

## Reasons for Withdrawing Belief in Vivid Autobiographical Memories

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### Abstract

Previous studies have shown that many people hold personal memories for events that they no longer believe occurred. This study examines the reasons that people provide for choosing to reduce autobiographical belief in vividly recollected autobiographical memories. A body of nonbelieved memories provided by 374 individuals was reviewed to develop a qualitatively derived categorization system. The final scheme consisted of 8 major categories (in descending order of mention): social feedback, event plausibility, alternative attributions, general memory beliefs, internal event features, consistency with external evidence, views of self/others, and personal motivation; and numerous sub-categories. Independent raters coded the reports and judged the primary reason that each person provided for withdrawing belief. The nature of each category, frequency of category endorsement, category overlap, and phenomenological ratings are presented, following which links to related literature and implications are discussed. This study documents that a wide variety of recollective and non-recollective sources of information influence decision-making about the occurrence of autobiographical events.

*Keywords:* autobiographical memory, autobiographical belief, nonbelieved memory, decision making

### Reasons for Withdrawing Belief in Vivid Autobiographical Memories

Remembering the past is fraught with uncertainty. People frequently have experiences that remind them of the fallibility of memory. They forget where they left their keys, have difficulty recalling the names of people they just met, and their loved ones frequently remind them of the actual details of shared experiences.

In part due to the awareness that autobiographical memory can be inaccurate, and in part because at times they face contradicting information, people sometimes must decide whether a mental representation is indicative of actual prior experience, or if it originated in some other process (e.g., dream, another's experience; Johnson & Raye, 1981). While a large body of work examines the circumstances under which false memories for non-occurring events develop (Bernstein & Loftus, 2009; Mazzoni & Scoboria, 2007), the converse case in which existing autobiographical memories are re-appraised and 'edited-out' of memory are less frequently studied. However, cases in which people come to the decision to reduce their belief or release ownership of memories are important in that they show that ongoing editing is characteristic of even the most vivid and closely held autobiographical memories.

In this paper we focus on one such phenomenon, that of *nonbelieved memories* (Mazzoni, Scoboria & Harvey, 2010). Nonbelieved memories are memories about personal events that were once believed to reflect genuine experiences. However, the belief that the memory reflects a genuine occurrence was somehow challenged, and the rememberer chose to stop believing that the memory was true. Despite the loss of autobiographical belief, the mental representation associated with the event continues to be experienced much like other believed memories.

Mazzoni et al. (2010) asked individuals claiming memories that they no longer believed to describe their memory, the reasons that they chose to withdraw belief in the memory, and to

rate phenomenological characteristics associated with the memory. The participants also described and rated age-matched believed memories and believed-not-remembered events (e.g., family stories). Nonbelieved and believed memories were rated similar in key characteristics associated with recollection (e.g., perceptual details, sense of re-experiencing), and ratings for both exceeded those of believed-not-remembered events. Nonbelieved memories were rated lower than believed memories on event complexity, event significance, and connectedness to other events in memory, suggesting differences in attributions about the personal importance and embeddedness within autobiographical memory. Subsequent studies have extended these findings, showing that this phenomenological pattern replicates and also can be obtained following a variety of experimental procedures (Clark et al., 2012; Mazzoni, Clark & Nash, 2014; Otgaar, Scoboria, & Smeets, 2013; Scoboria & Talarico, 2013).

Thus, these are memories that their owners decide are false, despite their recollective qualities. In this paper, we investigate the reasons that individuals provide for having chosen to alter autobiographical belief for a memory. Previous studies have documented memory verification strategies when personal memories are held with uncertainty. This might happen when the memory does not feel coherent, or the memory might conflict with other autobiographical knowledge such as the recollections of others who witnessed the event (Arbuthnott, Kealy, & Ylloja, 2008). When subjects recalled childhood memories of questionable accuracy and then described how they would verify the memories, the two most frequently endorsed strategies involved seeking information from family members or cognitive approaches such as trying to recall further details (Kemp & Burt, 2006; Wade & Garry, 2005). More recently it has been shown that selection of memory verification strategy depends in part on perceptions of the cost and reliability of available strategies (Wade, Nash, & Garry, 2014).

The current study goes further and investigates the reasons that people provide for having actually chosen to alter autobiographical belief for vivid memories. Nonbelieved memories are characterized by the choice to relinquish belief, which distinguishes them from other phenomena such as inaccessibility or forgetting. Thus the reasons for choosing to relinquish belief are a *prima facie* component of the phenomenon. The examination of the reasons provided for altering belief in memories has the potential to inform more general views on the elements that contribute to decision making about memories and memory editing processes.

To situate the phenomenon, we begin with a brief overview on decision making and autobiographical memory. We then describe the development of a scheme for coding the reasons people provide for altering belief in their memories, provide data on the nature of the resulting categories, and link these categories with the literature.

### **Making Decisions about Memory**

We begin from the assertion that the labeling of mental representations as ‘remembered’ reflects decision-making processes (Johnson, Hashtroudi, & Lindsay, 1993; Rubin, 2006). Thus, remembering is inherently metacognitive in nature – the products of remembering are monitored in various ways, and control is exerted when memory reports are output (Mazzoni & Kirsch, 2002; Nelson & Narens, 1990). There is growing evidence that distinct metacognitive judgments contribute to the experience of remembering (Brewer, 1996; Fitzgerald & Broadbridge, 2012; Mazzoni & Kirsch, 2002; Rubin, 2006; Scoboria et al., in press). One judgment involves recollection. Mental representations tend to be labeled as ‘memories’ or as ‘recollected’ when associated with vivid imagery and a sense of re-experiencing the past (Tulving, 1983; Moskovitch, 2012). The Reality Monitoring framework (Johnson & Raye, 1981) proposes that memories are differentiated from other mental representations (e.g., dreams) by the relative

contributions of perceptual versus other cognitive operations that are experienced at the time of remembering. The Basic Systems model (Rubin, 2006) proposes that recollection is an appraisal that is influenced by input from various component cognitive systems.

Another key non-recollective judgment made about mental representations for personal past events is *autobiographical belief*. This is the subjective judgment that an event genuinely occurred in the past (see Scoboria et al., in press, for a review). Autobiographic belief judgments are influenced by multiple inputs, and are made in the presence or absence of recollection. Some factors known to influence autobiographical belief include inference from necessary truth (e.g., most people believe that they were born), population base-rate information, event plausibility, and credible social feedback (Hart & Schooler, 2006; Mazzoni, Loftus, & Kirsch, 2001; Scoboria, Wysman, & Otgaar, 2012; Shtulman, 2009).

One implication of such a distinction is that the two constructs are dissociable. While events that are recollected are also believed to have occurred in many instances, recollection and autobiographical belief do not necessarily coincide. For example, in the case of believed- not-remembered events (such as non-recollected family stories that are believed to be true) and false autobiographical beliefs (Mazzoni, Loftus, & Kirsch, 2001; Scoboria, Lynn, Hessen, & Fisico, 2007), autobiographical belief exceeds recollection. In the case of nonbelieved memories, recollection exceeds the strength of autobiographical belief.

Scoboria et al. (in press) presented data supportive of a strong dissociation between distinct recollection and autobiographical belief latent constructs. In light of such a distinction, it becomes pertinent to examine what processes influence autobiographical belief. Researching the circumstances which lead people to question autobiographical belief in the presence of vivid recollection has the potential to reveal factors that contribute to the maintenance of

autobiographical belief and also to elucidate processes that contribute to the editing of memory.

When the occurrence or accuracy of an event is brought into question, various decisions may follow. Following false memory implantation procedures, some people remember nothing, most endorse autobiographical belief without recollection, and a sizeable minority report a recollective memory (Hyman, Husband, & Billings, 1996; Mazzoni, Loftus, Seitz & Lynn, 1999; Mazzoni & Memon, 2003). In other words, the procedures used in such studies can induce belief alone or belief plus recollection. Contested memories (Sheen, Kemp, & Rubin, 2001) are an example of the converse to nonbelieved memories, in which the rememberer chooses to defend their memory in response to feedback that an event did not occur (see also, Ikier, Tekcan, Gülgöz, & Küntay, 2003; Küntay, Gülgöz, & Tekcan, 2004; Sheen, Kemp, & Rubin, 2006). Smeets, Telgen, Ost, Jelicic, & Merckelbach (2009) report an interesting example of excessive memory defense. Thus, belief is sometimes maintained when the truth status of a memory is challenged. In other cases autobiographical belief is reduced or relinquished. Nonbelieved memories show that the truth status of vivid, personally significant memories is subject to updating.

In this study, we examined reports provided by individuals claiming nonbelieved memories regarding the actual reasons that they chose to cease believing their memories. We used a qualitative approach to identify and enumerate the various reasons provided. The study was intentionally not hypothesis driven, because the approach emphasized examining reports without strong assumptions as to what might appear in them. We did incorporate some findings from prior literature in the process. Based on Mazzoni et al. (2010), we expected to identify social feedback, external evidence, challenges to the plausibility of events, and mention of dreaming. We also anticipated identifying social feedback and evaluation of internal memorial evidence based on work on memory verification (Wade et al., 2014).

### Method

The data was collected over a two year period. On registering in an on-line participant pool system, students completed about 40 screening questions for various studies. Among them was a Y/N question which asked, “Do you have an event you stopped believing happened to you, but you have not stopped remembering?” Those responding yes could register for the study.

Participants who opted to take part completed an online inventory in which they first described one nonbelieved memory. They described their memory for the event, indicated their age when the event occurred, described the reasons that they stopped believing in their memory, and indicated their age when they stopped believing the memory. They then rated the event on autobiographical belief (2 items; belief, belief strength), recollection (2 items; memory, memory strength), personal plausibility, general plausibility, and rated 21 phenomenological and metamemorial characteristics prior research associated with remembering on 7 points scales. The autobiographical belief, recollection, and plausibility items were those reported in Scoboria et al. (in press; Study 1), in which each scale demonstrated good validity. The 21 additional items were the same as those used by Mazzoni et al. (2010), who drew them from related literature on self-reported memory characteristics (D’Argembeau & Van der Linden, 2006; Johnson et al., 1988; Rubin et al., 2003). The items queried reexperiencing (reliving, mental time travel, averaged), perceptual qualities (vision, auditory, touch, smell/taste), spatial characteristics (location, arrangement of people, arrangement of objects, averaged), temporal characteristics (time of event, length), emotion (feelings and now, feeling intensity, positive feeling, negative feeling), completeness of the representation, narrative coherence, subjective importance of the mental representation, prior conversations about the event, and connectedness to other memories.

The description and rating of the nonbelieved memory was followed by the selection,



description and rating of a self-selected believed memory and then a believed-not-remembered event. These events were selected after all data on the nonbelieved memory was gathered. These events are not the focus of this paper and the data are not reported further. The reasons provided for choosing to alter belief in the memory are the primary data examined here.

### **Participants**

The nonbelieved memories included in the current study were collected from 374 students (72% female;  $M_{\text{age}} = 21.07$ ,  $SD = 4.04$ , range 17 to 46). All reports included in the dataset met the definition of nonbelieved memory provided above. A majority of the reports are not previously reported, and 187 reports are the same as those analyzed in Scoboria et al. (in press, Study 2). The focus of that paper is on the conceptual distinction between autobiographical belief and recollection; the reasons for altering belief were not examined there.

### **Development and Validation of the Coding Scheme**

We used a qualitative approach to develop the scheme for classifying the reasons for no longer believing in memories, using primarily a data driven approach, but also informed by some preceding findings. We began with the basic categories reported by Mazzoni et al. (2010): social feedback, implausibility, acquisition of contradictory evidence, reference to dreaming. The second author read the transcripts to identify all themes present and generated an initial classification. In this phase the classification used verbatim rationales provided by participants wherever possible. In the rare instances in which the response was insufficiently specific, categorization was based to some extent on inference. The first and second authors then refined the categories and coding strategies (e.g., deciding when to rely on explicit statements, when to allow for inference), and developed guidelines for identifying the main reason for withdrawing belief in the memory when multiple rationales were given by the participants. The initial

classifications were clustered into major categories and sub-categories, and the process of sorting responses and defining categories was repeated over a number of iterations. Eight major categories and 25 sub-categories were included in the final scheme (see the results below).

We trained two assistants in the use of the scheme and provided a manual which included the categories and criteria for distinguishing amongst categories. We trained the raters by defining nonbelieved memories, describing each category, and discussing strategies for deciding on the presence of categories in a transcript. The second author and the assistants coded practice events, after which each assistant coded 15 practice events separately. After group discussion and refinement of the manual, the assistants rated 50 practice events independently to verify the scheme. Using the final scheme, one assistant and the second author rated the entire body of transcripts independently. Agreement rates were high for the individual categories and sub-categories (kappas ranged from .82 to .99). Disagreements were resolved via discussion.

## **Results**

### **Reasons for Withdrawing Belief from Memories**

In this section we describe the resulting categories and sub-categories. Category names, definitions, and brief quotations from the reports that exemplify the category are reported in Table 1. In total, 787 instances of reasons for withdrawing belief were mentioned by the 374 participants, and there were 671 unique mentions of each major category. The difference in total mentions and the total for major categories is because participants sometimes mentioned multiple sub-categories within a major category. Tables 2 and 3 provide additional details on the frequency of endorsement of major and sub-categories, including rates at which categories were judged to be the primary reason for withdrawing belief in the memory. Table 4 provides information on overlap between the primary reason for withdrawing belief and the other major

categories. Discussion of the nature and implications of categories and links to the literature are presented in the general discussion.

### **Major Category: Social feedback**

The most frequently mentioned reason for withdrawing belief in a memory was *social feedback* (or lack thereof). This category was defined by the participant mentioning social exchange as contributing to their choice to alter belief in the memory. Statements of this type were provided by 52.8% of individuals, and this category was judged to be the primary reason for altering belief for 42.2% of participants. Social feedback was the also most diverse category, with 12 distinct sub-categories. The sub-categories were organized into three groups:

**Direct social contradiction (7 sub-categories).** These sub-categories included cases in which another person(s) provided direct feedback contradicting event details and/or the occurrence of the event. They included: (SO1) being told that the event did not occur ( $n=78$ ); (SO2) being told that the event happened differently ( $n=37$ ); (SO3) being told that the event is impossible ( $n=28$ ); (SO4) being told that the event is not likely to have occurred ( $n=10$ ); (SO5) being told that the event happened to someone else ( $n=10$ ); (SO6) nonverbal feedback from another that the individual interprets as indicating that the event did not occur ( $n=10$ ); and, (SO7) being told that they were not present (physically or mentally) to witness the event ( $n=4$ ).

**Lack of corroboration (3 sub-categories).** These sub-categories involved instances in which confirmation could not be obtained from others. They included: (SO8) another person could not confirm the event when asked ( $n=46$ ); (SO9) corroboration was never sought from others ( $n=11$ ); (SO10) a key person was not available to ask ( $n=2$ ). These represent instances in which an inability to acquire social feedback influenced decision-making about the memory.

**Socially motivated invalidation (2 sub-categories).** These sub-categories included cases

in which the social feedback appeared to be related to the motivations of those who provided (or did not provide) the feedback. In other words, the person who provided the feedback may have had a reason to encourage the subject to stop believing in the event. The sub-categories included: (SO11) being pressured by another person to not discuss the event ( $n=10$ ); and (SO12) others refusing to provide information when asked ( $n=3$ ). Events in this group suggest cases in which the other individual had a motivation to avoid personal implication, to avoid implicating another person, or there was a secret within a group regarding admitting that an event occurred. These cases indicate that people sometimes alter belief in memories based on others' motives.

### **Major Category: Event Plausibility**

This category was comprised of instances in which events were appraised in terms of their reality status. Such assessments could be subjective or objective. In the case of subjective appraisals (PL1), the individual explicitly concluded that the event is either impossible, implausible (i.e., it is not likely to have occurred), or illogical (i.e., it simply does not make sense). Objective appraisals of implausibility (PL2) relied upon unbiased, impartial, commonly known and often scientifically accepted axioms of reality (e.g., encounters with cultural figures such as Santa Claus or the Tooth Fairy, ability to fly unaided, etc.).

This category was the second most frequently referenced, by 35.4% of the sample, and was judged as the primary reason for withdrawing belief in the memory for 19.5% of the sample. Statements of implausibility were made by 119 participants and 57 described an event that was objectively implausible without stating that as the reason for their decision. This reinforces that the event plausibility is an important component of the processing of autobiographical memories.

### **Major Category: Alternative Attributions**

This category was comprised of event attributions (i.e. sources other than 'real life')

experience) that were noted when describing the event. Of the sample, 28.9% made such a reference, and it was judged as the primary reason for altering belief in 8.8% of cases. The category was comprised of four sub-categories. The first (AA1;  $n=74$ ) involved mental representations originating when asleep (i.e., dreams, nightmares). The second (AA2;  $n=33$ ) involved attributions to mental fabrications that occurred when 'awake', such as imagination, fantasy, and daydreaming. The third (AA3;  $n=12$ ) included attributions to other mental states (i.e., hallucination, intoxication, exhaustion, confusion, déjà vu). The final (AA4;  $n=4$ ) involved confusions between external sources (e.g., television show, books, etc.) and actual experience.

Compared to the frequency with which information that fit this category was mentioned, this category was infrequently judged to be the primary reason for withdrawing belief. One explanation is that these are reattributions which occur after the event is challenged by another source of evidence. It follows that source reattribution may directly support relinquishing belief in the memory, or may result from a need to justify the decision to reduce belief.

### **Major Category: General Beliefs Regarding Memory and Memory Ability**

This category included general metamemory beliefs that shaped decisions about the occurrence of the event. Of the sample, 17.9% made reference to material that fit this category, and for 6.4% of the sample this was judged to be the primary reason for altering belief in the memory. This category was divided into three sub-categories. The first sub-category involved beliefs about memory in general and memory during childhood (GB1;  $n=36$ ). Examples include: memories cannot occur before a certain age, a memory is too vivid considering the age that it occurred, and childhood memories are unreliable. The second sub-category involved beliefs about the integrity of memory (GB2;  $n=30$ ). Examples include beliefs that memories can be false or (re)constructed, that events can be confused with other events, and that memories should be

clear if important. The third and final sub-category involved the belief that memorable events should have an ongoing influence on current behavior (GB3;  $n=5$ ).

### **Major Category: Internal Features of Event Representations**

This category was characterized by references to internal memorial characteristics. Here, respondents indicated that some feature of the internal representation led them to question the memory. These included references to specific sensorial, contextual, and emotional features (e.g., people, objects, perceptual qualities, vividness, location, coherence) and more general assessments of the representation (e.g., feelings that the memory was odd or unusual). Statements fitting this category were made by 16.3% ( $N = 61$ ) of the sample and the category was judged to be the primary reason for altering belief in 7.2% of the sample. Thus individuals sometimes reported scrutiny of internal features as a basis for questioning the memory.

### **Major Category: External Evidence**

This category included cases in which the individual actively sought or was confronted with external evidence that invalidated the memory, and the evidence was not obtained via social exchange. This category was noted by 10.7% of the sample and was judged to be the primary reason in 7.2% of cases. There were two sub-categories: (1) instances in which disconfirming evidence was obtained (EE1;  $n=24$ ), and, (2) instances in which confirming evidence could not be obtained (EE2;  $n=17$ ). Examples of (dis)confirming evidence included photographs, videos, other documentation, current physical or mental condition (e.g., lack of a scar), or through new knowledge concerning another person's actions or condition at the time of the event.

### **Major Category: Notions of Self/Others**

This category was comprised of instances in which incompatibility between the event (or event features) and the individual's self-concept, or their concept of another person(s),

influenced the decision to alter belief. Individuals made reference to thoughts, behaviors, speech, preferences, other enduring characteristics, occupation, etc. which influenced their thinking as to whether the memory was consistent with their view of themselves or of others involved at the time that they decided to alter belief. This category was endorsed by 12.0% of the sample and was judged as the primary reason for withdrawing belief for 6.4%. The first sub-category involved (in)compatibility with views of the self (SO1;  $n=17$ ) and the second (in)compatibility with views of others (SO2;  $n=30$ ). This indicates that people sometimes choose to withdraw belief in memories because an event is judged to be inconsistent with views of self or others.

### **Major Category: Personal Motivation**

This category was defined by instances in which individuals expressed a desire to not remember the event, and claimed success in altering belief that the memory reflected a genuine occurrence. Here, participants expressed a personal motivation to invalidate the memory for some form of self-benefit. This category was mentioned by 4.3% of the sample, and was judged to be the primary reason for withdrawing belief in the memory in 1.1% of cases.

This category shows that people sometimes seek to alter belief in memories due to personal motivation to not remember. While individuals report success in altering belief, they continue to experience vivid recollection. In order for events to be coded into this group, it must have been apparent that the individual was motivated to accomplish some form of self-benefit or threat-protection that was *self-driven*. This category does not include social exchange (which is discussed above), although it does allude to social conformity to the extent that the choice to conform appears to remain self-driven. These events are either explicitly stated or inferred to be somehow threatening or uncomfortable to the rememberer, and such reports indicate that the person claims to have succeeded in altering belief in the memory through their efforts.

This category is not to be confused with the instances described above in which another person is motivated to shape the rememberer's recall. The events in this category were characterized by discomfort at the prospect of recall and/or dislike of the content of the memory. The desire to avoid the memory was a theme, and hence there may be useful parallels with the literatures on memory for negative and traumatic events. Participants made statements such as, "I pushed it from my mind" and "I did not want to believe that that happened." Of further note, only events for which the individual claimed success in altering belief in the memory were included in the study. Memories which individuals wished that they did not believe did not meet the definition of a nonbelieved memory are not included in this dataset.

### **Category Overlap**

Frequency of unique mentions of categories is enumerated in Tables 2 and 3. Considering overlap between major categories, of the sample, 146 provided two, 50 three, 13 four, and 3 five reasons. Overlap between the primary reason for withdrawing belief and the other major categories is provided in Table 4. Overlap with the Alternative Attributions category is discussed above, and is not repeated here. The most frequent overlap occurred between the Social and Plausibility categories (9.6% of the sample). Social also overlapped with General Beliefs (6.7%), Internal (3.7%), and External (2.9%). Plausibility overlapped with General Beliefs (6.7%), External (4.0%) and Self/Other (3.5%). There were just four notable groupings of three categories: Social/Internal/Alternative ( $N=7$ ), Social/Plausibility/Alternative ( $N=10$ ), External/Plausibility/Alternative ( $N = 6$ ), and Plausibility/General Belief/Alternative ( $N = 11$ ).

### **Subjective Event Ratings**

The participants rated the nonbelieved memory using the self-report items listed above. We contrasted ratings across the categories, excluding Motivation (due to few observations) and



Alternative Attributions (due to high overlap). These contrasts are exploratory and are primarily reported for the sake of completeness. We examined the magnitude of differences between categories and overlap in confidence intervals between the groups, and report group differences for which the effect was statistically moderate or larger. For most items there were no notable differences. The events in the Plausibility category were rated lower on general plausibility than all other categories ( $M_{\text{diff}} = 1.59$ ;  $d = 0.66$ ) and lower on personal plausibility for all categories but Self/Other ( $M_{\text{diff}} = 1.52$ ;  $d = 0.70$ ), which speaks to the validity of the Plausibility category. Only two other contrasts were of note. The rehearsal item received higher ratings in the Social than the Internal category ( $M_{\text{diff}} = .84$ ,  $d = 0.43$ ), and the negative emotion item receive higher ratings in the Self/Other than the External category ( $M_{\text{diff}} = .89$ ;  $d = 0.47$ ).

### **Discussion**

The most striking result in this study is the sheer variety of reasons provided as informing the decision to alter belief in vivid memories. The reasons originated from internal and external information, were based in personal motivations and the motivations of others, and depended on the presence or absence of external evidence. The most frequent reasons were social influence, and event plausibility, both external in origin. These results support the argument made by Scoboria et. al. (in press) that judgments about the occurrence of events are influenced by many different sources of information. Links with the literature and implications are now discussed.

#### **External evidence and remembering**

The external evidence category reflects that fact that many different types of information can serve as evidence for or against the occurrence of events. There is an interesting literature on the use of memory aids, such as photographs and diaries, to cue recall, which will not be reviewed here. We will make the point that the recording and retention of memory aids is

frequently intentional. For example, Catal and Fitzgerald (2004) describe a woman who kept a detailed diary for decades so as to avoid conflicts within her family as to what ‘actually’ occurred (interestingly, this is also the use of a memory aid to facilitate a personal aim).

It is not surprising that encountering evidence about events can lead to the withdrawal of belief. Photographs may serve as concrete evidence that events occurred in a particular manner (Wade, Garry, Read, & Lindsay, 2002). Much of the work on the impact of photos on autobiographical memory has been in the context of false memory formation. Studies have shown that photos facilitate false memory formation under some conditions (Wade et al., 2002; Lindsay, Hagen, Read, Wade, & Garry, 2004; see Hessen-Kayfitz & Scoboria, 2012, for exceptions). The provision of doctored video evidence can lead to rapid inferences that false events must have occurred (Nash, Wade, & Lindsay, 2009).

The fact that some individuals described seeking information (sometimes finding it, and sometimes not) can be construed in different ways. First, this might be viewed as a search for information that might in itself directly verify the occurrence (or non-occurrence) of the event. That is, the information acquired may directly lead to a decision that the event happened/did not happen. Second, and not exclusively, searching for evidence might be thought of as an effort to cue additional remembering. While specific event-related evidence may not be located, other relevant evidence might be encountered. Lindsay et al. (2004) used such a cue when presenting a class photo along with a suggestion that a false event purportedly occurred. The current findings also show that it is not only locating confirmatory evidence that challenges autobiographical belief, but the failure to locate evidence can do the same.

### **The social basis of remembering**

The predominance of social input as an influence on judgments about the occurrence of

events is consistent with arguments that remembering is social in nature. Bartlett (1932) emphasized the social context of remembering. Bluck, Alea, Habermas and Rubin (2005), Hyman (1994), and Pillemer (1998) have variously argued that one of the functions of autobiographical memory is to serve social goals, such as nurturing relationships, transmitting knowledge, and informing others about personal experiences. Other views emphasize that it is difficult to separate retrieval, the conversion of retrieved material into verbal behavior, and the social aspects of retrieval contexts (Tulving, 1983; Blank, 2009), thus rendering much of what is studied under the rubric of memory as social in nature. Hirst and Echterhoff (2012) emphasize the communicative functions of remembering, and review ways in which what is recalled is affected by the purpose of remembering, with whom remembering occurs, and the dynamics of social exchange when remembering occurs. Sutton, Harris, Keil and Barnier (2010) argue that research on collaborative and transactive memory supports the proposition that cognitive processing may be extended beyond the individual to groups. An implication is that the maintenance and updating of individual beliefs about the occurrence of events are frequently subjected to input from members of the social groups within which people move.

These findings are also consistent with research showing the influence of social variables on remembering. For example, the credibility of messages and of individuals who are viewed as knowledgeable about events can influence the retrieval of genuine memories and the development of false beliefs and memories (e.g., Brown, Coman, & Hirst, 2009; Hyman & Pentland, 1996; Mazzoni, Lombardo, Malvagia, & Loftus, 1999). Work on memory verification also points to the reliance on social input to validate memories (Wade & Garry, 2005). People rely on social input even when the reliability of the informant is questionable. For example, people sometimes ‘fill in the blanks’ in memories for alcohol induced blackouts by relying on

other people who were also drinking to reconstruct (or fabricate) what occurred (Nash & Takarangi, 2011). When individuals report reduced confidence in the accuracy of memories, they most frequently cite lack of social verification as the reason for their uncertainty (Arbutnott et al., 2008). Wade et al. (2014) reported that individuals consider social verification to be a reliable and low cost method relative to other memory verification strategies.

### **When Someone Else is Motivated for You to Remember it Differently**

We found that social influence can also originate from individuals not wanting others to remember. This points to the fact that people sometimes challenge other's memories due to their own motivations. People vary in their motivations for challenging others' memories. An example is when someone recalls an event that involves another person being aware of something undesirable occurring in the past (e.g. abuse), and the other person invalidates the memory or refuses to discuss the issue. This other person's motivation may be to not recall the experience themselves, or to protect themselves or another person.

Work on suggestibility indicates that the motivations of others may serve to shape remembering. An example is false confessions, in which an interrogator may be motivated to obtain particular version of the past (Kassin & Kiechel, 1996), which requires also devaluing whatever memory is present for what did in fact occur. Related issues are a play in the case of retractors of false memories of childhood abuse (see Ost & Nunkoosing, 2009). These are cases in which individuals came to remember childhood events during psychotherapy, however at a later time (perhaps when alleged abusers deny that abuse occurred) they come to view this event as false. Here the motivations of the therapist as well as the motivations of the accused may impinge on the decisions made about the occurrence of the event. The point is that individuals may at times, intentionally or unintentionally, take advantage of the susceptibility of

autobiographical belief to social influence in order to advance personal agendas by challenging others' personal beliefs about the past.

### **Objective and Perceived Event Plausibility Play a Central Role in Remembering**

The emergence of plausibility as a basis for altering belief in vivid memories reinforces views that event plausibility plays a key role in the processing of event representations.

Plausibility has been proposed to influence memory-editing processes (Ghetti & Alexander, 2004; Lampinen & Odegaard, 2006), and may be thought of as constraining the degree to which events can be believed to be genuine (Scoboria, Mazzoni, Kirsch, & Relyea, 2004). When plausibility is low, false beliefs and memories are unlikely to develop (Pezdek, Finger, & Hodge, 1997), which is likely due to rejection of the event (Mazzoni, 2007). Only small increases in plausibility are needed to foment the development of false autobiographical beliefs (Mazzoni, Loftus, & Kirsch, 2001; Scoboria, Mazzoni, Jarry, & Shapero, 2012).

In other words, if Santa Claus is known to be real encountering him is plausible. On learning that Santa is not literally real, the ground truth of a memory for an encounter with Santa is undermined. In this case the presupposing conditions which support belief are eliminated. However, while the removal of plausibility leads to the withdrawal of belief in the occurrence, it does not affect in the same way the strength of the recollective quality of the mental simulation.

### **Internal Evidence and Memory**

The scrutiny of internal features as a basis for altering belief in the occurrence of an event is consistent with the view that mental representations tend to be labeled as memories when associated with sufficient levels of vivid perceptual imagery, contextual information, emotional content, and a sense of re-experiencing the past (Brewer, 1996; Johnson, Foley, Suengas, & Raye, 1988; Rubin, Schrauf, & Greenberg, 2001). Theoretical views proposing that the

classification of mental representations as memories reflects decision making processes argue that various sources of information are combined to reach the judgment that a mental experience is a sufficiently veridical representation of prior experience (Johnson & Raye, 1981). The internal features category reinforces the idea that memory representations judged at one time to be adequate may be re-appraised as inadequate at a later time. This re-appraisal might occur in light of other information that leads to altering the threshold for judging a representation to be a memory. The characteristics of the memory may not have changed at all, but the criterion for judging them as adequate can be altered by the new information. New information (accurate or inaccurate) may lead to changes in the threshold by which the event is judged to reflect genuine occurrence. Alternatively, the memory representation may change over time in any number of ways, which may lead to it being reappraised due to change in any of these qualities.

#### **Source Monitoring and Reattribution of the Source of Memories.**

The main theoretical approach that views memories as attributions is source monitoring. The source monitoring framework (SMF) proposes that the source of memories is not directly encoded, but instead is inferred at the time of recall (Johnson, Hashtroudi, & Lindsay, 1993). The current findings are consistent with the idea that mental representations may be attributed to one source and later reattributed to another source in light of new information. Most of the re-attributions identified here are examples of internal-internal monitoring (e.g., reattributing a memory as a dream). A small number reported internal-external misattributions, for example reattributing their memory to a television show.

People are sometimes uncertain about the source of mental representations. Shortly after waking, people sometimes report difficulty resolving whether vivid images originate from dreams or experiences (Kemp & Burt, 2006). People can be uncertain as to whether their

memories for childhood events originate from their own experience versus from family stories or from photographs that they have seen (Mazzoni, Chiesi, & Primi, 2000). Source misattribution is frequently cited as the means by which imagined mental representations are later labeled as memories reflecting genuine experiences (Lindsay, 2008). Arguably, all of the reasons examined in this paper are potentially elements that could lead to the reattribution of a memory.

The emergence of this category is a reminder of two key points that are made in the SMF: (1) that people are aware that the attribution of mental representations to a particular source is unreliable and therefore at times subject to revision; and, (2) that people sometimes actively engage decision-making processes when considering whether a mental representation reflects actual past experiences (termed ‘systematic processing’ in the source monitoring framework).

### **General Beliefs about Memory Shape Decisions about Specific Memories**

This category shows that people may base decisions to withdraw belief in memories on general metacognitive beliefs about memory. This category is consistent with arguments that general beliefs and knowledge about memory and remembering influence memory output. Mazzoni and Kirsch (2002) discuss a number of general beliefs, such as the belief that it is impossible to retrieve memories from before a certain age (the so-called infantile amnesia), that memories are more detailed than imaginings, that images that enter awareness with ease and fluency are likely to be memories, and distinctive events are likely to be recalled. Beliefs about childhood amnesia and beliefs about the unreliability of early memory do influence memory reporting (Maloniski & Lynn, 1999; Strange, Wade, & Hayne, 2008).

The finding that some individuals no longer believe their memory because they have learned that memory is reconstructive, or that false memories can occur, points to another type of memory belief: beliefs about memory that are acquired from experts (e.g., psychology instructors

providing information about infantile amnesia, false memory, etc.). Little is known about how such information influences the dynamics of everyday remembering. It is also interesting that, although we actively looked for them, there were few references to memory ability (e.g., beliefs that one's memory was generally poor, or that ability had declined). There is ample evidence that beliefs about memory function are a reliable individual difference variable that predicts memory performance (Hertzog, Dixon, & Hultsch, 1990). The current sample may simply have not reported such beliefs, as they might not be salient unless directly queried and instead operate in the background to shape performance. It is also possible that the current sample of younger adults may not have emphasized beliefs about memory ability when making decisions. The literature documents that belief in memory decline increases with age, and that older adults are more likely to attribute memory failures to decline in ability rather than situational factors (Lineweaver, Berger, & Hertzog, 2009; Pansky, Goldsmith, Koriat, & Pearlman-Avni, 2009). While such beliefs may be less pertinent in this sample, these examples are interesting because it has been shown that such beliefs predict underperformance on memory tasks in elderly individuals (Hertzog, McGuire, & Lineweaver, 1998; Hess, Auman, Colcombe, & Rahhal, 2003). This leaves the question as to whether nonbelieved memories, namely, those resulting from beliefs about memory ability, are more likely in older individuals.

### **Views of Self and of Others Shape Remembering**

Various researchers have argued that autobiographical memory serves self-related functions (Bluck & Levine, 1998; Pillemer, 1998). Evidence supports the assertion that autobiographical memory contributes to perceptions of the self as consistent over time (Bluck, Alea, Habermas, & Rubin, 2005). Perceptions of self-inconsistency can threaten current views of self-coherence, resulting in discrepant memories being rendered not readily accessible



(McAdams, 2001). Other approaches propose that retrieval is driven by current self-goals, leading to goal consistent information being more accessible than goal-inconsistent information (Conway, Singer, & Tagani, 2004; D'Argembeau & Mathy, 2011). What our data show is that sometimes memories are retrieved that are inconsistent with current self-views. For example, a memory may have been consistent with past goals and hence frequently retrieved, rehearsed, and rendered highly accessible. Thus inconsistency with self-goals at a later time may alone be insufficient to prevent retrieval of the memory image.

### **Personal Motivation to Alter Autobiographical Belief**

This data supports the perhaps not surprising view that people sometimes do not want to believe that certain events occurred. Negative past events are sometimes associated with distress when recalled, and the diagnosis of post-traumatic stress disorder is predicated in part on a desire to avoid reminders of distressing experiences. Experiences of shame or loss may be actively suppressed. The motivation category indicates that people sometimes claim to have succeeded in reducing or eliminating belief in events, even while the recollective image remains vivid. Although this category is partly reminiscent of work on intentional/directed forgetting of events (Anderson & Greene, 2001), and there is some evidence that memory for autobiographical events can be intentionally suppressed (Joslyn & Oakes, 2005; Noreen & Macleod, 2013), these studies focus on the intentional forgetting of recollective information, whereas our participants reported suppressing belief in the event but not recollective information. Theories of intentional forgetting will need to account for how belief in the occurrence of events is eliminated, both when recollection is and is not also reduced. Future research on events for which people actively strive to reduce their belief has the potential to illuminate the role of personal motivation in the maintenance and removal of belief from memories. This category points to the need to

understand whether, and to what extent, people succeed in eliminating belief, and represents a point on the continuum between the forgetting of experiences and the presence of intrusive memories that seem resistant to suppression. An important observation is that autobiographical belief may be altered due to such motivations, without access to the memory being lost.

### **Summary and Conclusions**

This is the first in depth examination of the reasons for withdrawing belief in vivid memories. Key to understanding the results is that, as shown in preceding work, the mental simulation for such events remain vivid (highly ‘memory-like’), despite the choice to reduce or completely withdraw belief. Respondents provided diverse explanations for such decisions. The withdrawal of belief is based on inferential decisions, triggered mainly by external evidence, and particularly by social influence. Such evidence can override the power that recollection typically holds as incontrovertible evidence that events occurred. This result confirms previous results showing that recollection and autobiographical belief are theoretically independent constructs, and provides support for the notion that autobiographical belief is influenced by multiple sources of information and processes, of which recollection is but one.

These findings show that people engage in systematic reasoning to explain why vivid memories may not reflect past experiences. As discussed in greater detail elsewhere (Scoboria et al., in press), such reasoning stems from the need to reconcile the cognitive dissonance that arises from opposing sources of evidence (recollection on one hand, and some other unavoidable, contradictory evidence on the other). It is important to note that the development of a nonbelieved memory is only one possible outcome of such decision-making processes. In other cases the weight assigned to the sense of ‘pastness’ conveyed by the memory is judged to be higher than that assigned to the external evidence. In these cases people defend autobiographical

belief (Sheen et al., 2001). Retention of belief in light of contradictory evidence might be facilitated by the centrality of the memory to the individual's current sense of identity. It is likely that greater resistance is met in changing belief for events that are currently viewed as more central for the self, or that are more strongly connected with central self-related themes, as suggested by both work on self-consistency (e.g., Wilson & Ross, 2003) and work showing that factual belief change is difficult (e.g., Elio & Pelletier, 1997). It is also possible that some memories once challenged by credible evidence are rendered inaccessible. This may explain why nonbelieved memories comprise a relatively small proportion of autobiographical events (see Scoboria & Talarico, 2013, for more on frequency). Nonbelieved memories may be the exception rather than the norm when believed memories are challenged; research is needed on this issue. A more complete analysis of the revision of autobiographical belief will require studying the factors that determine the choice to relinquish vs. the choice to defend the belief that memories represent true occurrences, under both naturalistic and laboratory conditions.

This paper focuses entirely on subjective appraisals of autobiographical events, and tells little if anything about the objective accuracy of the events. As discussed by Mazzoni et al. (2010), it is possible that nonbelieved memories reflect accurately 'disowned', or inaccurately 'orphaned' memories. However, the accuracy of the accounts examined here is not the focus of this work. Rather the aim is to document the reasons to reject, outside of the lab, in real life, an existing memory. Future studies will be needed to address the question of the accuracy of the initial memory, and evidence from the laboratory studies to date indicates that nonbelieved memories can result from both objectively true and objectively false events.

We note that it is not known if the current categories are exhaustive. The number of categories or frequency of endorsement might differ if individuals were asked to provide more

elaborate accounts. Furthermore, people may have tended to report only the most salient reasons. It is not clear how well internal categories such as general memory beliefs or internal features are captured via this approach. Future research might develop checklists of reasons for altering belief.

This study documents the wide variety of reasons that influence the choice to stop believing vivid memories. The results underline the key role of external information in memory-related decisions, and underscore the importance of including social and contextual elements in models of remembering. This reinforces claims that judgments of occurrence are based on the convergence of numerous memorial and non-memorial numerous sources of information.

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## References

- Anderson, M. C., & Greene, C. (2001). Suppressing unwanted memories by executive control. *Nature*, *410*, 366-369. doi: 10.1038/35066572
- Arbuthnott, K. D., Kealy, K. L. L., & Ylioja, S. (2008). Judgment of confidence in childhood memories. *Applied Cognitive Psychology*, *22*, 953-978. doi: 10.1002/acp.1404
- Bartlett, F. C. (1932). *Remembering: A study in experimental and social psychology*. Cambridge, UK: Cambridge University Press.
- Bernstein, D. M., & Loftus, E. F. (2009). The consequences of false memories for food preferences and choices. *Perspectives on Psychological Science*, *4*, 135-139. doi:10.1111/j.145-6924.2009.011113.x
- Blank, H. (2009). Remembering: A theoretical interface between memory and social psychology. *Social Psychology*, *40*, 164-175. doi: 10.1027/1864-9335.40.3.164
- Bluck, S., Alea, N., Habermas, T., & Rubin, D. C. (2005). A tale of three functions: The self-reported uses of autobiographical memory. *Social Cognition*, *23*, 91-117. doi: 10.1521/soco.23.1.91.59198
- Bluck, S., & Levine, L. J. (1998). Reminiscence as autobiographical memory: A catalyst for reminiscence theory development. *Aging and Society*, *18*, 185-208.
- Brewer, W. F. (1996). What is collective memory? In D. C. Rubin (Ed.), *Remembering our past: Studies in autobiographical memory* (pp. 96-66). New York: Cambridge University Press
- Brown, A. D., Coman, A., & Hirst, W. (2009). The role of narratorship and expertise in social remembering. *Social Psychology*, *40*, 119-129. doi: 10.1027/1864-9335.40.3.119

Catal, L. L., & Fitzgerald, J. M. (2004). Autobiographical memory in two older adults over a twenty-year retention interval. *Memory and Cognition*, *32*, 311-323. doi:

10.3758/BF03196861

Clark, A., Nash, R. A., Fincham, G., & Mazzoni, G. (2012). Creating non-believed memories for recent autobiographical events. *PLoS ONE*, *7*, e32998. doi:

10.1371/journal.pone.0032998

Conway, M.A., Singer, J. A., & Tagani, A. (2004). The self and autobiographical memory: Correspondence and coherence. *Social Cognition*, *22*, 491-529. doi:

10.1521/soco.22.5.491.50768

D'Argembeau, A., & Mathy, A. (2011). Tracking the construction of episodic future thoughts.

*Journal of Experimental Psychology: General*, *140*, 258-271. doi: 10.1037/a0022581

D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation

strategies. *Consciousness and Cognition*, *15*, 342-350. doi:10.1016/j.concoq.2005.09.001

Elio, R., & Pelletier, F. J. (1997). Belief change as propositional update. *Cognitive Science*, *21*, 419-460. doi: 10.1016/S0364-0213(99)80029-9

Fitzgerald, J. M., & Broadbridge, C. L. (2012). Latent constructs of the Autobiographical Memory Questionnaire: A recollection-belief model of autobiographical experience.

*Memory*, *21*, 230-248. doi: 10.1080/09658211.2012.725736

Ghetti, S., & Alexander, K. W. (2004). "If it happened, I would remember it": Strategic use of event memorability in the rejection of false autobiographical events. *Child Development*,

*75*, 542-561. doi: 10.1111/j.1467-8624.2004.00692.x

- Hart, R., & Schooler, J. (2006). Increasing belief in an invasive procedure that never happened: The role of plausibility and schematicity. *Applied Cognitive Psychology, 20*, 661-669. doi: 10.1002/acp.1218
- Hertzog, C., Dixon, R. A., & Hultsch, D. F. (1990). Relationships between metamemory, memory predictions, and memory task performance in adults. *Psychology and Aging, 5*, 215-227. doi: 10.1037/0882-7974.5.2.215
- Hertzog, C., McGuire, C. L., & Lineweaver, T. T. (1998). Aging, attributions, perceived control and strategy use in a free recall task. *Aging, Neuropsychology and Cognition, 5*, 85-106. doi: 10.1076/anec.5.2.85.601
- Hess, T. M., Auman, C., Colcombe, S. J., & Rahhal, T. A. (2003). The impact of stereotype threat on age differences in memory performance. *The Journals of Gerontology: Series B: Psychological Sciences and Social Sciences, 58B*, 3-11. doi: 10.1093/geronb/58.1.P3
- Hessen-Kayfitz, J., & Scoboria, A. (2012). False memory is in the details: Photographic details predict memory formation. *Applied Cognitive Psychology, 26*, 333-341. doi: 10.1002/acp.1839
- Hirst, W., & Echterhoff, G. (2012). Remembering in conversations: The social sharing and reshaping of memories. *Annual Review of Psychology, 63*, 55-79. doi: 10.1146/annurev-psych-120710-100340
- Hyman, I. E. (1994). Conversational remembering: Story recall with a peer versus for an experimenter. *Applied Cognitive Psychology, 8*, 49-66. doi: 10.1002/acp.2350080106
- Hyman, I. E., Husband, F., & Billings, J. (1995). False memories of childhood experiences. *Applied Cognitive Psychology, 9*, 181-197. doi: 10.1002/acp.2350090302



- Hyman, I. E., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language, 35*, 101-117. doi: 10.1006/jmla.1996.0006
- Ikier, S., Tekcan, A. İ., Gülgöz, S., & Küntay, A. C. (2003). Whose life is it anyway? Adoption of each other's autobiographical memories by twins. *Applied Cognitive Psychology, 17*, 237-247. doi: 10.1002/acp.869
- Johnson, M. K., Foley, M. A., Suengas, A. G., & Raye, C. L. (1988). Phenomenal characteristics of memories for perceived and imagined autobiographical events. *Journal of Experimental Psychology: General, 117*, 371-376. doi: 10.1037/0096-3445.117.4.371
- Johnson, M. K., Hastroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin, 114*, 3-28. doi: 10.1037/0033-2909.114.1.3
- Johnson, M. K., & Raye, C. L. (1981). Reality monitoring. *Psychological Review, 88*, 76-85. doi: 10.1037/0033-295X.88.1.67
- Joslyn, S. L., & Oakes, M. A. (2005). Directed forgetting of autobiographical events. *Memory and Cognition, 33*, 577-587. doi: 10.3758/BF03195325
- Kassin, S. M., & Kiechel, K. L. (1996). The social psychology of false confessions: Compliance, internalization, and confabulation. *Psychological Science, 7*, 125-128. doi: 10.1111/j.1467-9280.1996.tb00344.x
- Kemp, S., & Burt, C. D. B. (2006). Memories of uncertain origin: Dreamt or real? *Memory, 14*, 87-93. doi: 10.1080/09658210444000548
- Küntay, A. C., Gülgöz, S., & Tekcan, A. İ. (2004). Disputed memories of twins: How ordinary are they? *Applied Cognitive Psychology, 18*, 405-413. doi: 10.1002/acp.976

- Lampinen, J. M., & Odegaard, T. N. (2006). Memory editing mechanisms. *Memory, 14*, 649-654. doi: 10.1080/09658210600648407
- Lineweaver, T. T., Berger, A. K., & Hertzog, C. (2009). Expectations about memory change are impacted by aging stereotypes. *Psychology and Aging, 24*, 169-176. doi: 10.1037/a0013577
- Lindsay, D. S. (2008). Source monitoring. In H. L. Roediger, III (Ed.), *Cognitive psychology of memory. Vol. 2 of Learning and memory: A comprehensive reference*, 4 vols. (J. Byrne, Editor) (pp. 325-347). Oxford: Elsevier.
- Lindsay, D. S., Hagen, L., Read, J. D., Wade, K., & Garry, M. (2004). True photographs and false memories. *Psychological Science, 15*, 149-154. doi: 10.1111/j.0956-7976.2004.01503002.x
- Malinoski, P., & Lynn, S. J. (1999). The plasticity of very early memory reports: Social pressure, hypnotizability, compliance, and interrogative suggestibility. *International Journal of Clinical and Experimental Hypnosis, 47*, 320-345. doi: 10.1080/00207149908410040
- Mazzoni, G. A. L. (2007). Did you witness demonic possession? A response time analysis of the relationship between event plausibility and autobiographical beliefs. *Psychonomic Bulletin & Review, 14*, 277-281. doi: 10.3758/BF03194064
- Mazzoni, G., Chiesi, F., & Primi, C. (2000). Contenuti autobiografici dell'infanzia / The autobiographical content of infancy. *Giornale Italiano di Psicologia, 27*, 701-718.
- Mazzoni, G., Clark, A., & Nash, R. (2014). Disowned recollections: Denying true experiences undermines belief in occurrence but not judgments of remembering. *Acta Psychologica, 145*, 139-146. doi: 10.1016/j.actpsy.2013.11.007

- Mazzoni, G., & Kirsch I. (2002). Autobiographical memories and beliefs: A preliminary metacognitive model. In T. J. Perfect & B. L. Schwartz (Eds.), *Applied metacognition* (pp. 121-145). Cambridge, UK: Cambridge University Press.
- Mazzoni, G. A. L., Loftus, E. F., & Kirsch, I. (2001). Changing beliefs about implausible autobiographical events: A little plausibility goes a long way. *Journal of Experimental Psychology: Applied*, *7*, 51-59. doi: 10.1037/1076-898X.7.1.51
- Mazzoni, G. A. L., Loftus, E. F., Seitz, A., & Lynn, S. J. (1999). Changing beliefs and memories through dream interpretation. *Applied Cognitive Psychology*, *13*, 125–144. doi: 10.1002/(SICI)1099-0720(199904)
- Mazzoni, G. A. L., Lombardo, P., Malvagia, S. & Loftus, E. F. (1999). Dream interpretation and false beliefs. *Professional Psychology: Research and Practice*, *30*, 45-50. doi: 10.1037/0735-7028.30.1.45
- Mazzoni, G., & Memon, A. (2003). Imagination can create false autobiographical memories. *Psychological Science*, *14*, 186-188. doi: 10.1046/j.1432.1327.1999.00020.x
- Mazzoni, G., & Scoboria, A. (2007). Cognition and false memories. In F. Durso (Ed.), *Handbook of applied cognition* (2<sup>nd</sup> ed.) (pp. 789-812). West Sussex, England: Wiley and Sons Ltd.
- Mazzoni, G., Scoboria, A., & Harvey, L. (2010). Nonbelieved memories. *Psychological Science*, *21*, 1334-1340. doi: 10.1177/0956797610379865
- McAdams, D. P. (2001). The psychology of life stories. *Review of General Psychology*, *5*, 100-122. doi: 10.1037/1089-2680.5.2.100
- Moskovitch, M. (2012). The contribution of research on autobiographical memory to past and present theories of memory consolidation. In D. Berntsen & D. Rubin (Eds.),

- Understanding autobiographical memory: Theories and approaches* (pp. 91-113).  
Cambridge: Cambridge University Press.
- Nash, R. A., & Takarangi, M. K. T. (2011). Reconstructing alcohol-induced memory blackouts. *Memory, 19*, 566-573. doi: 10.1080/09658211.2011.590508
- Nash, R. A., Wade, K. A., & Lindsay, D. S. (2009). Digitally manipulating memory: Effects of doctored videos and imagination in distorting beliefs and memories. *Memory and Cognition, 37*, 414-424. doi: 10.3758/MC.37.4.414
- Nelson, T. O., & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G. H. Bower (Ed.), *The psychology of learning and motivation* (pp. 125-173). New York: Academic Press.
- Noreen, S., & Macleod, M. D. (2013). It's all in the detail: Intentional forgetting of autobiographical memories using the autobiographical think/no-think task. *Journal of Experimental Psychology: Learning, Memory and Cognition, 39*, 275-393. doi: 10.1037/a0028888
- Ost, J., & Nunkoosing, K. (2009). Reconstructing Bartlett and revisiting retractions of contested claims of abuse. In J. Haaken & P. Reavey (Eds.), *Memory matters: Contexts for understanding sexual abuse recollections* (pp. 41-62). New York: Routledge.
- Otgaar, H., Scoboria, A., & Smeets, T. (2013). Experimentally evoking nonbelieved memories for childhood events. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 39*, 717-730. doi: 10.1037/a0029668
- Pansky, A., Goldsmith, M., Koriat, A., & Pearlman-Avni, S. (2009). Memory accuracy in old age: Cognitive, metacognitive, and neurocognitive determinants. *European Journal of Cognitive Psychology, 21*, 303-329. doi: 10.1080/09541440802281183

- Pezdek, K., Finger, K., & Hodge, D. (1997). Planting false childhood memories: The role of event plausibility. *Psychological Science, 8*, 437-441. doi:10.1111/j.1467-9280.1997.tb00457.x
- Pillemer, D. B. (1998). What is remembered about early childhood events? *Clinical Psychology Review, 18*, 895-913. doi: 10.1016/S0272-7358(98)
- Rubin, D. C. (2006). The basic-systems model of episodic memory. *Perspectives on Psychological Science, 1*, 277-311. doi: 10.1111/j.1745-6916.2006.00017.x
- Rubin, D. C., Schrauf, R. W., & Greenberg, D. L. (2003). Belief and recollection of autobiographical memories. *Memory and Cognition, 31*, 887-901. doi: 103758/BF03196443
- Scoboria, A., Jackson, D. L., Talarico, J., Hanczakowski, M., Wysman, L., & Mazzoni, G. (in press). The role of belief in occurrence within autobiographical memory. *Journal of Experimental Psychology: General*. doi: 10.1037/a0034110
- Scoboria, A., Lynn, S. J., Hessen, J., & Fisico, S. (2012). So that's why I don't remember: Normalizing forgetting of childhood events influences false autobiographical beliefs but not memories. *Memory, 15*, 801-813. doi: 10.1080/09658210701685266
- Scoboria, A., Mazzoni, G., Jarry, J., & Shapero, D. (2012). Implausibility inhibits but does not eliminate false autobiographical beliefs. *Canadian Journal of Experimental Psychology, 66*, 259-267. doi: 10.1037/a0030017
- Scoboria, A., Mazzoni, G., Kirsch, I., & Relyea, M. (2004). Plausibility and belief in autobiographical memory. *Applied Cognitive Psychology, 18*, 791-807. doi: 10.1005/acp.1062

- Scoboria, A., & Talarico, J. M. (2013). Indirect cueing elicits distinct types of autobiographical event representations. *Consciousness and Cognition*, *22*, 1495-1509.
- Scoboria, A., Wysman, L., & Otgaar, H. (2012). Credible suggestions affect false autobiographical beliefs. *Memory*, *20*, 429-442. doi: 10.1080/09658211.2012.677449
- Sheen, M., Kemp, S., & Rubin, D. (2001). Twins dispute memory ownership: A new false memory phenomenon. *Memory and Cognition*, *29*, 779-788. doi: 10.3758/BF03196407
- Sheen, M., Kemp, S., & Rubin, D. (2006). Disputes over memory ownership: What memories are disputed? *Genes, Brain and Behavior*, *5*, 9-13. doi: 10.1111/j.1601-183X.2006.00189.x
- Shtulman, A. (2009). The development of possibility judgment within and across domains. *Cognitive Development*, *24*, 293-309. doi: 10.1016/j.cogdev.2008.12.006
- Smeets, T., Telgen, S., Ost, J., Jelicic, M., & Merckelbach, H. (2009). What's behind crashing memories? Plausibility, belief and memory in reports of having seen non-existing images. *Applied Cognitive Psychology*, *23*, 1333-1341. doi: 10.1002/acp.1544
- Strange, D., Wade, K., & Hayne, H. (2008). Creating false memories for events that occurred before versus after the offset of childhood amnesia. *Memory*, *16*, 475-484. doi: 10.1080/09658210802059049
- Sutton, J., Harris, C. B., Keil, P. G., & Barnier, A. J. (2010). The psychology of memory, extended cognition, and socially distributed remembering. *Phenomenology and the Cognitive Sciences*, *9*, 521-560. doi: 10.1007/s11097-010-9182-y
- Tulving, E. (1983). *Elements of episodic memory*. Oxford: Clarendon Press.
- Wade, K. A. & Garry, M. (2005). Strategies for verifying false autobiographical memories. *The American Journal of Psychology*, *118*, 587-602. doi: 30039087

Wade, K. A., Garry, M., Read, J. D., & Lindsay, S. (2002). A picture is worth a thousand lies: Using false photographs to create false childhood memories. *Psychonomic Bulletin & Review*, *9*, 597-603. doi: 10.3758/BF03196318

Wade, K. A., Nash, R., & Garry, M. (2014). People consider reliability and cost when verifying their autobiographical memories. *Acta Psychologica*, *146*, 28-34.  
doi: 10.1016/j.actpsy.2013.12.001

Wilson, A. E., & Ross, M. (2003). The identity function of autobiographical memory: Time is on our side. *Memory*, *11*, 137-149. doi: 10.1080/741938210

Table 1. *Reasons Provided for Choosing to Withdraw Belief in the Memory*

CATEGORY		DESCRIPTION	BRIEF EXAMPLE
<b>SOCIAL FEEDBACK</b> Invalidating information is derived via social exchange(s).			
SO1	Told did not occur	Feedback that the event did not occur, and/or others deny event.	"...told me it didn't happen."
SO2	Told happened differently	Feedback that details within the event happened differently.	"...told I found out about that differently..."
SO3	Told impossible	Feedback that event could not have occurred.	"...said there was no amusement park in that city."
SO4	Told unlikely	Feedback that the event could have occurred but it is unlikely.	"...told my teacher wouldn't have said that..."
SO5	Told happened to someone else	Feedback that the event (or event features) happened to someone else.	"...told me that happened to my sister, not me."
SO6	Disconfirming non-verbal feedback	Intentional non-verbal feedback (e.g., look of disbelief, laughing, etc).	"...they acted like everything was fine."
SO7	Told was not there	Feedback that was not present to witness event.	"...told me I wasn't there."
SO8	Lack of corroboration	Feedback provided that the memory cannot be confirmed.	"Nobody else remembers it."
SO9	Feedback not sought/provided	Does not seek feedback and others do not provide it.	"It was never brought up again".
SO10	Others unavailable	Does not receive feedback because key other(s) unavailable.	"...she changed her number, so I can't confirm..."
SO11	Pressured by others	Feedback appears motivated (memory poses consequences for other).	"...said he never hurt my sister like I remember."
SO12	Refusal to discuss	Seeks feedback but other(s) refuse to provide (other may be motivated to avoid).	"I tried telling [other], but she refused to talk..."
<b>EVENT PLAUSIBILITY</b> Information challenges the possibility that the event could have occurred in reality.			
PL1	Subjective	States event is impossible/improbable based on feelings, tastes, or opinions.	"It's impossible for a car to flip like that..."
PL2	Objective	Event judged impossible/improbable for commonly accepted axioms of reality.	"...in my memory I am flying!"
<b>ALTERNATIVE ATTRIBUTIONS</b> Invalidating information comes from other source attributions that are implied to be confused with reality.			
AA1	Internal, Asleep	Memory may have resulted from a dream or nightmare.	"It was all just a dream."
AA2	Internal, Awake	Memory may have resulted from fantasy, imagination, etc.	"I must have made it up."
AA3	Other mental state	Memory may have resulted from another cause (hallucination, substance, etc.).	"I was really drunk..."
AA4	External	Memory may have resulted from an external source (movie, T.V., book, etc.).	"I actually saw that in a movie."
<b>GENERAL BELIEFS</b> Invalidating information relies on general meta-memory attributions			
GB1	Memory and age	Belief memories cannot occur when very young or unreliable from childhood.	"Children have wild imaginations."
GB2	Memory integrity	Belief in general memory ability, quality of own memory; Beliefs that memories can be false; can result from expectations; should be salient if "important", etc.	"If that did happen, I would remember it better."
GB3	Memory influence	Belief that true memories should have an enduring influence.	"If I did get bit, I should be afraid of dogs ..."
<b>INTERNAL FEATURES</b> Invalidating information derived via subjective assessments of internal event characteristics.			
IN1	Atypical internal characteristics	Something unusual about memory (features disorganized, feels unreal, etc.).	"I can't remember the details and it seems blurry."
<b>EXTERNAL EVIDENCE</b> Invalidating evidence obtained; validating evidence not obtained (no social exchange).			
EE1	Disconfirming evidence obtained	Seeks or confronted with evidence that threatens the validity of the memory.	"I found a group photo and I wasn't even in it."
EE2	Confirming evidence not obtained	External evidence that validates the memory is absent or cannot be obtained.	"If I injured myself, I would have a scar..."
<b>NOTIONS OF SELF/OTHERS</b> Invalidating information relies on compatibility between event and one's concept of self and/or concept of another.			
SO1	(In)consistency w/self-image	States event (or features) is at odds with whom they regard themselves to be.	"I am a neat freak so there is no way..."
SO2	(In)consistency w/image of other(s)	Sates event (or features) is at odds with the image they hold of other(s).	"My mother would never lie to me about that."
<b>MOTIVATION</b> Invalidating information is self-derived in <i>wanting</i> to relinquish belief			
MO1	Motivation to relinquish belief	Motivated to stop believing confirmatory, or believe disconfirmatory evidence.	"I convinced myself it wasn't real."
<b>OTHER</b> Invalidating information is vague and does not fit into the above categories.			
25	Other	Nonspecific reports.	"I'm just unsure about it."



Table 2

*Frequency of Major Category Endorsement*

Major category	Frequency of mention of major category	Frequency of major category judged as primary reason for withdrawing belief	Frequency of major category endorsed alone
1) Social	198	158	97
2) Plausibility	132	73	28
3) Alt. attributions	108	33	13
4) General beliefs	67	24	6
5) Internal	61	27	5
6) Self/Other	45	24	3
7) External	40	27	6
8) Motivation	16	4	0
9) Other*	4	4	4

Total number of times that each major category was mentioned, judged to be the primary reason for withdrawing belief, and mentioned alone without additional mention of any other major category.  $N = 374$ . \*'Other' refers to vague responses that could not be categorized.

Table 3

*Frequency of Sub-Category Endorsement*

Major category	Sub-category	Frequency of mention of sub-category	Frequency of sub-category judged as primary reason for withdrawing belief	Frequency of sub-category endorsed alone
1) Social	Did not occur	78	56	31
	Happened differently	37	28	18
	Impossible	28	19	7
	Unlikely	10	5	1
	Happened someone else	10	6	5
	Non-verbal	9	4	2
	Not present	4	3	1
	Lack corroboration	46	31	9
	Not sought	11	5	2
	Unavailable	2	0	0
	Pressured	10	1	0
	Refused	3	0	0
	2) Plausibility	Subjective	119	72
Objective		57	1	1
3) Alternative attributions	Internal - Asleep	74	22	8
	Internal - Conscious	33	9	4
	Other mental states	12	2	0
	External	4	0	0
4) General beliefs	Memory and age	36	14	4
	Memory integrity	30	9	2
	Memory influence	5	1	0
5) Internal		61	27	5
6) External	Disconfirming obtained	24	17	5
	Confirming not obtained	17	10	1
7) Self/Other	Self	17	12	2
	Other	30	12	1
8) Motivation		16	4	0
9) Other		4	4	4

Total number of times that each sub-category was mentioned (this is the total number of reasons provided for withdrawing belief across all transcripts), judged to be the primary reason for withdrawing belief, and mentioned alone without additional mention of any other sub-category.  $N = 374$ .

Table 4

*Overlap Between the Primary Category and the Remaining Major Categories*

Primary reason for withdrawing belief	Frequency of primary reason	1	2	3	4	5	6	7	8
1. Social	158	-	18	26	15	10	4	7	2
2. Plausibility	73	12	-	25	12	5	4	3	2
3. Alt. attribution	33	5	9	-	5	5	1	0	3
4. General beliefs	24	7	5	7	-	6	0	5	1
5. Internal	27	4	5	8	3	-	2	3	2
6. External	27	7	11	5	4	2	-	2	0
7. Self/Other	24	4	10	3	3	5	2	-	2
8. Motivation	4	1	1	1	1	1	0	1	-

The table indicates the frequency at which other categories are endorsed, within the category judged as the primary reason for withdrawing belief. Because these frequencies are contingent on the number of primary judgments for each category, the table is only to be read horizontally. The category identified in the first column is the primary reason for withdrawing belief, and reading to the right indicates the number of times each of the other categories overlapped with the primary category.