

## Changing Beliefs About Implausible Autobiographical Events: A Little Plausibility Goes a Long Way

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Three experiments investigated the malleability of perceived plausibility and the subjective likelihood of occurrence of plausible and implausible events among participants who had no recollection of experiencing them. In Experiment 1, a plausibility-enhancing manipulation (reading accounts of the occurrence of events) combined with a personalized suggestion increased the perceived plausibility of the implausible event, as well as participants' ratings of the likelihood that they had experienced it. Plausibility and likelihood ratings were uncorrelated. Subsequent studies showed that the plausibility manipulation alone was sufficient to increase likelihood ratings but only if the accounts that participants read were set in a contemporary context. These data suggest that false autobiographical beliefs can be induced in clinical and forensic contexts even for initially implausible events.

Many studies have shown that people can be led to believe that they experienced events, when in fact, they did not. People have been led to believe that they were born left-handed (Kelley, Amadio, & Lindsay, 1996), that they spilled punch at a wedding (Hyman, Husband & Billings, 1995), that they broke a window with their hand (Garry, Manning, Loftus, & Sherman, 1996; Heaps & Nash, 1999), or that they got lost before age 3 (Mazzoni, Loftus, Seitz, & Lynn, 1999). These and other examples indicate how powerful suggestions can be in terms of making people believe that they had childhood experiences that they probably did not have.

### Plausibility and False Memories

It has been argued that there are limits to the types of events or beliefs that can be suggestively implanted, and that only events that are plausible can be implanted in memory (Hyman, Gilstrap, Decker, & Wilkinson, 1998; Hyman & Kleinknecht, 1999; Lindsay & Read, 1994; Pezdek, Finger, & Hodge, 1997). In support of this hypothesis, Pezdek et al. (1997) reported successfully implanting a memory of being lost in 15% of participants, but being unable to implant a memory for a less plausible event (receiving a

rectal enema). In a separate experiment (Pezdek et al., 1997), Jewish and Catholic participants received suggestions that as children, they had participated in Jewish Sabbath and a Catholic Communion. Participants were less susceptible to the suggestion that they had experienced a ritual foreign to their religion, rather than a ritual common to their religion. Only 3 of 29 Catholics (10%), and none of the Jewish participants, fell sway to the suggestion that they had participated in a foreign ritual, whereas larger percentages accepted the false suggestion that they had participated in a religion consistent ritual. Thus, the study showed that most participants resisted implausible suggestions.

Studies demonstrating the acceptance of false memory suggestions have been cited as indicative of the process by which false memories may be created in therapeutic and forensic settings (Loftus, 1997; Mazzoni, in press). However, some of the apparent memories created in these settings are for implausible events. People have not only developed memories for such implausible events as satanic ritual participation and alien abduction (Mack, 1994), but also for events that could not possibly be remembered, such as concrete narratives about the day after birth (Spanos, Burgess, Burgess, Samuels, & Blois, 1999). Given the data reported by Pezdek et al. (1997), how is it that false memories for implausible events can be created? The solution to this dilemma resides in the recognition that the perceived plausibility of an event may not be fixed. We hypothesized that memories of implausible events were implanted in these cases because the specific individuals either (a) already believed that the events were plausible, or (b) were led to believe that those events were plausible. Thus, if an event is seen as more plausible, then this should pave the way for allowing its acceptance as having occurred.

We propose a three-step model for the development of false memories. First, the event must be perceived as plausible. Second, individuals must acquire the autobiographical belief that it is likely

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to have happened to them. Third, individuals must interpret their thoughts and fantasies about the event as memories. This study is concerned with the first two of these three factors: perceived plausibility and the likelihood of the event having occurred to the person, as well as the relation between these two factors.

The purpose of this study was to test the hypotheses that (a) the perceived plausibility of an event can be changed by suggestive influence and (b) when plausibility is increased, further suggestive influence can increase ratings of the likelihood that an initially implausible event has occurred. Confirmation of these hypotheses would be consistent with the results of Pezdek et al. (1997) and would reconcile those data with data indicating the implantation of false memories for events generally seen as implausible. Thus, if we could make an event appear to be more plausible, then we would enhance the likelihood that a person might come to believe it was true for them personally.

### Overview of the Present Studies

In the first of three studies, people were recruited who (a) had not experienced the implausible event of witnessing another individual being "possessed" and (b) believed that such an experience was highly implausible. Much later during the second session of the study, some of these individuals were subjected to "plausibility" and "personalized suggestion" manipulations. For the plausibility manipulation, participants were provided with three mini-articles about possession, designed to enhance the subjective plausibility of possession and to increase the plausibility of the experience for each specific participants. The mini-articles gave information about the frequency of possession, suggesting it was more common than previously believed. The articles stressed the relative frequency of this phenomenon in the socioeconomic and cultural populations to which the participants belonged. Additionally, the articles provided stories, ostensibly experienced by other individuals, who had witnessed possession. After this plausibility manipulation (i.e., reading the articles), these participants went through a personalized suggestion procedure in which they took a test to measure their personal fears, and their "fear" data were interpreted as indicating that they may well have had the experience of witnessing possession. Finally, during the fourth and final session, participants rated the plausibility of witnessing possession, and indicated whether this had happened to them. To anticipate our results, we found that relative to controls, participants who received the intervening information came to believe that possession was more plausible and also increased their confidence that they had witnessed possession.

In Experiment 2, we explored whether the mini-articles alone (without the personalized fear interpretation) could similarly produce changes in plausibility judgments and autobiographical beliefs. Finally, in Experiment 3, we examined variations on the type of mini-articles read by the participants. We wanted to assess whether setting the event in a cultural and historical time different from that of the study participants would also affect plausibility judgments and autobiographical beliefs.

There were several reasons for selecting the specific critical event (witnessing possession) for use in this research. First, belief in possession has emerged in the treatment of a number of therapy patients (Loftus, 1997; *Modi v. West Virginia Board of Medicine*, 1995; *Olson v. Morris*, 1999). Second, the participants in this

research were young Italian adults. In Italian culture, the notion of possession is not so impossible as to be laughable, as would be, for example, the idea that your body turned forest green during your early childhood. However, possession is sufficiently implausible to be rated low in plausibility by most individuals. Therefore we hoped that, in choosing this item, severe floor effects would not impede our ability to demonstrate the malleability of plausibility and its concomitant effect on autobiography.

### Experiment 1

In Experiment 1, we examined the effects of a plausibility manipulation and a personalized suggestion on the perceived plausibility of an event and on ratings of the likelihood that it has occurred to the individual. Participants were divided into three groups. In one group, the manipulations were aimed at an initially implausible event (Witnessed Possession). In the second group the manipulations were aimed at an initially plausible event (Almost Choked). This allowed us to compare the effects of the suggestion on a naturally plausible event with the effects on an event whose plausibility had been experimentally enhanced. The third group received no experimental manipulation and provided a control for spontaneous changes in plausibility and likelihood ratings. We hypothesized that the manipulations would enhance the plausibility of the initially implausible event and would increase likelihood ratings for targeted events, regardless of whether they were initially plausible.

### Method

**Participants.** Participants were 65 undergraduate students from the University of Florence, drawn from a larger pool of 430 students who had completed rating scales in a mass-testing session, and they were invited for further participation on the basis of their responses on the scales. Random assignment resulted in 12 women and 10 men in the Possession group, 13 women and 9 men in the Choking group, and 11 women and 10 men in the Control group.

**Materials and procedure.** The experiment was conducted in four phases. Phase 1 was a mass-testing session, during which participants rated how plausible it was for individuals like them to have experienced each of a set of 40 events. The scale ranged from 1 (*highly implausible*) to 8 (*highly plausible*). Participants were then given a Life Events Inventory (LEI) containing 36 of the events on the plausibility scale. For each event, participants were asked to rate how certain they were that it actually had happened to them before the age of 3 (likelihood ratings). The scale ranged from 1 (*certain the event had not happened to them*) to 8 (*certain the event had happened to them*). Participants were invited to participate in the second phase of the experiment if they had given (a) low plausibility and likelihood scores (1 or 2) on the Witnessed Possession event, and (b) a high plausibility score (greater than 5) and a low likelihood score (1 or 2) on the Almost Choked event.

Phase 2, held 3 months later, presented the plausibility manipulation. This phase was skipped by participants in the control group. Participants assigned to the Possession group read 12 mini-articles about each of four different topics. Randomly placed within these 12 mini-articles were 3 articles that dealt with the topic of possession. The other 9 mini-articles concerned other topics (e.g., romantic relationships, work experiences, and the public health system). In the Choking group, participants were treated exactly like those in the Possession group, except the content of 3 of the mini-articles concerned various aspects of swallowing an object and choking. Participants in both groups were told that the purpose of the task was to assess the readability and writing style of various types of passages taken

from scientific and nonscientific journals. For each article, participants evaluated how convincing and compelling it was, and how relevant it was to the topic under consideration. The articles were prepared so as to appear unconnected (i.e., taken from independent sources).

The three articles on possession were no longer than one page each. One article presented the idea that possession is quite common in the general population—especially in the Italian culture—and that witnessing possession is also common. Another article conveyed the idea that many children have witnessed possession. The article included a description of what happens in a typical possession experience (e.g., St. Vitus's dance, convulsing, falling down, foaming at the mouth, swearing, vomiting hair, and spontaneous movement of objects), and falsely conveyed the idea that adults will sometimes display symptoms of possession in front of young children under the belief that they can freely do this and the children will not remember later on. The third article contained interviews with adults describing their memories of early childhood, which included witnessing strange behaviors consistent with possession.

Phase 3 occurred 1 week after the articles had been read and contained the personalized suggestion manipulation. Like Phase 2, Phase 3 was limited to participants in the Possession and Choking groups. The experiment was conducted on an individual basis so that more personalized suggestions could be delivered. Participants completed a questionnaire about their fears. Participants in the Possession group received false feedback on the responses and were told that their fear profile was a sign that witnessing possession had probably happened to them in early childhood (before age 3). The fear profile of participants in the Choking group was interpreted as a sign that nearly choking had probably happened to them in early childhood.

Phase 4 took place 1 week after the end of Phase 3. Participants were asked to rate the plausibility of the events (the same 40 events as during the mass-testing session) and to again complete the LEI on the same subset of 36 events.

Finally, the 65 participants who completed all phases of the experiment were debriefed as follows. Participants were told that the aim of the study was to assess conditions under which an implausible event can become more plausible. The goal of the study, they were told, was to assess the role of three factors on the subjective plausibility of an event: (a) information about how common the event is, (b) personal reports by others who have apparently experienced the event, and (c) false feedback about personality characteristics from the fear profile administered in Phase 3. Participants were also told that a goal of the study was to assess whether changes in perceived plausibility were related to increases in confidence that an event might have been personally experienced and why such a hypothesized relationship might be predicted. Participants were invited to contemplate why their own scores might have changed (if they did). They were encouraged to appreciate the potential value in participating in this study, which could make them more aware of possible influences on their own belief systems.

## Results

**Plausibility.** Mean pre- and postmanipulation plausibility scores are displayed in Table 1. A 3 (Group)  $\times$  2 (Event)  $\times$  2 (Time of Testing) analysis of variance (ANOVA) yielded significance ( $p < .001$ ) on all main effects and interactions: Event,  $F(1, 62) = 981.59$ ,  $MSE = 1.69$ ; Group,  $F(2, 62) = 4.47$ ,  $MSE = 1.94$ ; Time of Testing,  $F(1, 62) = 15.75$ ,  $MSE = 0.52$ ; Time of Testing  $\times$  Event,  $F(1, 62) = 27.13$ ,  $MSE = 0.54$ ; Time of Testing  $\times$  Group,  $F(2, 62) = 9.42$ ,  $MSE = 0.52$ ; Group  $\times$  Event,  $F(2, 62) = 8.3$ ,  $MSE = 1.7$ ; and the three-way interaction,  $F(2, 62) = 17.88$ ,  $MSE = 0.55$ .

Post hoc  $t$  tests revealed that plausibility increased only for the implausible Witnessed Possession event after the Possession manipulation ( $t(21) = 6.30$ ,  $p < .01$ ). As expected, the scores for the

Table 1  
Mean Plausibility Scores Before (Pre) and After (Post)  
Manipulation on Witnessed Possession and Almost  
Choked Events (Experiment 1)

Condition	Witnessed possession		Almost choked	
	Pre	Post	Pre	Post
Possession				
<i>M</i>	0.18	2.54	5.36	5.50
<i>SD</i>	0.39	1.82	1.29	1.18
Choking				
<i>M</i>	0.22	0.32	5.51	5.32
<i>SD</i>	0.43	0.46	1.30	1.28
Control				
<i>M</i>	0.28	0.33	6.14	6.09
<i>SD</i>	0.46	0.48	1.42	1.14

plausible event Almost Choked were already high and did not change from pre- to posttest for any group. Together, these results demonstrate that reading the Possession mini-articles and receiving the personalized fear profile, increased the plausibility of the Witnessed Possession event.

**Likelihood.** A second purpose of the study was to assess the effect of the manipulations on confidence that the event had been personally experienced. Remember that we selected only participants who initially reported that they had not experienced the key event in early childhood. We expected an increase in confidence to occur for the event that was already plausible (Almost Choked), but we were especially interested in whether this would also occur for Witnessed Possession, the event that was initially considered implausible.

Mean pre- and postmanipulation LEI scores are displayed in Table 2. A 3 (Group)  $\times$  2 (Event)  $\times$  2 (Time of Testing) ANOVA revealed that the two events were significantly different,  $F(1, 62) = 4.16$ ,  $p < .05$ ,  $MSE = 0.93$ . Moreover, LEI scores were higher after the manipulation than before,  $F(1, 62) = 63.21$ ,  $p < .001$ ,  $MSE = 0.86$ . Two of the two-way interactions were significant; Time  $\times$  Group,  $F(2, 62) = 17.55$ ,  $p < .001$ ,  $MSE = 0.40$ , and Event  $\times$  Group,  $F(2, 62) = 13.03$ ,  $p < .001$ ,  $MSE = 0.93$ . The three-way interaction was also significant,  $F(2, 62) = 25.12$ ,  $p < .001$ ,  $MSE = 0.41$ .

Post hoc  $t$  tests revealed that in the Possession group, there was a significant increase in LEI scores for the Witnessed Possession event,  $t(21) = 5.58$ ,  $p < .05$ , and for the Almost Choked event,  $t(21) = 3.46$ ,  $p < .05$ . However, the increase was significantly greater for the Witnessed Possession event than for the Almost Choked event,  $t(21) = 3.10$ ,  $p = .005$ . In the Choking group, there was a significant increase in LEI scores only for the Almost Choked event,  $t(21) = 5.53$ .

**Plausibility and likelihood of occurrence.** Surprisingly, the correlation between postmanipulation plausibility and LEI change for the targeted event (calculated across groups for the entire sample) was near zero and not significant. To further investigate the relationship between plausibility and LEI change, we analyzed the between-group differences in plausibility and likelihood ratings of the targeted events. Postmanipulation plausibility ratings of the Almost Choked event in the Choking group were significantly higher than corresponding ratings of the Witnessed Possession

Table 2  
*Mean LEI Scores Before (Pre) and After (Post) Manipulation on Witnessed Possession and Almost Choked Events (Experiment 1)*

Condition	Witnessed possession		Almost choked	
	Pre	Post	Pre	Post
Possession				
<i>M</i>	1.32	2.86	1.27	1.81
<i>SD</i>	0.47	1.42	0.55	0.96
Choking				
<i>M</i>	1.23	1.23	1.32	3.00
<i>SD</i>	0.43	0.53	0.57	1.48
Control				
<i>M</i>	1.27	1.33	1.64	1.54
<i>SD</i>	0.44	0.46	0.79	0.67

Note. LEI = Life Events Inventory.

event in the Possession group,  $t(42) = 6.13, p < .001$ . Although the manipulation increased the plausibility of the Witnessed Possession event, it did not bring its plausibility up to the level of the Almost Choked event. Nevertheless, the mean change in LEI scores on the Witnessed Possession event in the Possession group ( $M = 1.54$ ) was not significantly different from the change in LEI scores on the Almost Choked event in the Choking group,  $t(42) = .33, p = .74$ . Similarly, mean postmanipulation LEI scores on the Witnessed Possession event in the Possession group were not significantly different from postmanipulation LEI scores on the Almost Choked event in the Choking group,  $t(42) = .10, p < .92$ . Thus, contrary to our expectation, the difference in postmanipulation plausibility did not result in a difference in rated likelihood.

*Percentage of large increases in likelihood.* In terms of LEI scores, our participants initially were quite confident that witnessing possession had not happened to them in childhood ( $M = 1.27$  on an 8-point scale). After the Possession manipulation, the participant's mean score rose to nearly 3, still leaning on the "Didn't happen" side of the scale. It is of interest whether any of our participants moved to the "Happened" side of the scale; that is, did they move from a low score to one that was 5 or greater? We found that 18% of the participants in the Possession group gave final LEI scores of 5 or greater on the Witnessed Possession event. All of them had given this event a postmanipulation plausibility rating of 3. Thus, they saw the event as relatively implausible but believed, nevertheless, that it had probably happened to them. Similarly, we found that 14% of the Choking group gave final LEI scores that were 5 or greater on the Almost Choked event. Their mean plausibility score for this event was 5.33. By contrast, controls never gave post LEI scores above 3.

## Discussion

We found that when people were exposed to a two-part suggestion (mini-articles plus fear profile) about an already plausible event, Almost Choked, they increased the perceived likelihood that the plausible event had happened to them. This result is just a replication of previous findings showing the malleability of likelihood ratings (e.g., Mazzoni et al., 1999). Interestingly, we also found that the two-part suggestion on an initially implausible event, Witnessed Possession, made participants rate this event as

being less implausible and also showed increased confidence that the event happened to them in early childhood. Thus, we have demonstrated three things. First, suggestive information can increase the plausibility of an initially implausible event. Second, suggestive information can increase people's ratings of the likelihood that the event has happened to them. Third, the information can be effective not only in increasing likelihood ratings for an event that is already plausible, but also for one that is initially implausible.

The mean increases in plausibility and likelihood ratings were modest in terms of absolute numbers, and although most participants showed increases on both scores, they also continued to hold the "Witnessed Possession" event relatively implausible and unlikely to have happened to them personally. In terms of conventional effect sizes, however, the effects were quite large. The effect size (mean standardized change score; Hunter & Schmidt, 1990) for changes in plausibility of the "Witnessed Possession" event in the Possession group was 2.24; those for likelihood ratings of targeted events were 1.33 for the Possession group and 1.64 for the Choking group. More important, after brief experimental manipulations, a substantial minority (14–18%) of participants believed that the events had probably happened to them. Thus, these experimental manipulations may be a mild version of what happens in repeated, intensive, psychotherapy sessions, in which suggestive communications lead patients to believe that implausible events have happened to them.

These results are consistent with previous findings showing that plausible events are more likely than implausible events to be suggestively implanted in memory (e.g., Garry et al., 1996; Mazzoni & Loftus, 1998; Pezdek et al., 1997). In addition, they provide a new result not previously obtained, namely that our manipulation increased confidence that an initially implausible event had happened in early childhood. However, these data also throw into question the presumed link between plausibility and the effects of suggestive information on changes in the perceived likelihood of an event having occurred. Plausibility was not correlated with change in likelihood of the event having occurred. Furthermore, even after our plausibility manipulation, the Witnessed Possession event was rated as substantially and significantly less plausible than the Almost Choked event. Nevertheless, the increase in likelihood ratings was comparable for both events. Also, participants who came to believe that they had probably witnessed possession continued to believe that witnessing possession is a relatively implausible (but not impossible) event. How can these data be reconciled with previously reported data indicating likelihood change for plausible events but not for implausible events (Pezdek et al., 1997)? It is possible that a little bit of plausibility goes a long way. It may be that perceived plausibility merely needs to be boosted beyond a relatively low threshold in order for a personalized manipulation (e.g., the fear profile feedback) to produce changes in likelihood ratings.

A key question remains about our plausibility-enhancing manipulation. In Experiment 1, the manipulation consisted of two major parts: Reading mini-articles about the phenomenon, and then being given a personalized fear profile that suggested to participants that they had personally experienced the event in childhood. Which of these features of the manipulation was crucial? We conducted Experiment 2 to explore this issue. The major innovation was the removal of the fear profile and determining

whether the mini-articles alone were sufficient to enhance plausibility and confidence ratings.

### Experiment 2

In Experiment 2, we examined the role of the plausibility manipulation alone in changing the perceived plausibility of an event and the perceived likelihood of its having occurred to the individual. Participants were divided into three groups. In two of the groups, the manipulations were aimed at initially implausible events (Witnessed Possession and Kidnapping Threat). The third group received no experimental manipulation and provided a control for spontaneous changes in plausibility and likelihood ratings. We hypothesized that the manipulations would enhance the plausibility of the initially implausible events, but would not increase likelihood ratings for targeted events. Two different implausible events were used so that we could test the additional hypothesis that the effects would be specific to the targeted event.

### Method

**Participants.** In a mass-testing session, 332 undergraduate students from the University of Florence filled out some rating scales, including the plausibility and LEI questionnaires. The students who satisfied the selection criteria, which were the same as in Experiment 1, were invited to participate in later sessions. Of these, 71 completed all phases of the study.

**Materials and procedure.** This experiment was conducted in three phases. In Phase 1, participants rated the plausibility of a set of 40 events and also gave an LEI rating indicating their confidence that a subset of the events happened to them in childhood. In Phase 2, which took place approximately 3 months later, participants were exposed to the same plausibility manipulation used in Experiment 1. In Phase 3, which took place 1 week after Phase 2, participants again gave plausibility and LEI ratings.

There were two major changes to the materials and procedure in Experiment 2. First, instead of using the plausible Almost Choked event, two implausible events were used: Witnessed Possession and Kidnapping Threat. The Kidnapping Threat event was chosen because it had received plausibility ratings that were very low and, coincidentally, identical to those given to the Witnessed Possession event ( $M = .27$ ). Note that many Italians view both possession and kidnapping as plausible occurrences, but they were not seen as plausible occurrences for the subculture from which the sample was drawn. In this sense, the implausibility was similar to that studied by Pezdek et al. (1997), in which common religious rituals were rated as implausible because the raters were of a different religion.

The second major change was the elimination of the fear profiles for those groups who had a Phase 2 manipulation. The experimental groups received only a set of three mini-articles about either possession or kidnapping. The Possession articles were the same as those used in Experiment 1. The Kidnapping articles had exactly the same structure as the Possession articles; the only difference was the topic. The Control group participated only in Phase 1 and Phase 3. At the end of the experiment, participants who completed all phases were thoroughly debriefed as in Experiment 1.

### Results

**Plausibility.** Mean changes in plausibility as a function of the manipulation are shown in Table 3. A 3 (Group)  $\times$  2 (Event)  $\times$  2 (Time of Testing) ANOVA yielded significant main effects for group and time, but not for event: Group,  $F(2, 68) = 4.04, p < .05, MSE = 1.07$ ; Time of Testing,  $F(1, 68) = 77.82, p < .001$ ,

Table 3

*Mean Plausibility Scores Before (Pre) and After (Post) Manipulation on Witnessed Possession and Kidnapping Threat Events (Experiment 2)*

Condition	Witnessed possession		Kidnapping threat	
	Pre	Post	Pre	Post
Possession				
<i>M</i>	0.21	2.37	0.22	0.62
<i>SD</i>	0.41	2.03	0.43	0.77
Kidnapping				
<i>M</i>	0.17	0.95	0.30	1.74
<i>SD</i>	0.39	1.06	0.47	1.32
Control				
<i>M</i>	0.42	0.67	0.29	0.46
<i>SD</i>	0.65	0.88	0.46	0.51

$MSE = 0.69$ . In addition, all interactions were significant: Time of Testing  $\times$  Group,  $F(2, 68) = 11.66, p < .001, MSE = 0.69$ ; Time of Testing  $\times$  Event,  $F(1, 68) = 4.21, p < .05, MSE = 0.67$ ; and Event  $\times$  Group,  $F(1, 68) = 11.56, p < .001, MSE = 0.90$ ; and the three-way interaction,  $F(2, 68) = 13.41, p < .001, MSE = 0.67$ .

Post hoc  $t$  tests revealed that participants in both experimental groups increased their plausibility scores on the Witnessed Possession event—Possession group,  $t(23) = 5.11, p < .001$ ; Kidnapping group,  $t(22) = 3.46, p < .002$ —and all three groups showed increases on the Kidnapping Threat event—Possession group,  $t(23) = 3.12, p < .005$ ; Kidnapping group,  $t(22) = 5.93, p < .001$ ; Control group,  $t(23) = 2.14, p < .05$ . Within the Possession group, the increase was significantly higher on the Witnessed Possession event than on the Kidnapping Threat event,  $t(23) = 4.18, p < .001$ . Similarly, for the Kidnapping group, the increase was higher on the Kidnapping Threat than on the Witnessed Possession event,  $t(22) = 2.82, p < .05$ . In addition, the increase on the Witnessed Possession event was higher for the Possession group than for the Control group,  $t(46) = 4.18, p < .001$ . Conversely, on the Kidnapping Threat event, the increase was higher for the Kidnapping group than for the Control group,  $t(45) = 5.08, p < .001$ . The Possession manipulation had no effect on the Kidnapping Threat event, as can be seen when comparing plausibility ratings on that event between the Possession and Control groups,  $t(46) = 1.62, p < .12$ . The Kidnapping manipulation had no effect on the Witnessed Possession event, as can be seen when comparing plausibility ratings on that event between the Kidnapping and the Control groups,  $t(45) = 1.78, p = .08$ .

**Likelihood.** To analyze these results, we performed a 3 (Group)  $\times$  2 (Event)  $\times$  2 (Time of Testing) ANOVA on the LEI scores. Scores were overall higher for the Kidnapping Threat event than the Witnessed Possession event,  $F(1, 68) = 12.78, MSE = 0.77$  (see Table 4). Moreover, for both events, LEI scores were higher after the manipulation than before,  $F(1, 68) = 95.6, MSE = 0.28$ . The main effect of Group was not significant,  $F(2, 68) = 1.49, p > .20, MSE = 0.56$ . All three two-way interactions were significant: Time  $\times$  Group,  $F(2, 68) = 15.8, MSE = 0.27$ ; Event  $\times$  Group,  $F(2, 68) = 7.48, MSE = 0.78$ ; and Time  $\times$  Event,  $F(1, 68) = 15.87, MSE = 0.30$ , as well as the three-way interaction,  $F(2, 68) = 18.31, MSE = 0.33$ .

Post hoc  $t$  tests revealed that in all three groups there was a significant increase in LEI scores on both events. On the Wit-

Table 4  
Mean LEI Scores Before (Pre) and After (Post) Manipulation on  
Witnessed Possession and Kidnapping Threat Events  
(Experiment 2)

Condition	Witnessed possession		Kidnapping threat	
	Pre	Post	Pre	Post
Possession				
<i>M</i>	1.21	2.08	1.50	1.74
<i>SD</i>	0.41	0.97	0.72	0.74
Kidnapping				
<i>M</i>	1.13	1.43	1.48	2.96
<i>SD</i>	0.34	0.59	0.73	0.93
Control				
<i>M</i>	1.33	1.58	1.42	1.92
<i>SD</i>	0.48	0.65	0.65	0.77

Note. LEI = Life Events Inventory.

nessed Possession event: for the Possession group,  $t(23) = 4.53$ ,  $p < .001$ ; for the Kidnapping group,  $t(22) = 2.61$ ,  $p = .016$ ; for the Control group,  $t(23) = 2.03$ ,  $p = .031$ . On the Kidnapping Threat event: for the Possession group,  $t(23) = 2.30$ ,  $p = .031$ ; for the Kidnapping group,  $t(22) = 6.55$ ,  $p < .001$ ; for the Control group,  $t(23) = 3.39$ ,  $p = .003$ . Additional tests, however, showed that in the Possession group the increase was significantly higher on the Witnessed Possession event than on the Kidnapping Threat event,  $t(23) = 2.90$ ,  $p < .013$ . Similarly, in the Kidnapping group, the increase was higher on the Kidnapping Threat event than on the Witnessed Possession event,  $t(22) = 4.44$ ,  $p < .001$ . In addition, the increase on the Witnessed Possession event was higher for the Possession group than for the Control group,  $t(46) = 2.82$ ,  $p = .007$ . Conversely, on the Kidnapping Threat event, the increase was higher for the Kidnapping group than for the Control group,  $t(45) = 3.66$ ,  $p < .001$ . The Possession manipulation had no effect on the Kidnapping Threat event, as can be seen when comparing likelihood ratings on that event between the Possession group and the Control group,  $t(46) = 1.37$ ,  $p = .182$ . The Kidnapping manipulation had no effect on the Witnessed Possession event, as can be seen when comparing likelihood ratings on that event between the Kidnapping group and the Control group,  $t(45) = .34$ ,  $p = .73$ .

**Percentage of large increases.** In terms of LEI, our participants initially were confident that witnessing possession had not happened to them in childhood (mean 1.22, on 8-point scale). After the manipulation, the mean score rose but still leaned toward the Didn't happen side of the scale. It is of interest whether any of our participants moved to the Happened side of the scale; that is, did they move from a low score to one that was 5 or greater? We found that no one in the Possession group gave final LEI scores of 5 or greater, and only 1 participant in the Kidnapping group gave final LEI scores that were 5 or greater on the Kidnapping Threat event. Controls never gave post-LEI scores above 3.

## Discussion

As predicted, simply reading the mini-articles increased the plausibility ratings. Contrary to our hypothesis, however, the perceived likelihood that the event happened in childhood also in-

creased as a function of simply reading the mini-articles. Although the controls showed some increases in plausibility and likelihood ratings, they were significantly smaller than the increases observed in the experimental groups.

The main question of interest in Experiment 2 was whether the mini-articles alone produced similar effects to those obtained in Experiment 1, where both the articles and fear profiling were used. To address this, we examined the effect sizes for the Possession manipulation in the two studies, using the conventional meta-analytic measure of effect size (i.e., the standardized difference between the experimental and control groups; Hunter & Schmidt, 1990). The effect sizes for plausibility were 1.92 in Experiment 1 and 2.42 in Experiment 2. The effect sizes for likelihood of occurrence were 1.63 in Experiment 1 and 0.62 in Experiment 2. Thus, the plausibility manipulation alone produced a very large effect on plausibility but a much more modest effect on the perceived likelihood of the event occurring to the individual. Adding the personalized suggestion resulted in a substantially larger effect on perceived likelihood than that produced by the plausibility manipulation alone.

## Experiment 3

In Experiment 1, plausibility ratings were not correlated with likelihood ratings. In Experiment 2, however, we found only a partial dissociation between plausibility ratings and likelihood ratings. Although the plausibility manipulation alone produced a much stronger effect on plausibility ratings than on likelihood ratings, the effect on the latter variable was also significant. Experiment 3 examined a characteristic of the plausibility manipulation that might be necessary for its effect on likelihood ratings. We wanted to see whether eliminating this characteristic would increase the independence of plausibility and likelihood ratings so that the manipulation would only affect plausibility ratings.

What is it about the mini-articles that produce the kinds of changes that we observed in Experiments 1 and 2? One feature is that they were set in modern times, and in a culture that was the same as that of the participants. So, for example, witnessing possession was discussed in contemporary times and in mainstream Italian culture. What would have happened if we asked participants to read articles about possession that occurred at a totally different time and place, like the Middle Ages? Articles of this sort might well enhance the perceived plausibility of witnessing possession, but would they also influence people's judgments about their own lives? It was this issue to which Experiment 3 was addressed. We anticipated that articles about possession in a remote context would still affect plausibility ratings, but that they would not affect likelihood ratings. People could decide that perhaps an event was plausible for some individuals in a different time and place but is not plausible today and, therefore, not plausible for them personally.

## Method

**Participants.** Participants were undergraduate students from the University of Florence who were selected on the basis of a mass-testing performance, as in the previous experiments. From the larger group, 57 participants completed all phases of the experiment. None had participated in the previous two experiments. At the end of the experiment, all participants who completed all phases were debriefed.

**Materials and procedure.** This experiment was conducted in three phases. In Phase 1, participants gave plausibility and likelihood ratings for a set of 40 events. Those meeting the selection criteria (see Experiment 1), were invited to take part in Phase 2. In Phase 2, which took place after approximately 3 months, participants were exposed to experimental manipulations. In Phase 3, which took place 1 week after phase 2, they gave plausibility and LEI ratings again.

There were two major changes in Experiment 3. First, only a single critical event was used: Witnessed Possession. Second, two sets of mini-articles about Possession were used. The first set was the same set used in Experiments 1 and 2 (Same Culture articles). The second set of articles (Other Culture articles) were of similar length and style as the Same Culture articles but were set in a different country (Caribbean Islands) and in a different time period (early in the 20th Century). Moreover, the Other Culture articles described possession as occurring only in small rural villages isolated from the rest of the world. Additionally, whereas the Same Culture articles included interviews with adults describing memories of early childhood that included witnessing strange behaviors consistent with possession, the Other Culture articles did not. Finally, the Other Culture articles made no mention of the frequency of possession. The numerous changes introduced in the Other Culture articles were designed to make the possession phenomenon seem relatively distant. The control group did not receive any articles to read but only participated in Phases 1 and 3.

## Results

**Plausibility.** Mean changes in plausibility as a function of the manipulation are shown in Table 5. A 3 (Group)  $\times$  2 (Time of Testing) ANOVA revealed a main effect of Time of Testing,  $F(1, 54) = 48.37, p < .001, MSE = 1.21$ , but not for Group. Also, the interaction was significant,  $F(2, 54) = 6.44, p < .005, MSE = 1.21$ .

Post hoc *t* tests revealed that plausibility increased in all groups: Same Culture,  $t(18) = 4.28, p < .001$ ; Other Culture,  $t(19) = 6.03, p < .001$ ; Controls,  $t(17) = 2.67, p = .016$ . However, the increases in the control group were less than those in the Same Culture group,  $t(35) = 2.98, p = .005$ , and in the Other Culture group,  $t(36) = 3.16, p = .003$ . Increases in the Same Culture group were not significantly different from those in the Other Culture group. Thus, reading the mini-articles about possession, whether they were set in the same cultural and historical period or a different one, increased the plausibility of possession.

**Likelihood.** Mean changes in plausibility as a function of the manipulation are shown in Table 6. A 3 (Group)  $\times$  2 (Time of

Table 6  
Mean LEI Scores Before (Pre) and After (Post)  
Reading Mini-Articles (Experiment 3)

Condition	Witnessed possession	
	Pre	Post
Same culture		
<i>M</i>	1.21	2.05
<i>SD</i>	0.42	1.08
Other culture		
<i>M</i>	1.15	1.30
<i>SD</i>	0.37	0.47
Control		
<i>M</i>	1.39	1.33
<i>SD</i>	0.50	0.49

Note. LEI = Life Events Inventory.

Testing) ANOVA revealed a main effect of Group that was only marginally significant,  $F(2, 54) = 3.07, p = .054, MSE = 0.54$ , and a significant main effect for Time of Testing,  $F(1, 54) = 14.96, p < .001, MSE = 0.18$ . The two-way interaction was significant,  $F(2, 54) = 11.19, p < .01, MSE = 0.18$ .

Post hoc *t* tests revealed that after the manipulation, the scores increased only in the Same Culture group,  $t(18) = 4.40, p < .001$ , and not in the Other Culture group,  $t(19) = 1.37, p = .19$ . Thus, reading only the same-culture articles increased participants' confidence that the events had personally happened in their lives.

**Percentage of large increases.** In terms of LEI scores, our participants initially were confident that witnessing possession had not happened to them in childhood ( $M < 1.5$  on an 8-point scale). After the manipulation, the mean score rose but still leaned toward the "Didn't happen" side of the scale. In this study, no participants moved to an LEI score of 5 or greater on the posttest, although 11% of them in the Same Culture group gave a score of 4. The control group never gave post-LEI scores above 3.

## Discussion

As in Experiment 2, reading the Same Culture articles produced a significant increase in plausibility and likelihood ratings. Indeed, mean postmanipulation scores for participants reading these articles were virtually identical across the two experiments. By contrast, the effect of the Other Culture articles was limited to plausibility ratings. This confirms the dissociation between plausibility and likelihood ratings. It is clearly possible to increase plausibility without having any sizable effect on likelihood rating. Unless a plausibility manipulation is relevant to the person's cultural setting, it is not likely to affect autobiographical judgments.

## General Discussion

These three experiments tell a consistent story. Exposing people to a set of articles that describe a relatively implausible phenomenon, like witnessing possession, made people believe that the phenomenon is more plausible, and also made them less confident that they had not experienced the event in childhood. These effects on plausibility were consistently strong, with effect sizes ranging as high as 2.42 standard deviations. When the articles were cou-

Table 5  
Mean Plausibility Scores Before (Pre) and After (Post)  
Reading Mini-Articles (Experiment 3)

Condition	Witnessed possession	
	Pre	Post
Same culture		
<i>M</i>	0.11	2.37
<i>SD</i>	0.31	2.26
Other culture		
<i>M</i>	0.30	1.90
<i>SD</i>	0.57	1.16
Control		
<i>M</i>	0.61	1.06
<i>SD</i>	0.85	0.87

pled with a personalized fear profile (Experiment 1), there was also a strong effect on participants' ratings of the likelihood that the event had happened to them personally. The effect size for changes in the likelihood that the participant had witnessed possession was 1.63 standard deviations, and although most participants continued to believe that they probably had not witnessed a possession, 18% of the participants came to believe that they probably had. Thus, these data show that even for implausible events it is possible to make some people believe that they have personally had the experience in their own lives. Strongly enhanced plausibility was found even when the articles described a remote context (Experiment 3), but under these circumstances, the effect on likelihood ratings was much smaller.

### *Plausibility and Autobiographical Likelihood*

We have shown that under some circumstances, both plausibility and likelihood ratings increase, and in other circumstances, plausibility increases, without corresponding changes in likelihood. Both ratings increased when people were exposed to Same Culture mini-articles, both with and without the personalized fear profile (Experiments 1, 2, and 3). On the other hand, a dissociation occurred when people were exposed to Other Culture articles (Experiment 3). Here, plausibility increased, but people did not increase their ratings of the likelihood that the event happened to them (Experiment 3). We also showed that when the event is initially plausible, likelihood ratings can increase without any change in plausibility (Experiment 1).

One unexpected finding was that plausibility and likelihood ratings were not significantly correlated. What is then the relationship between plausibility and likelihood? Hyman and Kleinknecht (1999) argued that for a person to create a false memory from a suggestion, "the suggested event needs to be plausible" (p. 179), and, in line with this view, we have shown that plausibility is somewhat malleable and that a plausibility suggestion can also change likelihood ratings. We can cause people to judge implausible events as being more plausible than they initially thought by subjecting them to simple manipulations, and in most circumstances, this is accompanied by increases in the perceived likelihood that the event has happened to them. Arguably, this may be the first step in the eventual development of a false memory for an initially implausible event.

On the other hand, our data suggest that the link between plausibility and changes in likelihood ratings is less strong than may have been presumed. Although we raised the perceived plausibility of an implausible event, the resulting plausibility ratings remained modest and well below those of a plausible comparison event. Nevertheless, changes in the perceived likelihood of occurrence of the implausible event were as great as the changes reported for the comparison event. Thus, it may be that only modest levels of plausibility are required for changes in autobiographical beliefs. This is further supported by the lack of a significant correlation between plausibility and belief change.

### *The Effect of Suggestion*

It is probably not too surprising that new information could make events seem less implausible. But how does that new information make some people (18% in the Witnessed Possession event

in Experiment 1) go from saying at one point in time that an event did not happen, to later saying that it probably did happen? When people initially state that an event did not happen, they may base this on three sources of information. First, they have no memory of the event. Second, they may not have enough knowledge about the event to realize that they may have experienced it. Third, they may have knowledge about it that allows them to reject it as part of their own autobiography (Mazzoni et al., 1999).

Exposing people to new information designed to enhance plausibility removes two of the three major ways in which they know that an event did not happen to them. In these studies, participants read about possession occurring in their own culture, and they learned the "symptoms" of possession. From this, they concluded that the possibility that they had Witnessed Possession was somewhat less unlikely than they had thought. When then given false feedback indicating the likelihood that they had indeed Witnessed Possession, some of the participants concluded that they probably had witnessed it, developing in this way a false belief.

It remains to be seen whether a false belief about an event that was initially plausible is different from a false belief about an event whose plausibility was artificially enhanced. In Experiment 1, we studied one event in each of these categories—an event that was initially plausible (Almost Choked) and an event whose plausibility was artificially enhanced (Witnessed Possession). We showed that likelihood change for the event that was initially plausible was not stronger than that for the event that was initially implausible.

### *Likelihood of Occurrence and Memory*

Believing that an event is likely to have occurred is not the same as remembering it occurring. Our study concerned the manipulation of autobiographical beliefs and their relation to plausibility. Many of our autobiographical beliefs (e.g., where we were born) are based on knowledge that is independent of an autobiographical memory. There are data, however, showing that a "know" feeling today can become a "remember" feeling tomorrow, which means that people not only know an event happened in their past, but they also have some specific, concrete recollections to go with that knowledge. Hyman et al. (1998) have shown some of the simple manipulations that can convert actual know to remember responses, and these same manipulations ought to be able to convert false know responses to remember responses as well.

### *Conclusions*

We have proposed a three-processes model for the development of false memories for implausible events through suggestive procedures. The first process is to make an event be perceived as plausible, the second is to help individuals acquire the autobiographical belief that it is likely to have happened to them. The third, not examined in this study, is to help people interpret their thoughts and fantasies about the event happening as memories. Our data shed light on two of the three processes.

We have shown that information about an event from a presumably credible source can alter perceived plausibility of the event. Our results also indicated that this information can produce changes in the perceived likelihood of the event having occurred to the individual. When suggestive personalized information was



added, the effects on autobiographical likelihood were substantially greater and a sizable minority of participants came to believe that the event probably happened to them. In addition, we have shown that this happened although the event continued to be seen by participants as relatively implausible. This provides evidence for the fact that even a relatively small increase in plausibility of an initially implausible event can pave the way for additional suggestion, so that some people increase the perceived likelihood of occurrence of the event in their life. It also reinforces the idea that therapists need to be careful in their use of potentially suggestive procedures that can change the perceived likelihood of the occurrence of unremembered events (see Mazzoni, in press; Mazzoni et al., 1999).

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