

A picture is worth a thousand lies: Using false photographs to create false childhood memories

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Because image-enhancing technology is readily available, people are frequently exposed to doctored images. However, in prior research on how adults can be led to report false childhood memories, subjects have typically been exposed to personalized and detailed narratives describing false events. Instead, we exposed 20 subjects to a false childhood event via a fake photograph and imagery instructions. Over three interviews, subjects thought about a photograph showing them on a hot air balloon ride and tried to recall the event by using guided-imagery exercises. Fifty percent of the subjects created complete or partial false memories. The results bear on ways in which false memories can be created and also have practical implications for those involved in clinical and legal settings.

Image-manipulation technology has recently become widely available, inexpensive, and easy to use. As a consequence, people frequently encounter doctored photographic images in their everyday lives. For example, magazine and newspaper covers depict celebrities doing things that they have never done in places that they have never visited; print and TV advertisements show products doing things that they cannot do; and digitally enhanced movies present compellingly seamless blends of reality and fantasy. Moreover, image manipulation is no longer the exclusive domain of the marketing and entertainment industries, but has moved into the home. Camera shops assemble family portraits from separate photos of mom, dad, and the children, or delete unwanted former spouses from pictures of family reunions. Personal computers routinely come bundled with image-editing software, such as Photoshop, that lets users manipulate their photographs—adding objects, deleting people, changing colors—until the images are to their liking. Although doctoring personal photos may appear to be pure entertainment, the research

we present here shows that exposure to altered photographs can lead to false memories.

Until now, no research has examined the influence of doctored photographs on memory. The research that speaks most closely to the issue is recent and shows that people can develop false memories if they read short narratives of plausible yet false childhood events (Hyman & Billings, 1998; Hyman, Husband, & Billings, 1995; Hyman & Pentland, 1996; Loftus & Pickrell, 1995; Pezdek, Finger, & Hodge, 1997; Porter, Yuille, & Lehman, 1999). In those studies, subjects read descriptions of several childhood events supplied by a family member, with instructions to work at remembering the events and to report everything that they could recall in two or three sessions. All the events are true except for one experimenter-contrived false event, which a family member verified the subject had never experienced in childhood. Loftus and Pickrell, for example, presented subjects with four narratives, including one that described the subject's getting lost for an extended period of time in a shopping mall. After two interviews, 25% of the subjects reported memories of the suggested event. Memory implantation studies have reported proportions of false recall varying from 0% (Pezdek et al., 1997) to 56% of subjects (Porter et al., 1999), with the wide range of results likely to have been produced by variations in event plausibility, the amount of memory work/guided imagery that the subjects engaged in, and the period over which the interviews were conducted. The weighted mean percent of false recall across experiments is 30%.

Taken together, this small but growing body of research shows that it is easy to "implant" false childhood memories. How are these false childhood memories created? Recently, Hyman and colleagues (Hyman & Kleinknecht,

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1999; Hyman & Loftus, 1998) drew on the false narrative literature to describe a three-stage process that explains how false childhood memories are formed. The process, guided by the *source monitoring framework* (SMF; Johnson, Hashtroudi, & Lindsay, 1993), suggests that three conditions must be satisfied in order for subjects to create a false memory. First, the subjects must accept that the suggested event is plausible. Second, they must create contextual information for the event, such as an image and a narrative. Third, they must commit a source monitoring error: Subjects must wrongly attribute their memory construction to personal experience rather than to an image that they have created. A review of successful memory implantation studies shows that researchers use procedures that help subjects meet all three requirements. For instance, the false event is described with details such as where and when the false event occurred, who accompanied the subject, and other idiosyncratic details that increase the plausibility of the event.

Although we know that false narratives can lead people to create false memories, what we do not know is whether other kinds of suggestive media, such as photographs, can have the same effect. In the study we present here, we asked whether doctored photos could create false childhood memories. Our subjects viewed four photographs, each of which depicted their experiencing a childhood event such as a family holiday or birthday party. Over a period of 1–2 weeks, the subjects thought about the experience depicted in each photograph and worked at remembering details about those experiences. One of the photographs showed the subject having a completely false childhood experience: a hot air balloon ride. We made the photograph by electronically cutting and pasting an actual photo of the subject as a child into another of a hot air balloon.

What might happen if we used doctored photographs rather than narratives? We expected that many of the subjects would accept the photograph as authoritative evidence of a childhood event. To see why we made this prediction, let us return to Hyman's three stages (Hyman & Kleinknecht, 1999; Hyman & Loftus, 1998). First, people tend to think of photographs as frozen moments in time, place faith in them, and see them as reliable representations of the past (Mided, 1998). Hence Hyman's first condition, acceptance of the plausibility of the event, should be satisfied. Second, like narratives, photographs provide detailed information that subjects can use to generate images, thoughts, and feelings that are consistent with having experienced the suggested event. Because photographs are a rich source of perceptual information, they may act as a springboard or bootstrapping device and make it easier for subjects to generate images of the false experience. Thus, Hyman's second condition—construction of an image and storyline—should be satisfied as well. Third, research shows that easily generated images are more likely to be judged as genuine experiences (Finke, Johnson, & Shyi, 1988). If photographs do act as imagery springboards, Hyman's third condition should be satisfied as well.

However, there were also reasons to expect that false photographs might not lead the subjects to report false memories. Unlike the false narratives in previous studies, our false photographs were packed with details, any one of which might provide the subjects with a basis for rejecting the false event. For instance, a subject might say, "Wait a minute—I remember this picture of my dad and me from another photo!" Obviously, if subjects reject the false photograph on the basis of a false or true but stolen detail, the photograph will not cultivate a false memory. Moreover, television and newspaper advertisements increasingly depict the ease with which any amateur can manipulate photos from their home computer: Perhaps the subjects would not find our doctored photos compelling. Thus, the goals of this study were to explore whether subjects would or would not be swayed by doctored photographs and to gather information about possible mechanisms of influence.

METHOD

Subjects

Twenty adult confederates each recruited a family member who (1) had not taken a hot air balloon ride, (2) was at least 18 years old, and (3) had not taken a psychology class. The subjects (10 males, 10 females) were students at Victoria University of Wellington or at other local universities. The age range was 18–28 years ($M = 20.2$, $SD = 2.3$). Confederates and subjects were paid \$20 each.

Materials

The confederates each provided a selection of photographs in which the subject was 4–8 years old. For each subject, we selected and digitized three true photos of moderately significant events, such as birthday parties or family vacations. We also digitized additional photos and used a Macintosh G3 and Adobe Photoshop 4.0 to take images of the subject and one or more family members and paste them into a prototype photo of a hot air balloon (see Figure 1). We chose hot air balloon riding to be our target false event because it is an activity available to all New Zealanders (there are several hot air balloon festivals across the country each year, and dozens of hot air balloon operators), yet it is significant enough for family members to confirm that the subject never experienced it.¹

Photos were cropped to 150 mm × 150 mm, framed by a 3-mm black line, and printed in grayscale at 300 dpi. Photos were presented one per page and were labeled Event One, Event Two, and so on. The false photo was consistently presented in the third position.

Procedure

The subjects were interviewed three times over a 7–16 day period, depending on the subjects' availability. The first author (K.W.) conducted all interviews; she trained for the interviews by conducting several mock interviews prior to interviewing the subjects.

The first and third interviews were audiotaped and followed a modified version of the Step-Wise procedure (Yuille, Hunter, Joffe, & Zaparniuk, 1993; see also Porter et al., 1999). The step-wise interview was originally developed for childhood abuse investigations and has been modified for use with adults. The technique is widely used by police and social service providers throughout Canada, Britain, and the U.S. For each event, the subjects (1) gave a free narrative of everything they could recall, (2) answered general questions to help the interviewer clarify details, and (3) answered specific questions about the phenomenological experience of remembering the event.

At Interview 1, the subjects were told that the purpose of the study was to examine how and why people reminisce about some child-

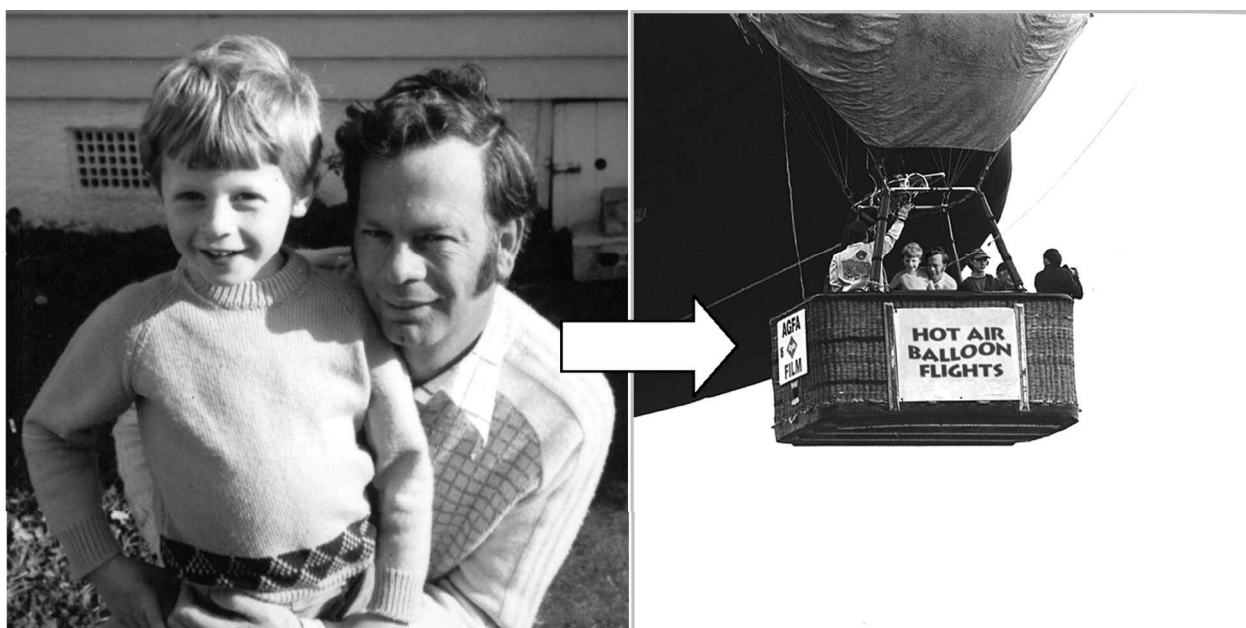


Figure 1. Process of doctoring a photograph.

hood events. The free-narrative phase began with the interviewer introducing the first photo and asking the subjects to “tell me everything you can remember without leaving anything out, no matter how trivial it may seem.” When the subjects could recall no more, we measured their confidence that the event actually occurred on a 7-point scale from 1 (0% confident) to 7 (100% confident).

The subjects who could not recall an event (typically the false event) were reassured that “many people can’t recall certain childhood events at first because they haven’t thought about them for such a long time.” They were given a few minutes to concentrate on getting the memory back. If they still recalled no details, they were told that another purpose of the study was to assess the efficacy of different memory retrieval techniques, and the interviewer used context reinstatement and guided imagery to help the subject remember the event. The subjects were taken mentally back into the scene of the event. For instance, for the false hot air balloon event, the interviewer told the subjects to close their eyes and picture being back in the hot air balloon. Then they were asked to think for a minute about details such as what it might have been like, who was with them, what the weather was like, and what they saw when they looked over the side of the basket. If they still recalled no details, the interviewer introduced the next photograph and repeated the procedure. The target photo was in full view of the subjects for the entire time it was discussed. At the end of Interview 1, the subjects were given a copy of their photo booklet and were asked to take a few minutes each night to focus on recalling the forgotten event(s).

Interview 2 was conducted 3–7 days later. This interview was shorter than Interviews 1 and 3. The subjects were asked only whether they had since remembered more about the “forgotten” event(s) (usually including the false event), and then context reinstatement and guided-imagery instructions were repeated. We did not record this interview, nor did we gather confidence measures. The final interview, which repeated the procedure from Interview 1, was conducted 3–7 days after the second interview. At the culmination of Interview 3, the interviewer revealed that one of the four photos was fake and asked the subjects to guess which one. The subjects were debriefed, and the confederates were contacted again to verify that they had not discussed any of the events with family members.

RESULTS

The subjects’ comments during debriefing suggests that they were not suspicious of the photographs. For example, when told that one of the photos was a fake, Subject A.G. replied, “That’s amazing, ’cause I honestly started to talk myself into believing it! ... I still feel in my head that I actually was there; I can sort of see images of it, but not distinctly, but yeah. Gosh, that’s amazing!”

Recall Rates of True and False Events

Recall that the 20 subjects were asked to remember three true events each—a total of 60 true events. Figure 2 shows the percentage of true events remembered at Interviews 1 and 3. Of the 60 true events, the subjects recalled information about 56 (93.3%) at Interview 1 and 58 (96.7%) at Interview 3, an average of 2.9 real memories each by Interview 3.

We now turn to the major focus of this paper, the false event. We followed Hyman and Billing’s (1998) relatively strict criteria for categorizing memories. To be classified as having a clear false memory, a subject had to report memories of the critical balloon ride, including consistent elaboration of information not depicted in the photograph. A partial false memory occurred when a subject consistently elaborated on the false photograph (such as reporting feelings, who was present, etc.) but did not indicate memories of taking the balloon ride per se. When a subject tried to recall the false event and described images of it but did not claim these images as memories, it was categorized as *trying to recall*. When a subject failed to attempt any recall, this was categorized as *no memory*.

Five independent raters (the first and second authors and three graduate students who were carefully trained

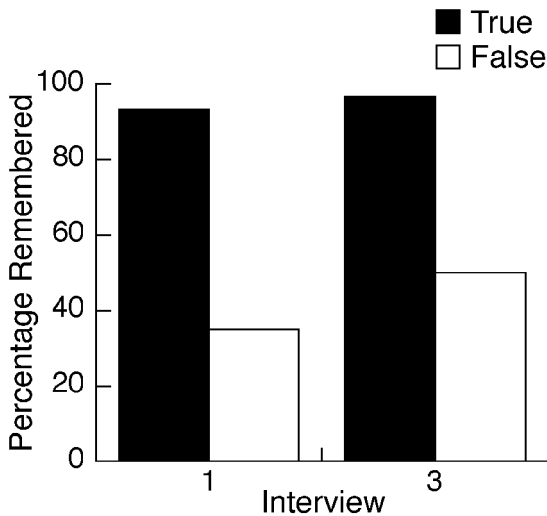


Figure 2. Mean percent of events remembered by event type and interview.

in the classification procedure) classified all 20 subjects' responses to the false event, agreeing on 85% of classifications. The disputed 15% were classified into the most conservative category.

The white bars in Figure 2 show the rates of false memory reports. At Interview 1, 1 subject reported a clear false memory, 6 reported partial false memories, 3 were trying to recall, and 10 had no memory responses. Although no subject immediately reported memories of the false event when shown the doctored photo initially, by the end of that interview, 7 of the 20 subjects (35%) remembered the false event either partially or clearly. By Interview 3, the one *clear* false memory remained clear; two *partial* false memories became *clear*; and one *trying to recall* false memory developed into a *clear* false memory. The other four *partial* false memories stayed *partial* false memories, whereas two *trying to recall* memories became *partial* false memories. Of the 10 *no memories* at Interview 1, half remained so, and the other half became *trying to recall* memories. In short, at the end of the three interview sessions, a total of 10 (50%) subjects recalled the false event either partially or clearly—claiming to remember at least some details of a hot air balloon ride during childhood.

Figure 2 does not depict the dramatic way in which the false memory reports tended to change over the course of the interviews. The subjects who ultimately reported memories of the false event typically began by offering fragmented descriptions of the balloon event and subsequently embellished the suggested information over time. Subject S.B. provides a good example of the development of a clear false memory:

Interview 1

Interviewer: And again, if you want to tell me as much as you can recall about this event without leaving anything out.

Subject: Mm . . . no, never actually thought I'd been in a hot air balloon, so there we go.

Interviewer: You can't remember anything about this event?

Subject: Nah. Though it is me . . . no memory whatsoever.

Interviewer: If you want to take the next few minutes and concentrate on getting a memory back, something about the event.

Subject: No, yeah I honestly . . . no I can't. That's really annoying.

Guided imagery instructions given, subject speculates aloud about where the balloon ride could have happened, who would have been there, etc., but does not report memory for the event.

Interview 3

Interviewer: Same again, tell me everything you can recall about Event 3 without leaving anything out.

Subject: Um, just trying to work out how old my sister was; trying to get the exact . . . when it happened. But I'm still pretty certain it occurred when I was in form one (6th grade) 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 . . . 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.

Subject F.J. developed a partial false memory:

Interview 1

Interviewer: Okay, so if you turn over, same case again. Can you tell me everything you remember?

Subject: I didn't even know I had been in a hot air balloon! I've never seen this photo in my life.

Interviewer: You can't recall anything that happened in this event?

Subject: No, I can't recall, I mean, the only thing I can assume is that when I was a really small child down in (city), at the (city) fair they had hot air balloons there. And that's like the only place that I think that could have happened. I've never even seen that photo before in my life.

Interview 3

Interviewer: If you want to turn over to Event 3 and tell me as much as you can remember about this event.

Subject: Well I don't really remember a lot. Um. I'm pretty sure it happened in City A but I couldn't be 100% certain. Um, at the (city) Fair. Um, I actually, until I had seen this picture I didn't even believe I had been up in a hot air balloon.

Interviewer: Okay, it's okay that you can't recall this event. Like I said last week, many people can't recall certain childhood events because they haven't thought about them for such a long time. So, I'd like you to take the next few moments and just concentrate on getting the memory back for a little while.

Subject: I'm sort of like my mind's playing tricks on me. I sort of think I remember being up in it. But I don't know whether that's just me thinking that I have been. I can see like the road and people and a big paddock.

Confidence Ratings

As expected, the subjects were more confident that the true events had occurred than that the false event had occurred. For true events that were recalled, the subjects were, on average, 90.8% confident that the event had occurred. Average confidence in the nonrecalled true events was 41.7%. The subjects who “recalled” the false event were 44.5% confident that the event had occurred. By contrast, the subjects classified as not remembering the false event were only 10.0% confident that it had occurred. Moreover, confidence was related to type of false memory report [$F(3,16) = 18.98, MS_e = 178.83, p < .01$]. Tukey-Kramer comparisons revealed that the subjects with clear false memories were significantly more confident ($M = 66.7\%$) that the false event had occurred than were the subjects with partial false memories ($M = 25.0\%$), the subjects trying for memories ($M = 20.0\%$), and the subjects with no memories ($M = 0\%$). Hyman and Billings (1998) reported similar results, but found no difference between partial memories and other types of memory.

Clause Analysis

To explore the extent to which perceptual details in the doctored photograph contributed to false memory reports, we divided the subjects' memory reports into clauses and categorized those clauses that contained details about the event according to whether or not that detail could be extracted from viewing the photograph (see Gross & Hayne, 1999, for a description of the clause analysis). Figure 3 shows the mean percent of clauses that contained information from the photograph. The “true” and “false” graphs in Figure 3 suggest that perceptual details in the photographs (true and false) played a limited role in determining the content of subjects' memory reports. At both interviews, for each type of event, on average fewer than

30% of subjects' clauses were made up of information from the photograph. Interestingly, at Interview 1 there was no significant difference between the mean percentage of clauses that contained photo information in the false reports and the true reports [$t(61) = 0.69, p = .49$]. This lack of difference at Interview 1 suggests that true and false photos were processed similarly at first. At Interview 3, however, the false memory reports were less likely than the true memory reports to contain information from the photographs [$t(66) = -2.59, p < .05$]. Such a finding is unsurprising, given that the majority of detail in the false photo was fake and unfamiliar.

We wondered how the subjects might have incorporated detail from other cognitive processes to construct a “memory” for the suggested event. To address this issue, we classified the *beyond photograph* clauses, depicted in the white portion of the center graph, according to whether they were about the event setting (scene, timing, location, and duration of the event), feelings (emotional responses to the event), or perceptions (sights, sounds, smells, etc.), experienced during the events. The breakout graph on the upper right of Figure 3 shows that the subjects reported more information about the setting of the false event than they did feelings or perceptions. Although the proportion of *perception* clauses remained the same across interviews, the proportion of *feeling* clauses increased across interviews at the expense of *setting* information. The increased reporting of *feeling* clauses at Interview 3 suggests that the subjects developed more emotion about the false event over the course of the study.

DISCUSSION

Our results show that false photographs, like false narratives attributed to parents, can produce false memories of childhood experiences. Indeed, 50% of our subjects

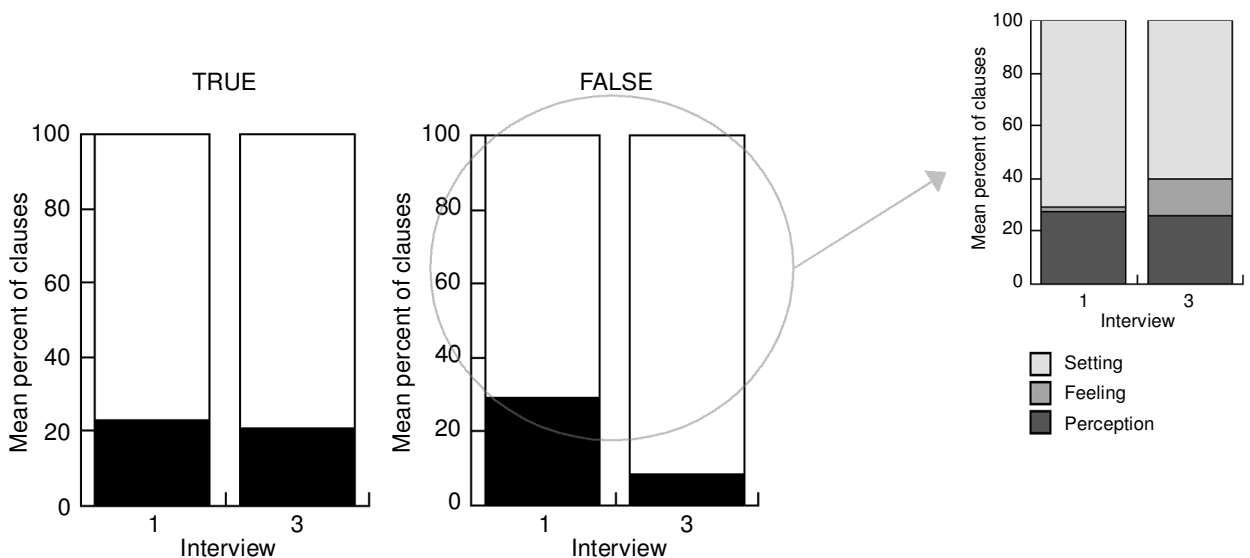


Figure 3. The larger graphs show mean percentage of clauses describing event detail that originated from the photograph (black) or from beyond the photograph (white). Breakout graph shows classification of *beyond photograph* clauses.

created false childhood memories, a rate higher than that of previous narrative studies, except for that of Porter et al. (1999). There are several differences between our study and prior studies using parental narratives, so we do not know whether false memories are more likely to emerge when the evidence is photographic rather than verbal. Future research should examine the relative potency of photographic versus verbal suggestion. Our results do demonstrate, though, that doctored photographs can lead to quite a high rate of false memory reports.

Recall that 35% of the subjects reported something about the false event at the end of Interview 1. Although we cannot directly compare the relative effects of photographs and narratives, we can use the existing narrative literature to speculate about the power of photographs. In the narrative research, the pattern has been for relatively few false memories to be reported at Interview 1. Recall has ranged from trivial (0%, Hyman et al., 1995, Experiments 1 and 2; 3%, Hyman & Billings, 1998; 6%, Hyman & Pentland, 1996, narrative-only condition) to 16% (Hyman & Pentland, 1996, narrative-plus-imagery condition) to a larger 29% (Loftus & Pickrell, 1995). Porter et al. (1999), using a method that most closely parallels ours, found that 20% of the subjects who went on to develop a complete false memory did so in Interview 1.²

Taken together, our results and those from narrative research suggest that photographs may require less constructive processing than do narratives to cultivate a false memory. How does the SMF account for such a finding? Photographs might provide subjects with a jumping off point, a leg up that makes it easier for them to conjure images, thoughts, and feelings associated with a genuine experience. Put simply, photographs are a denser representation of perceptual details. Although narratives are clearly powerful, text cannot capture this rich quality of information. Moreover, we believe that photographs are more reliable, more objective representations than narratives. During the first interview, the subjects often said something like, "Well, it's a photograph, so it must have happened" when looking at the hot air balloon photo. Perhaps, then, photographs do not require less constructive processing, so much as subjects are less likely to resist the accuracy of the photograph.

Our clause analysis indicated that the photograph played a limited role in determining the content of the false memories. Most of the details that the subjects reported were not explicitly depicted in the photograph: The majority of detail originated from guided-imagery exercises, imagination, and real life events. We speculate that the doctored photograph was accepted as authoritative evidence that the false event had occurred and in doing so, "planted the seed" of a false memory. It is also possible that the seeming authenticity of the photograph prompted the subjects to search their memory for event-consistent information. The results of our clause analysis fit with the view, endorsed by most contemporary memory theorists, that remembering is a constructive activity (e.g., Belli & Loftus, 1996; Jacoby, Kelley, & Dywan, 1989; Neisser &

Libby, 2000). In this view, remembering a past experience is not a matter of retrieving and "reading off" a previously stored, unified memory trace. Rather, the act of remembering a past experience involves generating thoughts, images, and feelings from multiple sources (such as distributed memory records, inferences, expectations, etc.) and attributing those thoughts, images, and feelings to a particular past episode.

Why should we care whether false photographs affect reported recollections of childhood? After all, in everyday life, people rarely encounter doctored photographs that depict them doing things they have never really done (but see Grumet, 1997). From a research perspective, we anticipate that the photo procedure will become a useful technique for examining the mechanisms that underlie false memory reports. For example, we can make predictions derived from the SMF (Johnson, 1988; Johnson et al., 1993) regarding the role of false photos in the creation of false childhood memories. One prediction is that lowering subjects' criteria for accepting feelings, thoughts, and images as memories will increase the rate of false recall. A closely related prediction is that increasing the similarity of true and false photos will increase the rate of false recall. A possible way to test this prediction is to manipulate the amount of "true" detail depicted in the false photo, such as the absence or presence of familiar background scenery and people. Would false reports be greater with richly detailed than with sparsely detailed photographs? Although this question is left for future research, we are confident that this new photograph procedure can be adapted in numerous ways to explore the predictions made by accounts that explain false memory phenomena.

On a more practical level, our research suggests that there are at least three questions that future research should address. First, can doctored photos induce people to testify about events that did not happen? Such a scenario is not as farfetched as it seems. An FBI photographic documents agent has warned that an "overzealous or dishonest" officer could photograph a crime scene, put those images onto a computer, and "a particularly damning piece of evidence could be later undetectably inserted into the images through an image processing program . . . I could see this becoming a problem" (Grumet, 1997, p. 98).

Second, when people gain access to new information about their past, what is the impact of that information on their personal identity, their sense of themselves? Research has found that the act of remembering experiences that do not fit with people's personal identity causes more change in how they see themselves than do memories that fit with their identity (Neimeyer & Metzler, 1994; Neimeyer & Raeshide, 1991). Perhaps that change would be accelerated or magnified if the incongruent remembering were accompanied by the evidence of a doctored photograph.

Finally, therapists who specialize in trauma memory often encourage their clients to peruse family photo albums as a means of "triggering" memories of childhood trauma (Dolan, 1991; Novey, 1999; Weiser, 1990; see also

Poole, Lindsay, Memon, & Bull, 1995). Viewing authentic childhood photographs while trying to recover traumatic memories may promote vivid visual images. Although some of these images are undoubtedly fragments of genuine experiences, others might be wholly fictional. Might these images—both true and false—subsequently be incorporated, along with products of suggestion and imagination, into illusory memories? This important question is a matter for future research.

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NOTES

1. Ceci, Huffman, and Smith (1994) also used the hot air balloon scenario as a verbal suggestion with 3-6-year-old children.
2. Unfortunately, Porter et al. (1999) provide data only for the 26% of subjects who developed a clear memory.

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