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Individual Differences and the Creation of False Childhood Memories

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We investigated if college students will create false childhood memories, the role of self-knowledge in memory creation, and if there are reliable individual differences related to memory creation. Based on information obtained from parents, we asked college students about several true childhood experiences. We also asked each student about one false event and presented the false event as if it was based on parent information. We asked the students to describe all events in two interviews separated by one day. When participants could not recall an event (whether true or false), we encouraged them to think about related self-knowledge and to try to imagine the event. In an unrelated experimental session, the students were administered four cognitive/personality scales: the Creative Imagination Scale (CIS), the Tellegen Absorption Scale (TAS), the Dissociative Experiences Scale (DES), and the Marlowe-Crowne Social Desirability Scale (SDS). We found that approximately 25% of the students created false childhood memories. Participants who made connections to related self-knowledge in the first interview were more likely to create false memories. We also found that the CIS and the DES were positively related to memory creation. Factors that decrease one's ability to engage in reality monitoring are related to the acceptance of false events and the creation of false memories.

INTRODUCTION

In response to a series of suggestive interviews, some children and adults will accept and eventually describe a false event as an autobiographical memory (Ceci, Huffman, Smith, & Loftus, 1994; Hyman, Husband, & Billings, 1995; Hyman & Pentland, 1996; Loftus & Pickrell, 1995). The fact that only some individual create false memories could be due to chance, something about the measurement of an individual in the particular context (e.g. the event used

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makes sense where another event would not for that person), or some characteristic of individuals that makes them more or less suggestible. If cognitive or personality differences predict the likelihood of creating false childhood memories, this may prove useful for interpreting recovered memories in the current repressed/false memory debate. In addition, knowledge of reliable individual differences would be useful for therapists considering the risks attached to using memory recovery techniques with particular clients.

Traditionally, research on eyewitness memory and memory errors has ignored individual differences (Hosch, 1994; Schooler & Loftus, 1993). Nonetheless, some researchers have looked at individual differences related to both the ability to accurately remember and recognise people (see Hosch, 1994) and the suggestibility of people in response to misleading information (see Schooler & Loftus, 1993). Researchers looking for individual differences related to suggestibility usually rely on some variant of eyewitness misinformation methodology. In misinformation studies, participants observe an original event (often they view a series of slides or a videotape depicting a crime or accident), are given misleading post-event information, and are later asked for their recollection of the original event. An error occurs if the participant indicates that the misleading post-event information was part of the original event.

Using the misinformation methodology, researchers have looked for demographic variables related to suggestibility. Younger children, for example, are more likely to incorporate misleading information into later reports (Ceci & Bruck, 1993; Schooler & Loftus, 1993). In other work looking at demographic variables, Loftus, Levidow, and Duensing (1992) found that occupation may be indicative of suggestibility: artists and architects were very susceptible to misinformation. Loftus et al. suggested imagery ability as the possible reason. Artists/architects may have a greater ability to clearly imagine the misleading suggestion and thus the suggestion may appear more real to them.

Other researchers have looked at cognitive and personality differences related to how suggestible an individual is. For example, Gudjonsson (1983, 1988) has argued that interrogator suggestibility is a trait related to low assertiveness, high neuroticism, willingness to lie for self-presentation purposes, low intelligence, and poor overall memory ability. In contrast, Loftus and her colleagues have been unable to find a relationship between suggestibility in response to misinformation and general memory ability (Tousignant, Hall, & Loftus, 1986) or intellectual ability (Powers, Andricks, & Loftus, 1979). In research looking at other measures of individual difference, Tousignant (1984, as cited in Schooler & Loftus, 1993) correlated several scales, particularly imagery scales and measures of social desirability, to suggestibility in the standard misinformation paradigm. Tousignant found that imagery ability is marginally related to suggestibility. One variable that has consistently been found to relate to suggestibility is hypnotisability (Barnier & McConkey, 1992; Labelle, Laurence,

Nadon, & Perry, 1990; Sheehan, Statham, & Jamieson, 1991a, 1991b). For example, Barnier and McConkey (1992) had high and low hypnotising participants view a slide series, and then, while either hypnotised or awake, the participants were given misleading suggestions. They found that hypnotisability, but not hypnosis, was related to the acceptance of misleading post-event information. Thus several cognitive/personality factors may relate to suggestibility in the standard misinformation paradigm.

Rather than use the standard misinformation methodology, we looked for cognitive and personality characteristics that might predict creation of a false childhood memory. Following other research in our lab (Hyman et al., 1995; Hyman & Pentland, 1996), we repeatedly asked college students about a false childhood event. The false event was presented as one of a series of events based on parent reports. The participants were told that the goal was to see how accurately they could recall the events and that their memories would be compared to their parents' reports. They were also told that they were expected to recall more events and more details about the events in the second interview. The interviewers encouraged the participants to imagine any event they could not immediately remember and to continue thinking about the events between the first and second interview.

In a separate testing session, unconnected to the memory interviews, the participants were given four cognitive/personality scales: the Creative Imagination Scale (CIS; Wilson & Barber, 1978); the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974); the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986); and the Marlowe-Crowne Social Desirability Scale (SDS; Crowne & Marlowe, 1960, 1964). The CIS was selected because it is a measure of hypnotisability, and hypnotisability has been found to relate to suggestibility (Barnier & McConkey, 1992). The CIS does not require trance induction and can be administered to small groups. In addition, the CIS is a self-report measure of the vividness of mental imagery, and mental imagery ability has also been linked to suggestibility (Loftus et al., 1992; Tousignant, as cited in Schooler & Loftus, 1993) and the experimental creation of images increases false childhood memory construction (Hyman & Pentland, 1996).

Two other scales, the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974) and the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986), were also selected in part because they are correlated with hypnotisability. Both were primarily selected because absorption and dissociation may themselves be related to memory suggestibility and creation. Absorption is how fully an individual becomes involved in some thought, experience, or object, and involves a component of being committed to memories and images (Roche & McConkey, 1990; Tellegen & Atkinson, 1974). Labelle et al. (1990) found that absorption was related to memory creation in hypnotised individuals. Thus an individual high in absorption may become very involved in the suggested false event and accept it as a personal memory. The DES measures the tendency to

have dissociative experiences, or disturbances of the normal integration of awareness, thought, memory, and personality (Bernstein & Putnam, 1986; Kihlstrom, Glisky, & Angiulo, 1994). Individuals who more frequently experience dissociations may be more accustomed to accepting external information as self-definitive and may be more willing to accept the suggested false events as personal memories.

As the social context of the memory interviews also plays a role in the acceptance of misinformation (Ceci, Ross, & Toglia, 1987; Chambers & Zaragoza, 1993; Dodd & Bradshaw, 1980; Greene, Flynn, & Loftus, 1982; Hyman et al., 1995), we chose a scale that purports to measure willingness to select a socially desirable response: the Marlowe-Crowne Social Desirability Scale (SDS; Crowne & Marlowe, 1960, 1964). The SDS measures the need to obtain approval by responding in a normal/acceptable fashion. The participants in the memory interviews were told that they were expected to remember more about the events with each interview. This was presented as an expected norm that participants might have seen as desirable in order to gain approval of both the experimenter and their parents (who supposedly provided the information).

In sum, our work had three goals. First, we intended to replicate previous work showing that college students will create false childhood memories in response to suggestions repeated across interviews (Hyman et al., 1995; Hyman & Pentland, 1996; Loftus & Pickrell, 1995). Second, we hoped to replicate Hyman et al.'s (1995) finding that accessing relevant self-knowledge in the first interview is related to false memory creation in later interviews. Third, we wanted to explore possible cognitive/personality correlates of false memory creation.

METHOD

Participants

The participants were recruited from introductory psychology classes at Western Washington University. A total of 267 students gave permission for us to mail a childhood events questionnaire to their parents. Parents returned 107 completed questionnaires by the end of the academic term (40% return rate). The students were asked to participate if their parents had described at least two events and if the questionnaire was returned with at least two weeks remaining in the quarter. Thus 83 were asked to participate in the memory interviews and 72 agreed to do so. Two participants did not complete both memory interviews and four were lost due to tape-recording failures, leaving 66 participants (29 male, 37 female) who completed both memory interviews; 48 of the participants (21 male, 27 female) also completed the individual differences measures. (As this was presented as a separate experiment, many students had completed their course experiment participation requirement and we experienced some difficulty in recruiting.)

Materials

Four scales were used to measure dimensions on which individuals differ. The Creative Imagination Scale (CIS) is a measure that combines vividness of mental imagery with responsiveness to suggestion (Wilson & Barber, 1978). Participants are asked to imagine 10 different items that involve visual, auditory, olfactory, and kinesthetic sensations (such as feeling that their arm is heavy, and the smell and taste of an orange). The descriptions that guide the images are very detailed. After all have been imagined, the participants rate the similarity between each imagined experience and the real experience on a 0–4 scale. Higher scores indicate a more vivid imagination and a stronger tendency to hypnotic susceptibility.

The Tellegen Absorption Scale (TAS) is a measure of the extent to which an individual becomes involved in everyday activities, such as getting caught up in music, being moved by poetic language, and forgetting one's surroundings while watching a movie (Tellegen & Atkinson, 1974). There are 34 true–false items and the more items identified as true, the higher the absorption score.

The Dissociative Experiences Scale (DES) is designed to measure the frequency of interruptions of the normal integration of consciousness, memory, and identity (Bernstein & Putnam, 1986). The scale consists of 28 self-report items from common experiences such as driving a car and realising you don't remember part of the trip, to more unusual experiences such as hearing voices in your head or being approached by apparent strangers and having them call you a different name. The items are rated on the frequency of occurrence so that higher scores indicate more of a tendency to experience dissociation.

The Marlowe-Crowne Social Desirability Scale (SDS) detects the tendency of individuals to present themselves in socially favourable terms and thus may measure conformity in response to some social pressures (Crowne & Marlowe, 1960, 1964). It is composed of 33 true–false items that assess if people endorse items concerned with positive self-presentation (I am always careful about my manner of dress, and no matter who I am talking to, I am always a good listener). Higher scores indicate a higher degree of desire for social approval.

A questionnaire regarding early childhood events was mailed to the parents of the students. Parents were asked to describe events that happened to their child between the ages of 2 and 10. As cues, the parents were given 10 categories of common events for middle-class American children: going to the hospital, getting lost, a family vacation, interaction with a prominent person, Loss of a pet, an eventful birthday, a car accident, weddings attended, winning a contest, and mischief with a friend. The parents were asked to describe one instance in categories with more than one occurrence. They were asked to provide their child's age at the time, what happened, where it happened, and the people involved.

Procedure

Memory Interviews. Upon the return of the parent questionnaires, the students were asked to participate in two interviews to assess their memory of early childhood events. The two interviews were generally scheduled one day apart (Monday–Wednesday, for example), were conducted by the same interviewer (one of three male and two female interviewers), and were tape-recorded. Each participant was asked about 2–5 true events (based on the parent questionnaire) and one false event. The false event was always the third event about which the students were asked. For this study all students were asked about the same false event: when you were 5 you went to the wedding of a friend of the family and at the reception you were running around with some other kids, bumped into the table holding the punch bowl, and spilled the punch on the parents of the bride.

In the first interview, the interviewer first told the participants that they would be asked about some childhood events based on information their parents had provided. The students were asked to describe all they could remember about the events. Each event was presented separately and was cued with an event title (such as eventful wedding), the student's age at the time of the event, event location, people involved, and one or two activities. When a participant could not recall an event (whether a true or false event), the interviewer encouraged (but did not require) the student to visualise how the event would have appeared to him/her.

At the end of the first interview, the participants were asked to continue thinking about the events they had been asked to remember. They were encouraged to attempt to remember more during the time period between the first and second interview and told that it is normal for more information about these events to return to memory. They were informed that they would be asked about the same events during the next interview and asked not to discuss the experiment with anyone.

During their second interview, the students were again asked about all events. During this interview, the participants were only given the name for the event; the details were supplied only in the case that they experienced trouble remembering the event. The students were told that it is normal and expected of them to remember more information during this session. Again, the students were encouraged to visualise events they could not remember.

The last portion of the final interview was the debriefing. The participants were asked to give a confidence rating for their memory of each event (scaled from 1, no confidence, to 5, very confident). They were also asked if they had talked to anyone during the experiment or had any knowledge that would prevent their responses from being used. The participants were told the purpose of this portion of the experiment and then information of the false event. They were told that it is normal for people to remember events that did not occur,

especially under these experimental conditions. They were asked not to talk about this project on campus.

Personality Measurement Session. In separate experimental sessions with a different set of experimenters (one male and one female) and under the name of a different faculty member, the students were given the four scales measuring individual differences. These scales were administered to groups of five or fewer, either two days prior to the false memory interviews or at least two days after (order of testing had no effect on scale scores or tendency to create a false memory and thus is not discussed further). The subjects were given the scales separately, in the order of CIS, SDS, TAS, and DES. The CIS was administered first because it take the longest to complete and requires the experimenter to read the 10 detailed items to be imagined. Each scale was administered on completion of each previous instrument by all the individuals in a group. The individual scale instructions were given verbally and in writing before each scale was administered. The students were given a short period of time between each scale to clear their thoughts. The administration of these scales took approximately 45 minutes per session.

RESULTS

In this section we describe the recall of the true events first and then the responses to the false events. We make some qualitative comparisons across the sections devoted to the true and false events to aid in understanding memory creation. In the final portion of the results section, we provide the correlations between the measures of individual differences and false memory creation. We looked for gender differences on all measures (recall of true events, false memory creation, and the individual differences variables) and found none. Thus we do not discuss gender any further in this paper.

Recall of True Events

The 66 participants were asked about 218 true events ($M = 3.30$, $SD = 0.66$). We scored each event as remembered or not based on the verbal descriptions the participants provided (two raters reached agreement on the scoring of each event). The participants recalled 161 (73.9%) of the events in the first interview and 186 (85.3%) in the second (see Fig. 1). (Failure to recall an event could be due to the student not remembering the event, the student choosing to not talk about an event that was recalled, or the parent making an error when recording the event.) Of the 57 events that were not recalled in the first interview, 25 (43.86%) were recalled in the second interview. The recall of the previously forgotten events could be the result of repeatedly thinking of the event (a form of hypermnesia) or these recovered memories may have been created in response to the demands of the interview. For ease of writing we refer to these 25 memories

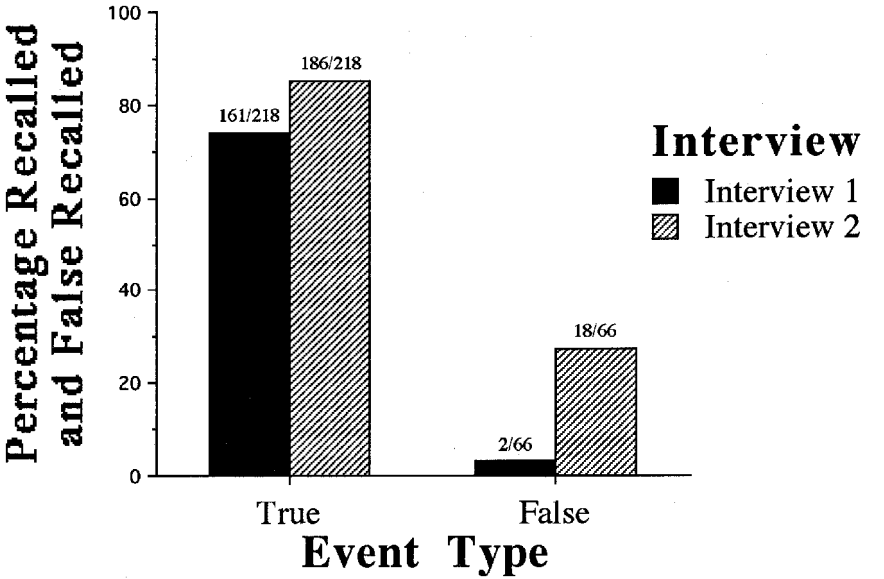

FIG. 1. The percentage of true and false events recalled in interviews 1 and 2.

as recovered, but they may well be creations in response to the interview demands. We note this because of the difficulty in distinguishing these recovered memories from the memories created in response to the false events. Tables 1 and 2 provide examples of a recovered memory and a false memory (these examples were chosen for brevity and representativeness). We find little difference between the verbal reports of the students in these examples or in the remainder of the recovered and false memories.

Given the recall rates for the true events in the two interviews, there were 161 that were recalled in both interviews, 25 that were not recalled in the first interview and recalled in the second (recovered memories), and 32 events that were recalled in neither interview. As expected, age at the time of the event was related to whether the event was recalled, $F(2,215) = 14.582$, $P < .001$, $MSe = 1.774$. Tukey's follow-up comparisons indicated that those events recalled in both interviews ($M = 4.55$, $SD = 1.32$) had a significantly older mean age than those events recalled in neither ($M = 3.28$, $SD = 1.33$) and those recovered by interview two ($M = 3.72$, $SD = 1.43$). There was not a significant difference in age between those not recalled and those recovered.

If we use these data to provide a childhood amnesia cut-off age (the earliest age from which people can recall a childhood event), we obtain different ages from the two interviews. Usher and Neisser (1993) assigned as amnesia off-set that age at which half of the subjects recalled something about the event in question. In the first interview, only 6 of 25 age-2 events were recalled, 33 of 42

TABLE 1
An Example of a Participant Recovering a Memory of a True Event

First Interview

I: This is mischief at age 5, you took the goldfish out of the fish tank and gave it a kiss

S: [laughs and interrupts] I don't remember doing that.

I: You don't?

S: No [laugh], took the goldfish out.

I: Do you remember the name of the goldfish?

S: It was like tank or something like that. I sort of remember when it died. I don't remember giving it a kiss. I remember my parents talking about that vaguely, but ...

I: About the fish?

S: No, me taking the fish out, I don't remember doing it.

I: Somehow it ended up on the floor under the couch and your mom, or whoever filled this out, scooped it up.

S: Probably my mom [laugh] do I get to read these things after you guys are done?

I: Yes, you can if you want.

S: I don't remember doing that.

Interview 2

I: The last one is mischief at age 5

S: The fish incident. I remember the fish tank that it was in cause we have a new, in the house now there is a big fish tank that we had but wasn't, I don't think the fish was in that fish tank when I took it out. It was in the smaller, like the one we have now is like a big one, it is like this big, it is tall and sort of octangle, whatever, like it has six sides, but the one it was in before was like a square one you know, you picture a fish tank and it rectangle right? It was in one of those and I sort of remember the fish flapping around on the ground. I don't remember wanting to give it a kiss, but I remember the fish being on the ground. It didn't really occur to me that it was bad for the fish. It was just like I was having fun I guess.

I: Can you think of anything else?

S: Hmm, I think the fish was probably like you know, I remember when it was really big, yeah, when a couple of later it was like this big but I think it was only like that big or so when I took it out. It wasn't that big. That's pretty big for a goldfish, we had it a long time. It was probably pretty old.

I: OK

age-3 events, and for all older ages well over half of the events were recalled. Thus using the first interview and Usher and Neisser's approach, we would select 3 as the age at which memories emerge from childhood amnesia. In the second interview, however, 14 of the 25 age-2 events were recalled and 36 of the 42 age-3 events. This suggests that 2 may be the lower bound of childhood amnesia. As parents did not provide events from earlier ages (due to our underlying bias that such events would not be retrievable), we can not assess age 1 or the first year of life. Of course, interpretation of these data depend on one's view of the recovered memories—are they recovered memories or created memories?

We also found that the participants' reported confidence, scaled from 1 (low) to 5 (high), related to recall, $F(2,215) = 84.33$, $P < .001$, $MSe = 1.01$. For events not recalled in either interview the mean confidence was 1.38 (SD = 0.91), for

TABLE 2
An Example of a Participant Creating a Clear Memory of a False Event

First Interview

I: Next one I have looks like an eventful wedding reception, and looks like you were 5 years old. You're at a wedding of a family friend, playing with some other kids, while you're running around uh you bump into a table and spill punch on the parents of the bride.

S: [laughs[I don't remember that either. That's pretty funny though. [laughs]

I: [laughs] Yeah, that seems that would be kind of eventful, I'd say.

S: Yeah, God, maybe my mom never talks about these. She never talked about, she's never told me about that, gees, that's funny. A wedding, I wonder whose wedding it could be . . . man, I want to talk to her and find out where she's getting these, cause . . . , a wedding reception. I can totally see myself like running around with kids and stuff and ah, bumping into a table? Oh yeah, I would do that.

I: You could see yourself doing that?

S: Oh yeah, I can see that but um, maybe not at a wedding, maybe it was at a um like a big get together like a big picnic or something that's what I'm more picturing, something like that.

[A little more discussion of imagining an outdoors wedding reception, but no memory.]

Interview 2

I: The next one I have is an eventful wedding reception at age 5.

S: Yeah, I thought about this one too, but I still can't really picture who the friends are but I do think it's a friend of my mother's. I definitely think it's a friend of my mother's for some reason, and the people I spilled punch on, I picture them to be a heavy set man, not like fat but like tall and big kind big beer belly, and I picture him having a dark suit on, like greyish dark and like having greyish dark hair and balding on top, and uh I picture him with a wide square face and I just picture him getting up and being kind of irritated or mad, then the woman, I see her in a light coloured dress that has like flowers on it, I think I see flowers on it and stuff, and I see like a big red punch thing down the front of them, can see that. Her hair hadn't turned grey yet, it was still dark, it was brown.

I: OK, can you describe the location?

S: Um they were near a tree, I'm almost sure about that. Like the table was a round table with a couple of chairs sitting around it and they were under the shade of a tree. They were right there and there were some drinks on the table, yeah, I think there was just drinks on the table, I don't think there was an actual pitcher or anything. I think I when I just bumped the table or maybe I bumped the glasses or something, it kind of just spilled on them, so I think what I did was I bumped the table, I like bumped the table and the glasses tipped over on them.

[Some further discussion of the reception and what the participant was wearing.]

recovered events $M = 2.44$ ($SD = 1.08$), and for events recalled in both interviews $M = 3.76$ ($SD = 1.01$). Tukey's follow-up comparisons indicated that all comparisons were significant ($P < .001$).

Responses to the False Event

Each of the participants was asked about one false event. As can be seen in Fig. 1, two of the participants (3.03%) provided a false recall in the first interview and 18 (27.27%) did so in the second. We further classified the responses in the second interview as clear false memories, partial false memories, trying but no memory, and no memory (see Human & Pentland, 1996). Clear false memories included the critical information of spilling the punch and generally provided

consistent elaborations and details of the event (see Table 2 for an example). Partial false recalls included consistent elaborations (such as reports of punishments and feelings), some details of the wedding reception, but no memory of actually spilling the punch. Trying but no memory participants discussed weddings they recalled attending and often described images of the punch bowl event, but would not claim the images as memories. No memory participants essentially refused to attempt to recall the event. Three independent raters classified all 66 responses to the false event. All three agreed on the classification of 82% and the remainder were resolved through discussion. Clear false memories were provided by 10 participants, partial false memories by 8 participants, trying but no memory responses by 18, and no memory by 30.

Confidence was related to the degree of false memory creation, $F(3,62) = 3,62) = 5.10$, $P = .003$, $MSe = 1.02$. Tukey's follow-up comparisons ($P < .05$) indicated that participants with clear false memories rated their confidence ($M = 2.60$, $SD = 1.27$) significantly higher than participants with no memory ($M = 1.40$, $SD = 0.89$) and that participants trying for memories ($M = 1.33$, $SD = 0.69$). Participants with partial false memories ($M = 2.25$, $SD = 1.58$) did not differ significantly from any of the other groups. The confidence in false recalls (for both clear and partial) is comparable to the confidence subjects displayed in recovered memories ($M = 2.44$ as noted previously). This adds to the difficulty of discerning recovered from false memories and thus to the difficulty of deciding if the recovered memories we obtained are truly recovered or actually created in response to the interviews.

We scored the responses to the false event in the first interview for the presence of relevant self-knowledge. Following earlier work (Hyman et al., 1995), self-knowledge was defined as any information the participant provided about their childhood that could have been related to spilling punch at a wedding reception. For example, participants noted whose wedding it could have been, where the event could have occurred, weddings they actually attended, descriptions of themselves (e.g. I could have done something like that, I was a wild kid), descriptions of family members, and other information that tied themselves to the false event. We scored information as self-relevant even if it was used to deny spilling a punch bowl (e.g. I couldn't have done that, because my family would never have let me forget it). Table 3 shows the distribution of no memory, trying with no memory, partial false memory, and clear false memory for those who did and did not describe relevant self-knowledge in the first interview. Replicating previous work Hyman et al., 1995), we found that participants who discussed relevant self-knowledge in the first interview were more likely to create false memories than those who did not, $\chi^2(3) = 18.44$, $P < .001$. (We also looked at the role of self-knowledge in creating false memories with false memories used as a dichotomous variable—yes, including clear and partial false memories, and no, including no and no but trying. Of the 46 who discussed self-knowledge, 17 created false memories of some sort while

TABLE 3
Responses to the False Event

	Talked about Self-relevant Knowledge	
False Event Response	*No*	*Yes*
No memory	17	13
No, but trying	2	16
Partial false memory	0	8
Clear false memory	1	9

How participants responded to the false event based on whether they talked about any self-relevant knowledge in the first interview.

only 1 of 20 who did not discuss self-knowledge created a false memory, $\chi^2(1) = 7.18$, $P = .007$.)

In addition to investigating the role of accessing self-knowledge, we looked at other characteristics of the interviews that might have been related to memory creation. For the purposes of conducting correlational analyses, we scored the response to the false event as 1 for no memory, 2 for no memory but trying, 3 for partial false memory, and 4 for clear false memory. From the interviews, we scored three variables based on the true events: the number of true events about which the participants were asked (as we noted earlier, this depended on the number described by the parents and varied between two and five), the proportion of the true events that the participants recalled, and the average number of words the participants used in responding to the first two true events in the second interview (only the first two events were used in computing this average because all participants were asked about at least two events). We also scored two variables based on the responses to the false events: the number of words used in responding to the false event in the second interview and whether or not the participants accessed relevant self-knowledge in the first interview (this is the same variable just analysed for its role in memory creation and is included here primarily to observe variables related to it[1]). The correlation matrix is presented in Table 4.

This set of correlations shows a fairly straightforward pattern: individuals who participate in interviews in which they talk more in response to each event are most likely to create false memories. In the second interview, the number of words used in response to the true events was highly related to the number of

[1] Instead of simply scoring relevant self-knowledge as a dichotomous variable, we also counted the number of words used in describing relevant self-knowledge. We then correlated memory creation to both the dichotomous measure of self-knowledge ($r = .437$) and the number of self-knowledge words ($r = .338$). The dichotomous variable appears to more fully capture the role of accessing self-knowledge—any access increases the likelihood of memory creation. Thus we rely on the dichotomous measure.

TABLE 4
Correlations among False Memory Creation and Variables Derived from the Interviews

Measure	*FM Creation*	*N-True*	*P-True*	*W-True*	*W-False*
FM Creation	—				
Number of True Events (N-True)	–.116	—			
Proportion of True Events Recalled (P-True)	.164	–.060	—		
Words Used in True Events (W-True)	.519**	–.336**	.260*	—	
Words Used in False Event (W-False)	.512**	–.255*	.035	.729**	—
Self-Knowledge	.437**	–.301*	.121	.385**	.398**

* $P < .05$
** $P < .01$

words used for the false event. Both of these measures were related to accessing self-knowledge in the first interview and to false memory creation. In general, when people are asked about more events they provided less information in response to each event. We emphasise caution in interpreting these results. We found that people who talked more in this pair of interviews were more likely to create memories, but we have no way of ascertaining if this is indicative of general talkativeness. Instead we suspect that it is a question of the match among experimenter, participant, and task. One possible interpretation is that when participants said more, the scorers were led to believe the participant was experiencing a false memory. As scoring for a false memory was based on the presence of certain indicators, we doubt that that was the primary source of the correlation. (Nonetheless, some of the correlation could have been due to categorising more talking, even in the absence of the indicators of a false memory, as at least trying to create a false memory as opposed to a simple no. Thus we computed the correlations with false memory as a dichotomous variable—combining no memory with no memory but trying, and partial with clear false memory. Doing so resulted in little change in the correlations to the number of words used for true events, $r = .486$, and the number of words used for the false event, $r = .565$.) We think that participants who talked more in this context spent more effort integrating the suggestion with self-knowledge and constructing an image and narrative. This led to difficulty in distinguishing the false event from a memory.

Individual Differences and False Memory Creation

Of the 66 participants, 48 also supplied scores on the four measures of individual differences. For the Creative Imagination Scale (CIS) the mean was 18.81 ($SD = 5.93$), for the Tellegen Absorption Scale (TAS) the mean was 20.27

($SD = 6.85$), for the Dissociative Experiences Scale (DES) the mean was 20.95 ($SD = 12.84$), and for the Social Desirability Scale (SDS) the mean was 13.42 ($SD = 5.37$). For the DES, the mean is somewhat higher than is typically reported for college students. As Kihlstrom et al. (1994) noted, however, administering the TAS prior to the DES tends to elevate scores on the DES.

The scores were correlated with false memory creation (scaled 1 for no memory, 2 for no memory but trying, 3 for partial false memory, and 4 for clear false memory) and with the other measures derived from the interviews. Table 5 provides the correlations. Both the Creative Imagination Scale (CIS) and the Dissociative Experiences Scale (DES) were significantly positively correlated with false memory creation—higher scores on the CIS and the DES were related to a higher false memory score. Neither the Social Desirability Scale (SDS) nor the Tellegen Absorption Scale (TAS) was significantly related to false memory creation. There were significant correlations among CIS, DES, and TAS, but SDS was correlated with none of the other scales. Interestingly, with the exception of the DES, none of the scales was significantly related to the measures drawn from the interviews. The DES was related to measure of talking about both the true and the false events, indicating that high scores on the DES may relate to willingness to engage in constructive memory processes. The CIS, in contrast, may indicate some other process not picked up by the nature of the interviews—such as the clearness of mental images that leads to difficulty in discerning created images from remembered experiences.

TABLE 5
Correlations among Cognitive/Personality Scales, False Memory Creation, and Measures Derived from the Interviews

Measure	*CIS*	*TAS*	*DES*	*SDS*
CIS	—			
TAS	.504**	—		
DES	.599**	.599**	—	
SDS	–.040	.028	–.036	—
FM Creation	.361*	.231	.482**	–.144
Number of True Events	.054	–.063	.041	–.028
Proportion of True Events Recalled	.145	.001	.159	–.030
Words Used in True Events	.167	.040	.358*	–.300
Words Used in False Event	.139	.097	.344*	–.092
Self-Knowledge	.254	.252	.216	.078

* $P < .05$
** $P < .01$

DISCUSSION

We found that 27% of the participants created false childhood memories in response to the repeated false event (15% were clear false memories and 12% were partial false memories). This not only replicates the creation of false memories in this type of interview context, but also closely mirrors the percentage of false memories observed in Hyman et al. (1995) and Loftus and Pickrell (1995). Hyman and Pentland (1996) found, however, that with more interviews and the use of imagery techniques the proportion of memory creation was higher. We suspect that with greater social pressure or the use of memory recovery techniques (such as guided imagery, group therapy, hypnosis, confirming memories and disconfirming doubts, etc., see Lindsay & Read, 1994), the proportion of individuals who create false childhood memories would increase. Conversely, under conditions where participants are told to attend more closely to issues that raise doubt (such as noting inconsistencies and attending to the source of the information) the proportion who create false memories should decrease. The proportion who actually create false memories is less important than the demonstration that false memories occur and the understanding of conditions that increase or decrease the likelihood of memory creation.

An important limitation of this style of research is that neither the interviewers nor the scorers are blind to which event is the false event. Having blind interviewers and scorers is difficult without using as many false events as there are subjects. Using the many different false events is difficult to do in a fashion that provides events that are consistently unlikely to have occurred yet are plausible (pilot work in our lab found this to be very difficult to accomplish—see Hyman et al., 1993). Loftus and Pickrell (1995) removed the interviewer (participants responded in writing for the first two interviews) as a means of alleviating one of these problems. Instead we have tried to structure the interviews to ensure that the false memories are treated like the true events (for example, the number of words used in response to the false event did not differ from the average number of words used in responding to the true events in the second interview, and several of the true events that were not originally recalled were eventually recovered). In addition, we look for particular verbal indexes in order to declare responses to be false events, measure reliability of the coding of the responses to the false events, and try to err on the conservative side when resolving differences. These methodological limitations mean that some of the false memories may be a result of biased interviewing or scoring errors. This again points to less emphasis on the exact proportion of participants who created memories, the goal of understanding factors that relate to memory creation, and the importance of similar findings by other researchers (e.g. Kelley, Amodio, & Lindsay, 1996; Loftus & Pickrell, 1995).

Replicating Hyman et al. (1995), we also found that participants who discussed relevant self-knowledge in the first interview were more likely to

create a false memory by the second interview. Individuals who think about self-knowledge make an association between that knowledge and the false event, perhaps even storing the false event with the self-knowledge. When they later think of the false event, they also access the related self-knowledge and construct a memory that combines the false and real information—a form of schematic reconstruction (Bartlett, 1932; Hyman et al., 1995; Loftus & Pickrell, 1995). As some of the memory that individuals reconstruct is based on self-knowledge, this makes reality monitoring decisions more difficult (Johnson, Hashtroudi, & Lindsay, 1993). This finding has implications for memory recovery therapy if therapists ask clients to think of the question of child abuse in terms of their own life history (such as imagining the abuse in their house, thinking of who could have done it, looking at old photographs, visiting childhood sites, and recalling other childhood memories). In this situation clients may make a connection between abuse suggestions and self-knowledge. They then may be more likely to accept that they were abused and later construct a memory of the abuse—even if they were not abused.

In addition to demonstrating the role of self-knowledge, we also found that other features of the interviews are related to the creation of false memories. In particular, participants who talked more, both in response to the true and the false events, were more likely to access self-knowledge and to create false memories. Again, this may be indicative of engagement in constructive memory processes.

Interestingly, we found that the CIS and the DES were related to false memory creation. As the CIS involves suggested images and is a measure of hypnotisability, it is difficult to say which factor is associated with memory creation. Both factors may be related to false memory creation, as both imagery (Loftus et al., 1992; Tousignant, as cited in Schooler & Loftus, 1993) and hypnotisability (Barnier & McConkey, 1992; Sheehan et al., 1991a,b) have been found to be associated with suggestibility in more traditional eyewitness memory studies. The DES association to memory creation suggests that people with dissociative tendencies may be more accustomed to integrating external information to their self-concept and may use less stringent standards of reality monitoring. This association is troubling given that high scores on the DES are indicative of Dissociative Identity Disorder (Kihlstrom et al., 1994). If people with dissociative tendencies are more suggestible, then deciding if their recovered memories and discovered personalities are real or creations becomes increasingly important.

Differentiating between recovered true memories and created false memories, however, does not appear possible at this juncture (Ceci et al., 1994; Lindsay & Read, 1994). We have not been able to identify any obvious distinctions in the verbal reports individuals provide (see Hyman & Pentland, 1996). In addition, the confidence participants displayed in the recovered true memories and the created false memories was nearly identical. Further complicating this issue, we

have no way of ascertaining if those memories that were recovered in response to true events were actually memories or creations in response to the interview demands. The inability to discern if the recovered memories are personal memories also has ramifications for understanding research concerning childhood amnesia. As many of the recovered memories were for early events (age 2 and 3), establishing an offset age for childhood amnesia in this data set depends on whether we look at the first or second interview. Establishing the age of earliest memory will always be problematic if an individual has had access to external information (such as family stories, photographs, and videotapes; see Usher & Neissesr, 1993). Is an individual's earliest memory a personal autobiographical memory or a story that has been adopted as a memory?

In many respects, the source of the memory does not matter if a person considers the event part of the narrative truth of his/her life (Spence, 1982). An individuals' self-concept is dependent on autobiographical memories and our research adds to the view that the remembered self is a construction created in the present act of remembering (Bruner, 1986, 1987; Fivush, 1994; Hyman & Neisser, 1992; Hyman & Pentland, 1996; Neisser, 1988; Neisser & Fivush, 1994; Spence, 1982). Memories are reconstructed to fit one's current view of oneself. External stories may also be adopted as personal memories—all of us have some memories that we are unsure are personal memories or frequently told family stories that we now accept as memories. Based on the somewhat unusual events we asked about, we suggest that the remembered self is very malleable. In addition, given the popular press examples of dramatic memories claimed as creations, it appears that there may be few limits as to how extensively the remembered self can be altered given the right pressures (see, for example, the Ingram family as described by Wright, 1993a,b).

In other respects, the source and the historical truth of a memory do matter if an individual is going to take action based on the memory. For this reason it is important to apply this line of research to the therapy context. We (Hyman et al., 1995) and others (Lindsay & Read, 1994; Loftus, 1993) have previously noted that there are many differences between this type of research and memory recovery therapy—some of which make memory creation in therapy less likely and others that may make memory creation more likely. We also think it is important to acknowledge that some individuals have always had memories of abuse and that therapists may have an ethical obligation to address such memories as they are related to the client's presenting problems (see Harvey & Herman, 1994). Other people forget childhood abuse (Williams, 1994) and, as adults, some individual recover memories of child abuse (Briere & Conte, 1993; Loftus, Polonsky, & Fullilove, 1994). Unfortunately, some individuals create false memories of abuse in response to suggestions in therapy or the media, and several aspects of therapy focused on memory recovery may increase the risk of memory creation (Hyman & Loftus, in press; Lindsay & Read, 1994; Loftus, 1993). We have found that repeatedly asking about false events in a context that

assumes the events are true, making connections between false events and related self-knowledge, and certain cognitive/personality traits increase the likelihood of false memory creation. Given the risks attached to memory recovery therapy, the lack of symptoms clearly indicative of childhood abuse in the absence of memories of abuse (Lindsay & Read, 1994), and the inability to differentiate between recovered and false memories, therapists may want to severely limit the search for child abuse memories in clients with no such memories.

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