The research on false memories has raised some significant questions. For instance, how do participants feel about being deceived in false memory studies? Do they get upset when they are debriefed? In short, the answers are *intrigued* and *very rarely.* Together, we

(KW and CL) have conducted over 25 false memory studies with over 3200 participants, and between us only one participant has expressed significant concern about the use of deception. We carefully debrief our participants at the end of their participation, both to ensure that the deception used in our studies has minimal long-term effects and to allow participation in our studies to be a learning process for participants. The vast majority of participants in false memory experiments enjoy the experience and learning about the fallible nature of human memory.

Another question is how do we know that participants genuinely believe the false events happened? There are several reasons why, we believe, participants are not confabulating details to please the experimenters. First, we have already mentioned that participants are often surprised to learn, during debriefing, that their (newly acquired) memories are likely false. Second, in research that parallels that on detecting deception, there is evidence that third parties are quite poor at distinguishing between true and false memory reports (Laney, 2006).

Third, one of us (CL) and her colleagues conducted a study that was specifically designed to both assess the role of social demand in false memory research and minimize its effects (Laney, Kaasa, Morris, Berkowitz, Bernstein & Loftus, in press). Participants in false memory studies are always given some kind of cover story designed to hide the true nature of the study. In this study, the participants were told that the researchers were studying "food preferences and personality," when they were really trying to implant false memories of loving asparagus the first time it was tried. But beyond that cover story, these participants were also lead to believe that the study had a different focus, the American obesity epidemic. This other, implied purpose has been dubbed the "red herring." Although almost half of the participants in the study bought into the "red herring" explanation– and just 8% figured out that the study was attempting to implant false memories – the study still

produced false memories in 40% of manipulated participants, a proportion equivalent to previous similar studies. The researchers concluded that social demand could not be the primary explanation for the observed false memories.

Another question is whether false memories have behavioural repercussions. Do they cause us to change our behaviours outside of the lab? As mentioned above, false memories of getting sick after eating a particular food as a child have indeed been linked to changes in preferences for that food, and intentions to eat that food in the future (Bernstein et al., 2006). In addition, other research has shown that getting people to believe that they had a specific experience with the character Pluto at Disneyland can have behavioural consequences, including reduced willingness to buy a Pluto souvenir (Berkowitz, Laney, Morris, Garry, & Loftus, in press).

Finally, one of the ultimate purposes of conducting false memory studies is to determine whether there is some characteristic that differentiates real from false memories. If such a characteristic could be found, then psychologists might be able to look at a particular memory and determine whether that memory is true or false. Thus far, there is no such characteristic (but see Okado & Stark, 2005 for some promising future directions). Like true memories, false memories can be held with great confidence, can be detailed, can be vivid, can have behavioural consequences, and can even be emotionally rich. As such, the fact that a particular memory is confidently held, detailed, vivid, consequential or emotional, or even all of these, cannot guarantee that the memory is real.

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Figure Captions

Figure 1. Demonstration of the photo doctoring process used in Wade et al. (2002). Participants were digitally cut from a genuine photo (A) and pasted into a prototype hot-air-balloon photo (B), to create the doctored photo that they viewed during the interviews (C).

Figure 2. The video doctoring process. Left photo shows the original scene in which the participant takes money from the bank when she answers a question correctly. Right photo shows the doctored scene in which the participant ostensibly takes money from the bank when she answers a question incorrectly. Here a red cross appears on the screen.