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Creating False Memories: Effects of varying types of details contained in photographs

by

Joanna K. Hessen

University of Windsor

A Thesis
Submitted to the Faculty of Graduate Studies
through Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts at
the University of Windsor

Windsor, Ontario, Canada

2008

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ABSTRACT

Recent research has suggested that false narratives produce higher false memory rates than false photographs. This has been explained in terms of photographs being higher in *constraint*, defined as the limitation of freedom to develop familiar details about a memory, because they are a snapshot of a moment and may discourage imagination when attempting to remember the event. This study extends previous research by exploring the effects of *constraining* and *self-relevant* details in false photographs upon false memory formation. Seventy-six participants were randomized to conditions where either a non-self relevant or self-relevant detail was paired with either a non-constraining or constraining detail. Over the course of three sessions during which they were encouraged to provide as much descriptive detail about their memories, participants viewed 4 photographs allegedly provided by their parents, one of which depicted an alleged childhood balloon ride with a parent. They rated how much they remembered each photograph, as well as the quality of their memories. Additionally, participants' transcripts from the first and third sessions were rated by two independent judges as to the extent to which they constituted visual images or memories. Consistent with predictions, individuals who received self-relevant information without associated constraining information in photographs provided the highest memory ratings, and endorsed certain memory characteristics (e.g. visual images, event coherence, emotional content) for the false event. However, predicted differences in judge's ratings of events as memories were not observed. Groups showed statistically equal false memory formation rates at both time points, achieving an overall images rate of 20.9% and memory rate of 12.4%. This research has implications in both the therapeutic and legal arenas.

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TABLE OF CONTENTS

	Page
AUTHOR'S DECLARATION OF ORIGINALITY	iii
ABSTRACT	iv
ACKNOWLEDGEMENTS	v
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER	
I INTRODUCTION	1
Early False Memory Research	1
Suggesting False Memories for Entire Events	4
Suggesting false events using narratives	4
Suggesting false events using photographs	6
Comparing narratives and photographs	8
Two Main Variables Playing a Role in False Memory Formation	11
Constraint	11
Self-Relevant and Specific Details	15
Summary	19
Manipulating Constraint and Self-Relevance in Photographs	21
Hypotheses	24
Hypothesis 1	24
Hypothesis 2	27
Hypothesis 3	27
Hypothesis 4	27
II METHOD	28
Participants and Setting	28
Design and Materials	28
Soliciting information from parents	28
ABMQ	30
Judges' ratings	31
Memory Characteristics Questions	31
Procedure	33
III RESULTS	37
Overall images and memories formed	37
Judges' ratings	37
ABMQ	39

MCQ	42
Participants' guesses	45
IV DISCUSSION	46
General discussion	46
Relationship between self-relevant and constrained details	51
Subjective reports	51
Judges' ratings	56
Summary and implications	58
Limitations and future research directions	63
REFERENCES	66
APPENDIX A: Sample Doctored Photograph	73
APPENDIX B: General Consent Form	74
APPENDIX C: Audio-taping Consent Form	78
APPENDIX D: Consent Form to Contact Parents	79
APPENDIX E: Letter of Information for Parents	80
APPENDIX F: ABMQ	82
APPENDIX G: Memory Characteristics Questions	85
APPENDIX H: Demographics Questions	86
APPENDIX I: Logistic Regression Analyses of Judges' Ratings	87
VITA AUCTORIS	88

TABLES		Page
1	The four experimental conditions and how they were created	32
2	Percentage of image and memory formation judgments across experimental conditions over time	34
3	Means and standard deviation for all ABMQ variables at Time 2	38

FIGURES	Page
1 Predicted rates of false memories formed as a factor of varying details contained in photographs	26
2 Mean memory rating on the Autobiographical Belief and Memory Questionnaire as a factor of experimental condition.	41

CHAPTER I

INTRODUCTION

A topic which has received ongoing attention in the literature and the criminal justice system for over a decade is that of “false” or “implanted” memories. It has been argued that an individual can come to “remember” situations or events that never happened and people or things that never even existed. When remembering an event, distortion naturally occurs because memory does not function like a video recording that can be played back in order to view past events exactly as they were experienced. Because memories are considered to be based more on reconstruction of elements than on rote recall of a single memory (Wright & Loftus, 1998), they are susceptible to change. Since reconstruction involves piecing together separate components of memory into a representation of the episode being remembered, at the time of retrieving a past event, new material may be incorporated into existing memories, and old material may be reorganized in novel ways which do not reflect original experience.

EARLY FALSE MEMORY RESEARCH

These concerns over the reliability of memory have given rise to a branch of research dealing specifically with issues involving distorted or implanted memories. This literature developed out of concerns over the accuracy of memory in a number of domains, such as the accuracy of eyewitness testimony, false confession, the effects of purported memory enhancing techniques such as hypnosis, and the accuracy of childhood memories recovered during therapy. Prior research convincingly demonstrates that memory is fallible. For example, memories can be altered by providing post-event information that is misleading – a phenomenon termed the “misinformation effect”

(Loftus, 2004). However, even without overt manipulation and attempts to deceive, memories are susceptible to decay. Even the most vividly experienced of memories appear susceptible to distortion and decay. Numerous studies have demonstrated that “flashbulb memories” are no more likely to be accurate than are ordinary memories. In one recent example, Talarico and Rubin (2003) asked undergraduates at Duke University in North Carolina to record their memories of when they first heard of the terrorist attacks of September 11, 2001 and also of a recent everyday event. They questioned them about their memory after 1 week, 6 weeks, and 32 weeks. They found that the consistency for both the 9/11 flashbulb memory and the memory of the everyday event did not differ: accuracy of recall for both events decreased over time. Nevertheless, participants rated vividness, recollection and belief in the accuracy of the 9/11 memories as greater than that of the everyday events.

Thus, even memories subjectively experienced as vivid and accurate tend to naturally become distorted over time. Two mechanisms are frequently posited to explain such changes: decay and interference (Jenkins & Dallenbach, 1924). Briefly, when we learn something new, a neural pathway is created. Over time, that pathway (unless reinforced) slowly disintegrates until we cannot remember the originally learned material. Regarding decay, according to Ebbinghaus’ classic research, the half life of human memory is approximately one hour, absent regular rehearsal (Ebbinghaus, Ruger & Bussenius, 1913)

The second mode of forgetting, interference (Jenkins & Dallenbach, 1924), can be divided into two concepts: proactive and retroactive interference. Proactive interference involves the forgetting of new information due to information provided before the event

to be remembered. For example, if one were to take a French class followed by a Spanish class, the French words initially learned may interfere with the learning subsequent recall of the appropriate Spanish words on a test. Retroactive interference involves forgetting which is due to information provided after the event to be remembered. In the latter instance, the new (i.e. post-event information) alters or displaces original information. This information does not have to necessarily relate to the original event. For example, if the target event is a birthday party, then the occurrence of many future birthday parties that the individual experiences serve as post-event information. This post-event information may merge and integrate with the memory of the original birthday party, increasing the likelihood that details from the particular party being recalled will contain inaccurate information. When post-event information is inaccurate and relates to the original event, it is appropriately termed “post-event misinformation”. This occurs when individuals encounter information from other sources (e.g. friends, television, newspapers, etc) regarding the event in question, and incorporate the new information into their recall for the original event (Wright, Self, and Justice, 2000; Loftus, 2007).

The classic misinformation study was conducted by Loftus and Palmer in 1974. They had 45 participants view videotapes of car accidents and subsequently estimate how fast the vehicles were going when they collided. Verbs in their questions varied between experimental groups, from “collided” and “smashed” to “hit,” “bumped,” and “contacted.”. Participants’ estimates of speed were 20% higher when a strong verb such as “crashed” was presented, contrasted with weak verbs such as “contacted”. Furthermore, when retested a week later, participants that had been questioned with “smashed” were more than twice as likely to report that they had seen a broken headlight,

even though there was no broken headlight in the videotape.

A substantial body of work over the years has consistently documented the negative effects of misinformation (Loftus, 2007). For example, in a more recent study (Okado & Stark, 2005) participants viewed a video of a man stealing a woman's wallet. Participants were subsequently provided with misinformation about a central aspect of the event the event. Finally, participants were questioned about what they remembered about the event, with 47% remembering the incorrect detail provided to them. The importance of this study is that it demonstrates that it is possible to alter memory for a central detail of a scene, although it has been suggested that it is easier to alter peripheral details (Heath & Erickson, 1998). Another recent study showed that suggesting that someone had consumed alcohol (by providing a placebo that study participants are told contains alcohol) is enough make people more susceptible to misinformation and to make them inappropriately confident in their memory (Assefi & Garry, 2003).

SUGGESTING FALSE MEMORIES FOR ENTIRE EVENTS

Suggesting false events using Narratives

A criticism of research that examines the alteration of existing true memories, however, is that it is not at all getting at the core of one of the issues that has stimulated this work – namely the creation of completely novel memories (Pezdek & Lam, 2007). In the first study to address this question, Loftus and Pickrell (1995) used a false narrative to suggest a childhood event for recall. They asked 25 participants to recall 4 events which were presented in the form of a short verbal narrative. All of the narratives were allegedly provided by relatives of participants. Three of the events were true and researchers added a false narrative about the participant becoming lost in a shopping mall as a child.

Participants were encouraged to recall all of the events, and were questioned regarding their memory for events across two interviews. Twenty-nine percent of participants fully or partially “remembered” the false event (Loftus & Pickrell, 1995).

This methodological approach, termed the “familial-informant false-narrative procedure” (Lindsay, Hagen, Read, Wade, & Garry, 2004), has since been employed in numerous studies. Amongst the events that have been suggested to participants, individuals have been lead to believe that they had been in the hospital with a high fever and suspected ear infection as a child (Hyman, Husband, Billings, 1995), that they had undergone a medical procedure in which a nurse removed a skin sample from their fingertip (Mazzoni & Memon, 2003), that they had almost drowned and been rescued by a lifeguard (Heaps & Nash, 2001), or even that they had been the victim of a brutal attack by an animal (Porter, Yuille, & Lehman, 1999). Across nine studies it has been estimated that false memories successfully created in research participants approximately 33% of the time (Strange, Gerrie, & Garry, 2005).

The power of narratives as a suggestive medium is thus apparent. However the methodology of requesting parents to provide events has been criticized. As previously mentioned, research has demonstrated that memories are fallible and subject to decay over time. This is true of parents as well as of children. It is thus entirely possible that when researchers request that parents provide various events experienced by the participant during childhood, parents’ own memories may not be accurate. Therefore, when researchers are attempting to implant a false memory of being lost in a shopping mall, what they think is a false memory may not be such after all. How does one know if a false memory is not in fact a recovered true memory?

Another problem with using narratives that have been provided by parents or family members is that different members of the family may remember a given event differently. This is something that is often the subject of (not always friendly) dispute at family gatherings, especially when each party is certain that they remember the event correctly. Details may be added or omitted, people who were not present may be included, weather may change, etc. This begs the question: what constitutes an accurate childhood memory? Knowing what we know about the fallibility of memory and its decay over time, it is hard, if not impossible, to determine which version of events described is the way it really happened. If the two family members were to write out a narrative describing the same event, one description would be highly familiar to the individual, whereas the other would not. There are inevitably details, people, and places that the person does not remember. And yet, the authenticity of our family photographs is rarely ever questioned. Even when we are aware of software programs such as Adobe®Photoshop®, which can alter photographs, we just assume that our own family photographs are real (Strange et al., 2005).

Suggesting false events using Photographs

Wade, Garry, Read, and Lindsay (2002) studied the influence of childhood photographs, when they examined whether utilizing a doctored *photograph* would lead to acceptance of a false event as having occurred. They posited that if photographs are accepted unconditionally, then they should lead to high false memory rates. These researchers took four true photographs obtained from participants' family and doctored one of them using Adobe®Photoshop®. The doctored photograph depicted the participant with a parent in a hot air balloon. They encouraged 20 participants to attempt to

remember the four events across three interviews, during which the photographs were presented. Participants were asked to provide a brief description of what was going on in the photo, and were asked some general and then some increasingly more specific questions regarding the details in each photograph. By the end of the third interview, 50% of participants were judged to have either fully or partially “remembered” the false event (Wade et al., 2002).

The authors argued that the doctoring of photographs may be more effective in altering memory, because people may be more trusting of photos (see Wade et al., 2002) than of merely a verbal account. Perhaps they were more easily convinced that the event was true because the photographs were obtained from a reliable source, a family member. Family photos offer compelling evidence that the events depicted in them really took place, and they provide perceptual details of the alleged events which may act as memory cues (Lindsay, Hagen, Read, Wade, & Garry, 2004). While Wade et al.’s (2002) results are suggestive that photographs promote greater false memories, most people would not find themselves presented with a picture that depicts them doing something they had never done before or being somewhere they had never been (Strange et al., 2005). Using the example of the squabbling relatives mentioned above, it is likely that when the details regarding a past event are under debate, individuals may look to provide evidence or to help cue them to details that will facilitate their remembering.

Building upon this possibility, Lindsay et al (2004) observe that some memory recovery techniques encourage individuals to peruse family photo albums to aid in recalling unremembered childhood events. To explore the impact of such procedures upon false memory formation, these researchers asked whether people would be more

likely to endorse memory for a false event if they had a relevant picture to aid in the recall of the event. Utilizing the standard narrative paradigm described above, participants were encouraged to recall a false event involving getting in trouble in Grade 1 for putting a Slime toy in their teacher's desk. Participants' parents provided narratives for two events which occurred in early elementary school, and provided a number of class photographs from the same time period. All participants were presented with the three events in narrative form. Furthermore, half of the participants also received the narrative coupled with the matching class photograph to facilitate their "remembering".

It is important to emphasize that this was not a doctored photograph, as was used by Wade et al. (2002), but a true photograph which was taken in the same time period that was represented in the false narrative. Lindsay et al. (2004) argued that if a person is led to believe that something happened to them through the provision of the false narrative, a photograph may provide the necessary details and images that facilitate the formation of a false memory. The results were supportive: they found that 72.8% of participants in the narrative plus photograph condition were judged as having memories or memory-like images, as compared to 45.5% for those who received the narrative alone. Clearly, a photograph is a strong facilitative device. Furthermore, this study demonstrates that true photographs used as recall aids can be just as hazardous as doctored photographs (Strange et al., 2005).

Comparing narratives and photographs

Thus, narratives and photographs have emerged as media for inducing false memories. On average, narratives result in false memories about 33% of the time (Strange et al., 2005). The one study using doctored photographs resulted in a false

memory formation rate of 50% (Wade et al., 2002). However, as Garry & Wade (2005) note, to assume that doctored photographs result in more false memories is premature for several reasons. First, false memory rates vary widely within published studies, from 0% (Pezdek, Finger, and Hodge, 1997) to 82% (Garry & Wade, 2005). These differences are likely in part a function of the plausibility of events (Pezdek et al, 2006), and the wide ranging types of details used in the narratives of such studies (Desjardins & Scoboria, 2007). Secondly, such a comparison between media is not well founded, as it is tenuous to argue that the details in a narratives and a photograph for the same event are equivalent. To be able to compare the two suggestive media, it is necessary to somehow equate them.

Garry and Wade (2005) compared the two media by attempting to equate their characteristics, and examining whether they produce the similar or different rates of false memory formation. They again employed a hot-air balloon ride as the target event. They provided half of their participants with a narrative that described this event happening in their childhood, whereas the other half of participants were shown a picture depicting the event. Efforts were made to generate a narrative that was equivalent in detail to the photograph, by asking judges to generate as many descriptive details as they could regarding what was depicted in the photograph. The most frequently reported details were used to construct the false narratives. Participants were interviewed three times according to Wade et al.'s (2002) procedure, following which 50% of participants in the photograph condition were judged as having a memory for the event, as compared to 82% of the participants in the narrative condition.

These results are inconsistent with Wade et al's (2002) explanation that photographs are more believable and trusted sources of information, which provide vivid details that promote formulation of memories of events. To explain this unexpected finding, Garry and Wade (2005) proposed the concept of "constraint". They argue that narratives require individuals to generate their own details to flesh out the story line. Photographs, on the other hand, already provide all of the details, thus limiting the flexibility of imagination. By doing so, photographs impose more constraint than do narratives.

The primary purpose of the present research is to systematically investigate the influence of different types of details within photographs upon the promotion or detractor of false memory formation. As the results of Garry & Wade (2005) were unexpected, the explanation of photographs as providing "constraining" details was provided post-hoc. The present work will systematically define and operationalize "constraint", with an eye towards understanding how photographs with greater and fewer constraining characteristics relate to false memory formation.

This was done in relation to a second variable recently documented by Desjardins and Scoboria (2007) as relevant to false memory formation. They have argued that the presence of self-relevant details in suggestive media is a strong predictor of false memory formation. Additionally, Strange, Hayne, and Garry (2008) have recently published a study where they presented 10 year-old children with photographs depicting a hot-air balloon event. Half of the children saw the hot-air balloon alone, whereas the other half saw a doctored photograph with themselves and their family members posing in the hot-air balloon. The first photograph can be likened to the non-self-relevant, non-constrained

condition of the present study, whereas the second photograph can be likened to the self-relevant, unconstrained condition (see below). The authors found that the children who had seen the hot-air balloon with themselves and their family posing inside were judged as having developed a higher percentage of false memories than children who had seen the hot-air balloon by itself. By contrast, children's own memory ratings did not differ significantly according to whether or not they saw themselves and their family members in the hot-air balloon. The authors did not, however, address any constraining characteristics that may be present in photographs.

Thus, this study focuses on articulating the relationship between the presentation of constraining and/or self-relevant details within a false photograph of a childhood event upon false memory formation. In the following section, each concept is described in detail.

TWO MAIN VARIABLES PLAYING A ROLE IN FALSE MEMORY FORMATION

Constraint

As noted above, Garry and Wade (2005) explained their finding for an advantage of a false narrative over a doctored photograph in terms of *constraint*, which they defined as the limitation of freedom to develop familiar details about a memory. Although photographs are a rich source of details which might help cue memories, they are a relatively rigid snapshot of an event, and thus may reduce the freedom to generate personalized details when imagining the event depicted therein. The participant must incorporate the details provided in the photograph into their imagination of the event, and many of these details may not be familiar to them. Narratives, on the other hand, may

permit greater use of active imagination to “fill in” gaps in recall with details that are individually relevant to them. Garry and Wade (2005) further contend that if narratives do provide more room for generating details to “flesh out” a story line, then the participants who were in their narrative (vs. photograph) condition should have provided more details about where the hot air balloon ride took place, which is exactly what they found.

Another way to conceptualize constraint is via self-schema theory, as articulated by Conway and Pleydell-Pearce (2000) in their model adapted from the work of Markus and Ruvolo (1989) and Markus and Nurius (1986). They propose that sets of self-schemas exist within individuals, which consist of long-term memory representations of different concepts of the “self”. A subset of these schemas are active at any given time and modulate individuals’ thoughts and behaviors. Currently active schemas form what is called the “working self concept”, which is a constantly changing view of the present self and what it may become. Conway and Pleydell-Pearce (2000) argue that the goals of the working self are grounded in autobiographical memory, which limits the range of goals that a person can hold in order to maintain a healthy mental balance. Autobiographical memories that are dissonant with an individual’s life period result in very strong (negative) cognitive reactions. Due to these negative cognitive reactions, memories that are dissonant with an individual’s working self must be altered or reinterpreted in some way to reduce the negative feelings brought about by this dissonance. Two ways in which this reworking is accomplished are attempts at justification (labeling the memory that is resulting in these dissonant feelings as an exception to the norm) or attempts at

outweighing (finding multiple examples of consonant autobiographical events so that the single dissonant memory is outweighed).

Based on this model, it can be hypothesized that unremembered events or event details that are consonant with an individual's "working self" are less likely to stand out and thus will not be attended to as much as events that are dissonant. This is likely whether or not unremembered events are true or false. Dissonant events or details, on the other hand, may result in the above-mentioned negative cognitive reactions, thus increasing the likelihood that the event were rejected as false.

This is consistent with Leon Festinger's theory of cognitive dissonance, which states that contradicting thoughts or beliefs compel the mind to acquire or invent new thoughts or beliefs, or to modify existing ones, so as to reduce the amount of dissonance therein (Festinger, 1957). The goal of the working self, in Conway and Pleydell-Pearce's (2000) model, is to maintain cognitive consonance, meaning that new information encoded and subsequently retrieved needs to be reasonably consistent with a given individual's present autobiographical repertoire (i.e. the thoughts, beliefs, and memories that make up that individual's current sense of personal identity). Conway and Pleydell-Pearce (2000) hold that this goal of the working self is what determines access to an individual's autobiographical knowledge base. The present working-self model dictates the generation of memory retrieval models, which guide the search process when an individual is trying to recall a past event. Such retrieval models thereby act as "gate keepers", which control access to autobiographical material by setting parameters (i.e. either shortcuts or roadblocks) in ways that facilitate or inhibit the search of the knowledge base. If the stimulus presented as a memory cue will lead to the search for a

memory that is dissonant with the goal of the self (i.e. does not “fit” into the memory repertoire of an individual) then the retrieval model generated (which seek to maintain cognitive consonance) will constrain the search for that memory.

To relate this model to Garry and Wade’s (2005) study, it is possible that the cues presented in photographs resulted in the generation of memory search models that were more constraining. This may have been the case with false events as well as with true events. For false events, the entire photograph depicts nothing but foreign details. Therefore, many of the details were likely dissonant with the individual’s autobiographical repertoire, resulting in the generation of a highly constrained search model. This suggests that even photographs depicting true events may result in the generation of fairly constrained search models relative to a narrative description.

To illustrate, consider a request to recall an event that happened in one’s elementary school. If the event is presented as a narrative, one can visually imagine the school from any perspective they wish (from any angle, from the interior, the exterior, a specific room, etc.). If, on the other hand, when one sees their elementary school in a photograph, only one of many possible representations is made available. Therefore, a photograph is limiting in terms of the breadth of stimuli it can provide in order to facilitate remembering. For narratives, the lack of specificity, inherent vagueness and lack of visual detail allows for the generation of a greater number of idiosyncratic memory cues. Cues generated by the individual will naturally be experienced as more relevant, thus reducing the likelihood that a memory retrieval model were constraining. This suggests that unremembered events presented in narrative form were more likely to be endorsed as “having happened”. Furthermore, it opens the possibility that constraint

may also vary within media. The question becomes not which media is superior in facilitating false memory formation, but rather: What aspects of narratives or photographs might result in greater or lesser levels of constraint?

Self-relevant details and Specific details

What if the details provided by researchers in suggested events are highly self-relevant? One would expect that the overall level of constraint for an event would be lower, because self-relevant details are consistent with the working model for the self. This was the question asked by Desjardins and Scoboria (2007) in relation to narratives. They identified a methodological confound in the false memory literature that utilized narratives as a suggestive medium: in some studies, the narratives were personalized to include information idiosyncratic to the participant (e.g., the name of the participant's hometown, name of a family member; Garry & Wade, 2005), while in other studies, the narratives did not contain such self-relevant details (e.g. Loftus & Pickrell, 1995). Interestingly, studies which included self-relevant details in narratives appeared to have higher rates of false memory formation – about 69.4% (Garry & Wade, 2005; Lindsay et al., 2004) vs, the estimated 33% on average in other false memory studies cited previously. Desjardins and Scoboria (2007) hypothesized that the presence of self-relevant details were responsible for producing the elevated rates of false memory formation seen in these studies.

Another factor that they explored was the presence of “specific” details in the narratives. They defined this type of detail as “elements of the narrative that could be removed without altering the general script (e.g. the toy was a “revolting Slime toy”)”. When such specific details are included in a narrative, they may serve the same effect as

the details in an unfamiliar photograph: constraining the ability to freely generate one's own relevant details. Using the same logic as above, the goals of the working self would generate a retrieval model that is likely to be more constraining than that those based solely upon self-relevant information, thus resulting in a lesser likelihood that the false event would be accepted as being true.

To study these types of details (self-relevant and specific), Desjardins and Scoboria (2007) employed Garry & Wade's (2005) methodology, and Lindsay et al.'s (2004) false narrative (participant putting slime in a teacher's desk). This narrative was tailored to include self-relevant details, specific details, both, or neither. Parents of participants provided information about childhood events, and self-relevant details were included in self-relevant conditions (name of teacher in grade 1, name of a friend in that grade, name of a favorite toy that year). The results were consistent with the argument that self-relevant information would facilitate false memory formation. They found that 68.2% of participants in self-relevant conditions were judged as having memories or memory-like images of the false event, as compared to 36.4% of participants in the non-self-relevant conditions. Furthermore, subjective memory ratings were significantly greater when self-relevant information was included in false narratives. There was no effect found for the inclusion of highly specific details; while they did not impede the formation of false memories, they did not promote fluency.

In terms of Conway & Pleydell-Pearce's (2000) model, these results from the inclusion of highly self-relevant details are expected. Essentially, highly self-relevant details should be more compatible with the working self, and thus a less constraining retrieval model should be generated. If these types of details are included in a study, they

may also serve as a “springboard” via the activation of other self-relevant details, leading to a greater likelihood that the false event were accepted as being true. The effect of self-relevance may have been much greater than the constraining aspect of the specific details used, in that the self-relevant details served to promote fluent processing whereas the specific details did not.

One reason that self-relevant information may promote false memory formation, while details generated by experimenters or encountered in an unfamiliar photograph do not, is the degree to which fluency is promoted. This is related to Jacoby and Dallas’ (1981) attributional view of memory and Whittlesea’s (1993) fluency attribution hypothesis, where feelings of familiarity do not necessarily result from the retrieval of a memory fragment, but rather from the unconscious attribution of fluent processing to prior exposure to a stimulus. Later, Whittlesea and Williams’ (1998) modified the fluency attribution hypothesis model to what they termed the discrepancy attribution hypothesis, which states that feelings of familiarity occur when *surprisingly* good/fluent processing is attributed to prior exposure to a stimulus. To demonstrate this experimentally, they had participants study a list which contained three types of words: 1) real words (e.g. violin), 2) non-words (e.g. plandit), and 3) pseudohomophones (e.g. bautel, phrawg). Then they provided a recognition test, presenting participants with a new list of words and asking them to identify old words and new words. They found that the previously un-presented pseudohomophones had the highest probability of being identified to be old words. This is because, whereas the pseudohomophones did not look like real words, the meaning comes to mind (i.e. “phrawg” gives rise to the meaning of the word “frog”). The ease

with which the familiar meaning of the “word” comes to mind (surprising fluency) is attributed to the fact that the word had been encountered before.

Desjardins & Scoboria (2007) argue that self-relevant details likely induce feelings of familiarity and thus possibly facilitate rapid acceptance of the event as being about their past. If fluent processing is experienced when encountering an unremembered event, the accompanying sense of familiarity may well be erroneously attributed to the false event, rather than to the details that actually induce the feelings. Lack of presence of self-relevant details or the presence of particularly vivid specific details still leaves sufficient room for the individual to generate their own elaboration of the scene, although little has occurred to promote self-schematic activation or fluency. As mentioned above, literature suggests that false memory endorsement rates are not particularly high in these cases (Desjardins & Scoboria, 2007).

This thinking is based on the fact that the “self” – or the “working self-concept” that has been proposed by Conway & Pleydell-Pearce (2000) (see discussion above) - is amongst the most well-developed schematic constructs that exist in memory. As such, the working self is referred to frequently (Symons & Johnson, 1997) and any information that is relevant to the self is likely to be processed efficiently. Desjardins & Scoboria (2007) observe two ways in which this might occur. First, encountering self-relevant information is likely to produce fluent cognitive processing. Second, self-schematic activation is likely to promote activation of other aspects of the self, which then can be drawn into the “memory” for the event. This self-generation of details and images reflects a superior level of processing than does the mere acceptance of details already provided. In fact, Kronlund and Whittlesea (2005) demonstrated that deeper processing at encoding

results in greater fluency at retrieval. The result is that individuals are more likely to accept a false event as true: The feelings of familiarity are erroneously attributed to the event (e.g. the stimulus of the hot air balloon ride) as having been experienced before.

A closely related concept is that of *source monitoring*, which refers to the cognitive processes involved in determining the origin of memory. Failures in source monitoring have been shown to play an important role in memory distortions (Johnson, Hashtroudi, & Lindsay, 1993). According to this source monitoring, or “reality monitoring”, framework, the integration of the various features of an event into a complete whole is termed binding, which is thought to place at the moment of encoding. Deficient binding can result in a variety of source confusions (Koriat, Goldsmith & Pansky, 2000) when trying to access encoded information during remembering. For example, post-event information or other existing memories can get integrated into the new memory trace, thus distorting the memory for the original event experienced. The integration of elements unrelated to the event being remembered interferes with the encoding of the “pure” elements of the event (i.e. binding). At the moment of retrieval, this deficient binding can result in confusion when the person is trying to remember where they first experienced the event. This is because, as discussed above, memories are based on reconstruction as opposed to recall. As such, when remembering, fragments of a memory are pieced back together to form a whole. When the initial memory has been deficiently bound, interfering fragments can result in various source confusions.

Summary

The theoretical concepts discussed above relate to one another to help explain how false memories can come to be formed. An example of the integrative role that each

likely plays in the study of false memory can be found in examining Garry and Wade's (2005) study. To review, half of participants were presented with a narrative describing having been on a hot air balloon ride as a child, whereas the other half were presented with a photograph depicting this event. It is proposed that individuals who were in the narrative condition (vs. the photograph condition) were able to more freely imagine the self-relevant details that were presented to them. These self-relevant details promoted self-schematic activation which allowed the individuals to generate their own details to flesh out the story and make it more personalized to themselves. Participants in the narrative condition may have experienced surprisingly fluent processing as a result of encountering self-relevant information, which is misattributed to the event as familiar and "about themselves". This likely facilitated the generation of a sufficiently vivid image of the event in their minds. The source of this vivid image, in turn, may have been incorrectly attributed to a memory of an actual event from the past (i.e. that they had really gone on a hot air balloon ride as a child), thus demonstrating a breakdown in reality monitoring.

The difference in the rates of false memory formation in the narrative vs. photograph condition can be explained by the degree to which each medium facilitated fluency, and the subsequent ease with which participants were further able to generate their own self-relevant details. Participants in both the narrative and photograph conditions saw self-relevant details, but due to the relatively non-constraining nature of the narrative medium, the participants in this group were able to generate self-relevant details with greater ease than those in the photograph condition. Details in the unfamiliar

photograph, on the other hand, may have both constrained fluency, and later inhibited development of images, resulting in a lower rate of false memory formation.

MANIPULATING CONSTRAINT AND SELF-RELEVANT DETAILS IN PHOTOGRAPHS

A limitation of Wade and Garry's (2005) study is that it's hard to be able to say unequivocally that a narrative is equivalent to a photograph in terms of the amount of information contained therein. There are two main types of suggestive media used in false memory literature – narratives and photographs. Both of these media influence the formation of false memories, with differing rates of success. Instead of attempting to equate the two, another approach is to systematically examine the mechanisms which underlie false memory formation in each medium prior to attempting to understand the similarities and differences of the media.

Both therapeutic and legal settings employ photographs regularly for goals similar to those in which narratives are employed. This study set out to examine whether the same effects for self-relevant information are found in photographs as were found in narratives by Desjardins and Scoboria (2007). Two factors were examined: self-relevant (vs. non-self-relevant) details, and constraining (vs. non-constraining) details.

This research study extends the work of Garry and Wade (2005) and Desjardins and Scoboria (2007) to further clarify the role of details presented in false photographs upon false memory formation. Prior work with false photographs supports the importance of examining the influence of self-relevance and constraint. Wade et al. (2002) used a self-relevant but relatively constraining photograph, in that it depicted the specific target event, leaving individuals less freedom to generate their own details to flesh out the

memory they were trying to “retrieve”. Lindsay et al. (2004), on the other hand, used a self-relevant and non-constraining photograph. Their photograph did not depict the target event, but provided some self-relevant details to help the individual “recall”. However, Lindsay et al (2004) provided their participants with a narrative along with the photograph. The current study represents the first effort to systematically examine the influence self-relevant and/or constraining aspects of false photographs, while holding the influence of narrative descriptions to a minimum.

As suggested by Desjardins and Scoboria (2007), self-relevant details clearly have a significant effect when narratives are used as the suggestive medium. It is thus important to investigate how the effect of self-relevance will play out in photographs, which are more constraining than narratives because the self-relevant details are explicitly provided, limiting one’s ability to imagine different perspectives of the same detail.

Also, Desjardins and Scoboria (2007) point out that there may be a point where self-relevant details cease to enhance the formation of false memories, and may even impede the process. This might occur when self-relevant information is presented in excessive amounts or in a context which is incorrect. For example, if one were to include details about an individual’s first grade teacher (self-relevant details) but place them in the context of the individual’s back yard (incorrect context). Therefore, self-relevant details may enhance recognition of an unremembered event, to the degree that they fit with other details as well as with the overall narrative context.

This leads to an alternate explanation which can be offered for this apparent dual nature of self-relevant details. It may be that it is not the self-relevant details themselves

that become restrictive, or constraining. Instead, it may be the case that any given detail has both self-relevant and constraining qualities. These qualities vary such that one may outweigh the other. If a detail is higher in constraint than in self-relevance, fluency will be impeded, resulting in reduced likelihood that an unremembered event were accepted as being true. If, on the other hand, the more a detail is self-relevant, the more likely it will promote fluency and lead to the generation of subsequent self-relevant details. Another way to look at this is that a given detail can either result in both a degree of cognitive dissonance and a degree of cognitive consonance. This will dictate the type of retrieval model that is generated by the working self, resulting in either acceptance or rejection of the detail as true; and the summation of such details within the event to determining whether a false event as a whole is true.

Therefore, it is necessary to consider the characteristics of details described above and examine how different details relate to one another, based on how they differ in their relative amounts of self-relevance and constraint. Using the hot-air balloon example used in the present study, three main details were isolated: the hot-air balloon, the participant with his or her parent, and the background against which the event took place. Each of these details contained a balance of self-relevance and constraint, with some details containing more or less of either. Four conditions thus emerged based on the relative levels of the detail types: 1) non-self-relevant and non-constrained, 2) self-relevant and non-constrained, 3) non-self-relevant and constrained, and 4) self-relevant and constrained. Each condition contained the same three details mentioned above, however the background and the presence of the participant with his or her parent were altered so as to vary the relative levels of self-relevance and constraint contained therein (Appendix

A). The hot-air balloon was present in all of the conditions, as it depicts the type of event. The two non-self-relevant conditions both contained a picture of a group of people inside the hot-air balloon with a flashbulb effect obscuring the identities of the two people in the foreground, such that their identities were unknown. The two self-relevant conditions both contained the same group of people inside the hot-air balloon, but the picture revealed a clear shot of the participant posing with his or her parent. The background was neutral in the unconstrained conditions, depicting a plain gray sky. In the constrained conditions, the background depicted a lighthouse among some shrubbery. This background was constraining because it was unfamiliar to the participant, and would be dissonant with his or her self-concept, thus impeding fluency of processing.

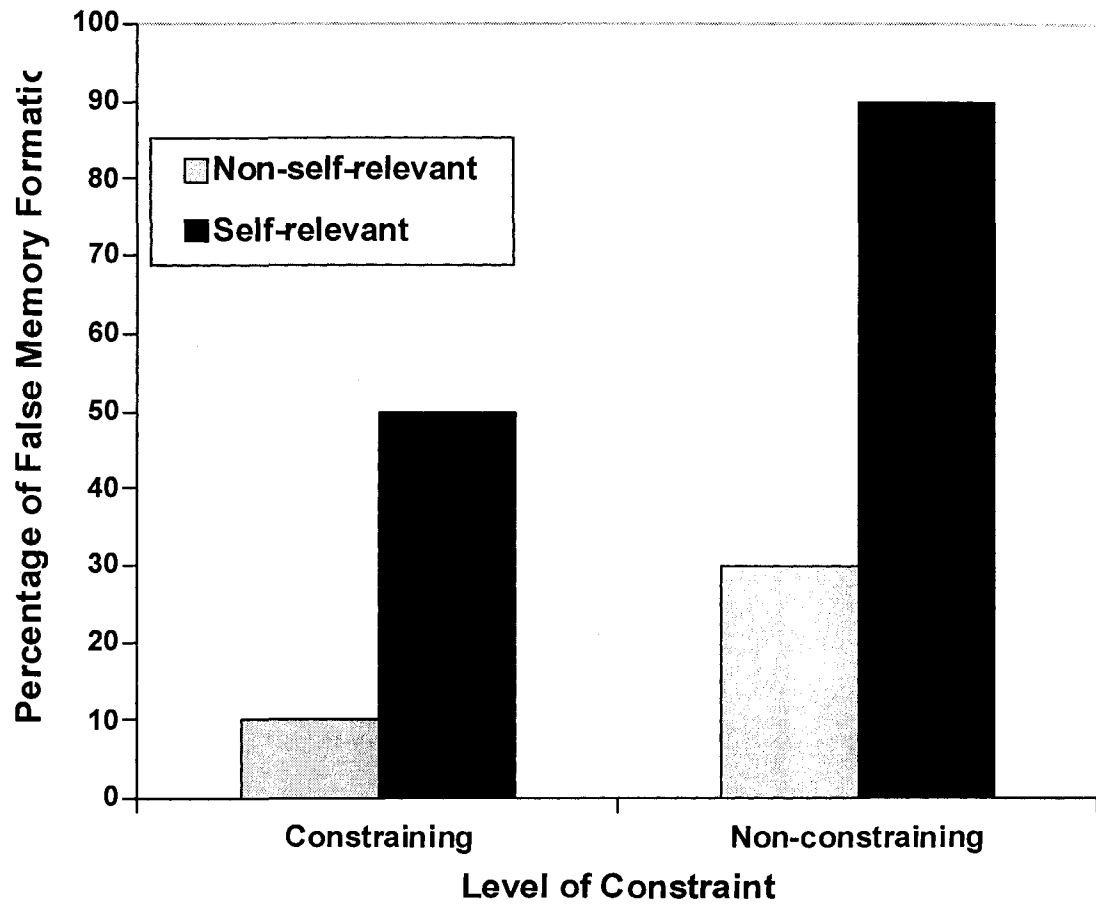
Using photographs and brief descriptions of their content that were provided by the participants' parents, participants were interviewed three times according to the protocol used in Desjardins and Scoboria (2007). The target event selected was taking a hot-air balloon ride before the age of six. Of the photographs sent by the parents, three were selected to compose a personalized booklet that was used in the interviews and given to the participant for use between interviews. An additional photograph was doctored according to the conditions created by the two levels of each independent variable as described above and was placed third in the sequence of photographs.

Hypotheses

Hypothesis 1. It was predicted that higher rates of false memory formation would be rated as having occurred by judges upon exposure to self-relevant photographs or non-constrained photographs, with the self-relevant detail conditions producing higher rates. This was based on the observation that in the self-relevant conditions, participants were

given a springboard from which to start generating their own self-relevant details to flesh out potential memory formation. In the non-constrained photograph condition, they were not given such a starting point, but they were also not restricted in their ability to generate self-relevant details to assist them in attempting to “remember” the events in the photographs. It was further predicted that constraint and self-relevance would interact, such that the highest rates of false memories would occur when self-relevant details were paired with non-constrained details (see Fig 1).

Figure 1. Predicted rates of false memories formed as a factor of varying details contained in photographs



Note: Percentages are illustrative of the predicted pattern of results; the specific rates and magnitude of differences are not predicted.

Hypothesis 2. It was predicted that higher magnitudes of subjective memory ratings would occur in the self-relevant detail conditions as well as in the non-constrained detail conditions, with the self-relevant detail conditions producing higher rates. It was further predicted that the highest magnitude of subjective memory ratings would occur when self-relevance and constraint interact. However, subjective autobiographical belief ratings would not differ across conditions. This was based on the assumption that telling the participants that the photographs were provided by their parents was a strong belief manipulation; and was consistent with data from Desjardins and Scoboria (2007).

Hypothesis 3. It was predicted that higher ratings of memory quality would occur in the self-relevant detail conditions as well as in the non-constrained detail conditions, with the self-relevant detail conditions producing higher rates. It was further predicted that the highest ratings of memory quality would occur when self-relevance and constraint interact.

Hypothesis 4. It was predicted that when participants were asked to identify which of the four events are false, those who were in the non-self-relevant conditions and constrained conditions would be most likely to guess incorrectly. Those who were in the self-relevant/unconstrained condition would be least able to guess which event is false. This was based on Desjardins and Scoboria's (2007) findings when employing the same methodology in their study using narratives.

CHAPTER II

METHOD

Participants and Setting

Seventy-six undergraduate students (19 male, 57 female; between the ages of 17-24; $M = 19.5$, $SD = 1.8$) recruited from the University of Windsor Psychology Department participant pool consented and participated in this study. Of the participants invited to participate, 160 provided their parents' contact information. Eighty-two responses from parents were received, two of which needed to be disqualified due to having actually taken a hot air balloon ride as a child. Four participants failed to participate in all three interviews. Participants received credits for participation as part of their course requirements for introductory psychology courses, and were entered in a raffle for 6 prizes of \$50.

Design and Materials

Soliciting information from parents. Participants' parents were contacted by mail for the purpose of obtaining photographs of the participant before they were of age six. Parents were given a list of themes to assist in selecting photographs (e.g birthday parties, barbecues, family outings, etc). Parents were requested to select pictures that contained groups of people in social situations, and to the degree possible, photographs that the participant had not seen before. For each photograph, parents were asked to provide a brief narrative of what is occurring in the picture. Furthermore, parents were asked whether to their knowledge their child has ever taken a hot air balloon in their life. Parents were guaranteed that the photographs they provide were returned to them in the original condition provided.

Upon receipt, the materials were reviewed. If appropriate for the study, four photographs were selected from those provided, and were scanned into a computer file. One of the four photographs was doctored using Adobe Photoshop[®]. All photographs were accompanied by a one-line description of the event depicted and at what age the participant was when the event occurred. A booklet was created, which contained four photographs for each participant, one photograph on each page. The photographs were black and white. Participants were told that this is the case because the photographs submitted needed to be scanned, digitalized, and returned to their parents in good condition and that the printer used only enabled black and white printing.

After photographs were received, participants were scheduled for an initial session. Prior to the first session, participants were randomly assigned to conditions, according to the two levels of each independent variable (self-relevant/non-self-relevant details and constraining/non-constraining details). Therefore, the conditions were as follows: non-self-relevant and non-constrained, non-self-relevant and constrained, self-relevant and non-constrained, and self-relevant and constrained. Self-relevant details are defined as “information highly unique to the participant”, such as the face of a family member (Desjardins & Scoboria, 2007). Constraining details are defined as limiting the freedom to experience familiarity about an unremembered event.

The configuration of detail in photographs is depicted in Table 1. The non-self-relevant and non-constrained condition contained the hot-air balloon against a neutral background that contains no perceptual details (only the sky as visible). Inside the hot air-balloon there was a group of people, but they were shaded in a manner such that their identities were unknown. The self-relevant and non-constrained condition contained the

hot-air balloon against a neutral backdrop. Inside the hot-air balloon there were a group of people, among which there was a clear shot of the participant posing with his or her parent. The non-self-relevant and constrained condition contained the hot-air balloon against a backdrop that was unfamiliar to the participant. Inside the hot-air balloon there were a group of people, but they were shaded in a manner such that their identities were unknown. Finally, the self-relevant and constrained condition contained the hot-air balloon against a backdrop that was unfamiliar to the participant. Inside the hot-air balloon there were a group of people, among which there was a clear shot of the participant posing with his or her parent.

Autobiographical Belief and Memory Questionnaire (ABMQ). Participants completed the Autobiographical Belief and Memory Questionnaire (Scoboria, Mazzoni, Kirsch, & Relyea, 2004; Appendix B) in order to provide information about their subjective memory experience. This questionnaire assesses general and personal plausibility (where 1 = not at all plausible, and 8 = extremely plausible); autobiographical belief (where 1 = definitely did not happen and 8 = definitely did happen); and autobiographical memory (where 1 = no memory for the event at all and 8 = clear and complete memory for the event). This measure was employed as in Desjardins & Scoboria (2007). Participants were asked to rate each of these constructs for five different events. The first, fourth and fifth events were the same for all of the participants (choking on an object, bone density screening, seeing a UFO). One of the participants' true events was placed second and the hot-air balloon ride false event was placed third. This was done so that the false event would not stand out. Research on the ABMQ has found that individuals are able to distinguish these constructs within events, and that events vary in

the level of each construct (Scoboria et al, 2004). Furthermore, ratings tend to remain relatively stable when not manipulated across 2 week periods of time and change as predicted when manipulated (Scoboria et al., 2006).

Judges' ratings. Based upon the transcripts from the first and third interviews, participants were classified by two independent judges (a procedure consistent with Lindsay et al. 2004), who are blind to the experimental condition, as having either (1) no images; (2) images only; or (3) memories for each of the four events, according to Lindsay et al's (2004) criteria. The purpose of these ratings was to determine if rates of false memory formation would vary as a function of objective ratings of participant narratives. This further allows for the comparison of the quality of verbal output (as judged) with subjective memory ratings. Participants who report actual memories were coded into the *memory* category, whereas those who describe images associated with the event, but not definitive memories, were classified in the *images* category. *Images* constituted only reporting what the participant saw in the photograph and describing where the event may have taken place. *Memories* constituted reporting what the participant saw, but also adding descriptions of what they may have been thinking and feeling what it may have been like to have experienced the event. The judges were two research assistants employed in the lab. They were trained for coding using sample event transcripts until an inter-rater agreement of 90% was obtained. The judges attained an inter-rater agreement of 88% on the actual transcripts; disagreements were resolved through discussion.

Memory Characteristics Questions. Participants also rated the quality of memories for all of the events depicted in the photographs they saw using questions

Table 1.

The four experimental conditions and an example of how they were created (See Appendix A for sample photographs)

	UNCONSTRAINED	CONSTRAINED
NON-SELF-RELEVANT	<ul style="list-style-type: none"> • Hot-air balloon • Shaded picture of participant plus parent • Neutral background 	<ul style="list-style-type: none"> • Hot-air balloon • Shaded picture of participant plus parent • Unfamiliar background
SELF-RELEVANT	<ul style="list-style-type: none"> • Hot-air balloon • Clear picture of participant plus parent • Neutral background 	<ul style="list-style-type: none"> • Hot-air balloon • Clear picture of participant plus parent • Unfamiliar background

Garry and Wade (2005) adapted from Bernstein, Willert, and Rubin (2003). The purpose of this measure was to provide more information about phenomenological characteristics which are associated with autobiographical memory. On a 7-point scale (1 = low, 7 = high), participants rated whether they could: (1) relive the event in their mind; (2) see the event in their mind; (3) hear the event in their mind; (4) feel emotions associated with the event; (5) remember the event rather than just know that it happened; (6) remember the event as a coherent story; (7) believe the event occurred in the way remembered; and (8) whether they had talked/thought about the event in the past.

Procedure

All procedures were approved by the University of Windsor Research Ethics Board. Participants that met the screening criteria were asked to provide parental contact information, and were told that their parents were contacted for the purpose of obtaining non-sensitive information about their childhoods. Once parents provide the information, four photographs were selected to make up the individual participant booklets.

Participants were interviewed three times over the course of one week, according to Garry and Wade's (2005) procedure, as depicted in Table 2. Interviews, which were approximately 30 minutes in duration, were conducted by four research assistants who were blind to the hypotheses of the study. Efforts were made to balance administration so that each research assistant interviewed participants assigned to each of the four conditions. Research assistants were provided with a script which they were asked to follow verbatim. Adherence to the script was ensured by practicing, and by reviewing the audiotaped interviews conducted by the research assistants.

Table 2.

Timeline and content of the three interviews

Interview #1	Interview #2	Interview #3
Told photos provided by parents.	Asked to provide maximum details.	Asked to provide maximum details
Asked to provide maximum details.	Guided imagery if event not remembered.	Guided imagery if event not remembered
Guided imagery if event not remembered.		MCQ Administered
MCQ Administered		ABMQ Administered
Interview Audiotaped		Interview Audiotaped

During the first interview, participants were told that the purpose of the study was to evaluate the effectiveness of memory recovery techniques on memory for childhood events. They were told that their parents provided the photographs and a brief description of what was going on in each. The photographs were ordered so that the first, second and fourth are true events and the third is the false event, consistent with false memory research paradigms to date. The ordering of photographs in this manner also facilitates the comparison of false memory formation rate between studies. After each photograph, and with the photograph remaining in front of them, the participant was asked to describe everything they could remember about the event depicted therein without leaving anything out. If the participant did not remember the event, he or she was reassured that many people have difficulty remembering events that happened such a long time ago because they have not thought about them. Participants were instructed to concentrate for a few minutes, and to try to bring the event into focus. They were told to close their eyes and try to imagine that they were back in the situation depicted in the photograph. They were encouraged to focus on the details of the event, such as what they may have felt that day, what it may have been like to experience the event, who was with them, the season. Then they were asked what, if anything, they can remember. If they cannot remember any details, the next photograph was introduced and the above procedure was repeated. Participants' recollections were audio recorded during the first and last interviews for the purposes of transcription and scoring of inter-rater agreement on the extent to which the participants' descriptions constituted either (1) no images; (2) images only; or (3) memories.

Once participants were unable to remember any more details about each of the photographs, they were asked to fill out the Memory Characteristics Questionnaire to describe the quality of the memories they had for each event. They were given the personalized booklet containing their photographs, and were asked to review it once daily, spending a few minutes per photograph, to try to remember the events contained in the photographs. Participants were also instructed not to discuss the events in their booklet with anyone during the course of the study.

The subsequent interviews followed the same format as the first. After imagining each event, participants were asked to describe any details remembered. If no new information was remembered, the research assistant proceeded to the next event. The memory questionnaire was not administered during Interview 2 because interest was primarily in memory characteristics immediately after the first interview and again at the end of the experiment. Additionally, this allows for Interview 2 to be fairly brief as compared to the other two interviews. After Interview 3, once participants complete the memory questionnaire, they were asked to complete the ABMQ. They were then asked how frequently they thought about events during the study, and whether they discussed any of the events with others. Participants were then told that one of the events was false, and the research assistant asked them to select which of the events they thought was false. Finally, the research assistant disclosed the false event, and participants were debriefed.

CHAPTER III

RESULTS

Overall images and memories formed

Analysis of judges' ratings of interview transcripts found that at Time 2, 12.4% of participants were judged to have true memories for the false event, compared to 2.7% at Time 1. Furthermore, 33.3% of participants were judged to have generated images or memories at Time 2, as compared to 24.7% at Time 1. These rates were not statistically different.

Judges' ratings

Logistic Regression was used to analyze the frequencies of the judges' ratings of interview transcripts (see Table 3). Main effects for self-relevance and constraint were hypothesized, whereby non-constraining details and self-relevant details would yield a higher false memory formation rate than constraining and non-self relevant details, respectively. Additionally, it was hypothesized that self-relevant details paired with non-constraining details would yield the highest false memory formation rate. At both Time 1 and Time 2, analyses revealed no significant main effects or interactions, thus the hypotheses were not supported. Specifically, at Time 1, 27% of participants in the self-relevant conditions generated images or memories as compared to 21.6% in the non-self relevant conditions ($B = 0.801$, $SE = .745$, $Wald = 1.155$, $p = .283$, $Exp(B) = 2.227$). At Time 2, 36.1% of participants in the self-relevant conditions reported images or memories for the false event, as compared to 30.5% of participants in the non-self-relevant conditions ($B = 1.030$, $SE = .739$, $Wald = 1.940$, $p = .164$, $Exp(B) = 2.80$). In terms of constraint, logistic regression at Time 1 revealed that 31.4% of participants in

Table 3

Percentage of image and memory formation per judge's ratings by experimental condition and time

	Time 1			Time 2		
	None	Images	Memories	None	Images	Memories
Non self- relevant, Non-constrained	76.47%	23.53%	0.00%	76.47%	11.76%	11.76%
Self-Relevant, Non-Constrained	61.11%	33.33%	5.56%	52.94%	28.41%	18.65%
Non-Self-Relevant, Constrained	80.00%	15.00%	5.00%	63.16%	21.05%	15.79%
Self-Relevant, Constrained	83.33%	16.67%	0.00%	73.68%	21.05%	5.27%

Note: Non self-relevant, non-constrained, n at T1 = 17, n at T2 = 17; Self-relevant, non-constrained, n at T1 = 18, n at T2 = 17; Non self-relevant, constrained, n at T1 = 20, n at T2 = 19; Self-relevant, constrained, n at T1 = 18, n at T2 = 19.

the non-constrained conditions generated images or memories as compared to 18.4% in the constrained conditions ($B = -0.134$, $SE = .796$, $Wald = 0.028$, $p = .867$, $\text{Exp}(B) = .875$). At Time 2, 31.6% of participants in the non-constrained conditions reported images or memories for the false event, as compared to 35.3% in the constrained conditions ($B = 0.634$, $SE = 0.736$, $Wald = 0.742$, $p = .389$, $\text{Exp}(B) = 1.885$).

Autobiographical Belief and Memory Questionnaire (ABMQ)

Judge's ratings provide an objective evaluation of false memory formation. They do not, however, take into consideration the participants' subjective evaluations of their memory for the target event. Hypotheses for main and interaction effects on these ratings were the same as for the objective judges' ratings. Analysis of ABMQ memory ratings after the third interview using a factorial between-subjects ANOVA revealed a significant interaction effect for self-relevant and non-constraining details, $F(1, 72) = 7.62$, $p < .01$), Cohen's $d = 0.78$ (see Figure 2 and Table 4); there was no significant main effect for self-relevance ($p > 0.1$). Whereas the main effect for constraint was approaching significance ($p = 0.05$), this was found to be driven by the interaction. Therefore, hypotheses regarding main effects were not supported. Planned comparisons using Mann-Whitney U tests were performed. This non-parametric test was employed because the data violated the assumptions of normality and of homogeneity of variance necessary for parametric tests. Analyses revealed that the condition in which self-relevant details were paired with non-constraining details generated significantly higher memory ratings than the remaining conditions ($U = 361.5$, $p < .05$), thus supporting the hypothesis. Additionally, the self-relevant, non-constrained condition was significantly higher than both of the

Table 4:

Means and standard deviation for all Autobiographical Belief and Memory

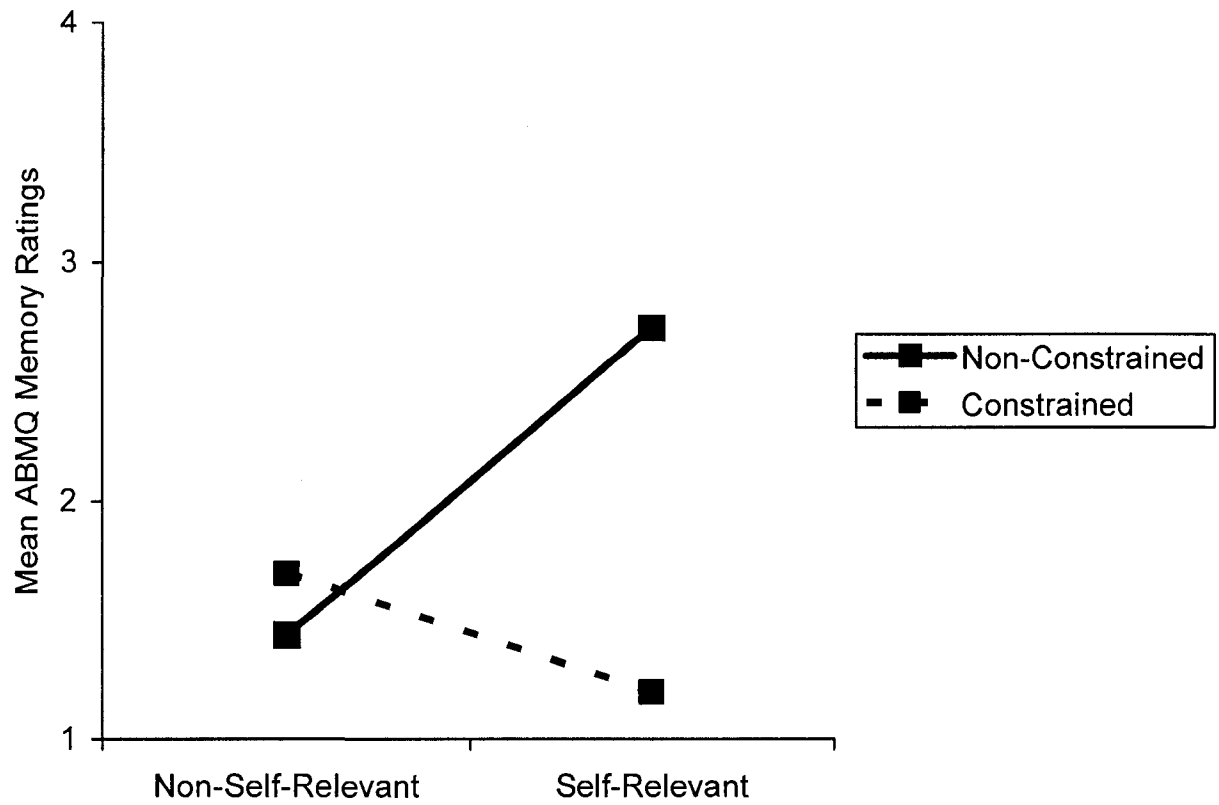
Questionnaire (ABMQ) variables at Time 2

Condition	General Plausibility		Personal Plausibility		Belief		Memory	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Non self- relevant, Non-constrained	4.44	2.36	4.44	2.36	4.11	2.52	1.44	0.84
Self-Relevant, Non-Constrained	5.39	1.94	5.22	2.46	4.72	2.76	2.72	2.23
Non-Self-Relevant, Constrained	4.20	1.58	4.85	2.06	4.90	2.51	1.70	1.22
Self-Relevant, Constrained	5.25	1.93	4.90	2.22	4.55	2.87	1.20	0.52

Note: Non self-relevant, non-constrained n = 18; Self-relevant, non-constrained n = 18;

Non self-relevant, constrained = 20; Self-Relevant, Constrained n = 20.

Figure 2. Mean memory rating on the Autobiographical Belief and Memory Questionnaire as a factor of experimental condition.



constrained conditions ($U = 251.5$ $p < .05$), as well as from the self-relevant constrained condition ($U = 108.5$, $p < .05$). There were no significant differences found between groups on plausibility and belief ratings (all $p > .10$).

Memory Characteristics Questionnaire (MCQ)

Analyses of the Memory Characteristics Questionnaire (see Appendix G) ratings were conducted using 2x2x2 mixed factorial ANOVAs with the experimental factors as between-subjects variables and Time as a within subjects factor. Hypotheses for main and interaction effects on these ratings were the same as for the objective judges' ratings and for the ABMQ ratings. Full analyses for each item are provided in the subsequent paragraphs. For the purposes of brevity, only items with significant findings are presented. To summarize the notable findings, significant increases in memory quality rating between Time 1 and Time 2 were observed for all items, excepting items 5 (remember rather than know) and 8 (talked/thought about event). Significant main effects for constraint were found on items 2 (see) and 4 (feel emotions), showing that participants in the non-constrained conditions gave higher ratings than those in the constrained conditions for these items, consistent with the hypotheses. Three-way interactions were found for items 3 (hear), 6 (coherent story), and 7 (believe), which were due to significant differences being found between groups at Time 2, but not at Time 1. The pattern for these three items at Time 2 was similar: participants in the self-relevant, non-constrained and non-self-relevant, constrained conditions gave higher ratings than did those in the self-relevant, constrained condition. The former finding was consistent with the hypotheses, whereas the latter finding was not. The specifics of each analysis are discussed below.

For items 2 (i.e. see the event) and 4 (i.e. feel emotions), a significant main effect for constraint was found, $F(1, 72) = 4.11, p < .05$, and $F(1, 72) = 3.72, p < 0.06$, respectively. Participants in the non-constrained conditions gave higher ratings than those in the constrained conditions.

For item 3 (i.e. hear the event) a significant 3-way interaction between time, self-relevance and constraint was found, $F(1, 72) = 6.44, p < 0.05$. The interaction was found to be due to a lack of significant differences between groups at Time 1, whereas there were differences at Time 2. A univariate 2X2 ANOVA at Time 1 with self-relevance and constraint as factors, revealed no significant effects (all $p > .10$). A similar analysis at Time 2 found a significant interaction between self-relevance and constraint, $F(1, 72) = 9.29, p < 0.05$. Independent sample t-tests revealed that participants in the self-relevant, non-constrained group gave higher ratings than those in both the non-self-relevant, non-constrained group, $t(34) = 2.07, p < 0.05$, and the self-relevant, constrained group, $t(36) = 3.02, p < 0.05$. Furthermore, participants in the non-self-relevant, constrained group gave higher ratings than those in the self-relevant, constrained group, $t(38) = 2.29, p < 0.05$. A paired t-test revealed that only the self-relevant, non-constrained group increased significantly from Time 1 to Time 2, $t(17) = 2.83, p < 0.05$.

For item 5 (i.e. You remember the event rather than just know that it happened), factorial between-subjects ANOVA revealed a significant interaction effect between self-relevance and constraint $F(1, 72) = 4.64, p < 0.05$. Univariate 2x2 ANOVAs were run for both Time 1 and Time 2. At Time 1, there were no significant main effects, nor significant interactions. At Time 2, there was a significant interaction between self-relevance and constraint, $F(1, 72) = 5.32, p < 0.05$. However, planned comparisons using

t-tests revealed no significant differences between groups (all $p > .10$), meaning that the interaction in this case was a statistical artifact.

For item 6 (i.e. coherent story) a significant 3-way interaction between time, self-relevance and constraint was found between subjects, $F(1, 72) = 4.59, p < 0.05$. To determine whether time was influencing the 3-way interaction, univariate 2X2 ANOVAs for each time point were performed. No significant main effects were found at either time point. However, a marginal interaction effect was found at Time 2, $F(1, 72) = 3.69, p < 0.06$. Independent sample t-tests revealed that participants in the self-relevant, non-constrained group gave higher ratings than those in the self-relevant, constrained group, $t(36) = 2.49, p < 0.05$. Furthermore, participants in the non-self-relevant, constrained group gave higher ratings than those in the self-relevant, constrained group, $t(38) = 2.30, p < 0.05$. Paired t-tests revealed that only the non-self-relevant, constrained group increased significantly from Time 1 to Time 2, $t(19) = 2.93, p < 0.05$.

For Item 7 (i.e. occurred way remembered) a significant 3-way interaction between time, self-relevance and constraint was found between subjects, $F(1, 72) = 5.82, p < 0.05$. Examining the group mean plots at each time point appeared to indicate that ratings on this item increased from Time 1 to Time 2. Univariate 2X2 ANOVAs for each time point were performed. No significant main effects or interaction effects were found at Time 1. At Time 2, there was a significant interaction between self-relevance and constraint, $F(1, 72) = 4.05, p < 0.05$. Independent sample t-tests at Time 2 revealed that participants in the self-relevant, non-constrained group gave higher ratings than those in the self-relevant, constrained group, $t(36) = 2.46, p < 0.05$. Furthermore, participants in the non-self-relevant, constrained group gave higher ratings than those in the self-

relevant, constrained group, $t(38) = 2.07, p = 0.05$. Paired t-tests comparing each of the groups across time revealed that participants in the self-relevant, non-constrained group gave significantly higher rating on this item, $t(17) = 3.34, p < 0.05$, as did those in the non-self-relevant, constrained group, $t(19) = 2.94, p < 0.05$.

Participants' guesses

Finally, in terms of participants' guesses about which photograph was false at the end of the third interview, only two participants guessed incorrectly. Interestingly, both were in the self-relevant, non-constrained group. This resulted in an incorrect guess rate of 11.11% for this group, and 0% in the other groups. All of the other participants correctly identified the doctored photograph as the false one.

CHAPTER IV

DISCUSSION

General discussion

Consistent with predictions, individuals who received self-relevant information without associated constraining information in photographs provided the highest memory ratings for a false childhood event. However, predicted differences in judge's ratings of events as memories were not observed. Groups showed statistically equal false memory formation rates at both time points, achieving an overall images rate of 20.9% and memory rate of 12.4%. This suggests that, at least with respect to the ABMQ subjective memory ratings, the self-relevant, non-constrained condition provided the most optimal environment for false memory formation of all of the conditions tested. Participants are provided with a self-relevant detail that likely promotes feelings of familiarity, leading to fluency of processing, which is not impeded by the presentation of unfamiliar (i.e. constraining) details. The frequencies of images or memories generated for the false event by participants in the self-relevant conditions were approximately half of those generated in Desjardins and Scoboria (2007). This was expected, as photographs are more constraining than narratives, and thus limit the overall ability for individuals to imagine additional details when trying to remember an event. In terms of other studies which employed photographs (e.g. Wade et al., 2002; Garry & Wade, 2005) the overall judgement of images or memories found at Time 2 in the present study was lower (i.e. ~33% versus ~50%). This is particularly interesting as the self-relevant, constrained condition in this study was identical to the doctored photograph condition in both of these studies. A possible explanation is that individuals are becoming increasingly aware of

digital imaging technology, which increases the likelihood that they will become skeptical as to the veracity of the photograph and thus may reject the event more readily.

The discrepancy between the judges' ratings and the participants own ratings of their memory experiences highlight the importance of including these two measures when assessing false memory formation. Although outside observers may not judge a given response as constituting either an image or a memory, the extent to which an individual perceives him or herself to remember an event carries a significant amount of weight in both judicial and therapeutic settings. A possible reason for the discrepancy between objective and subjective ratings may be that, whereas participants in the different conditions were exposed to different stimuli, and may have felt as though they remembered the event to varying degrees, these feelings of remembering (or not remembering) may not have been expressed in a manner that can be coded by raters. Therefore, a given participant may have felt confident that they "remembered" the event, but this subjective experience, while resulting in high memory ratings, did not manifest itself in rich descriptive detail about the event that could have been judged as constituting an image or a memory.

The subjective Memory Characteristics Questionnaire (MCQ) ratings were expected to mirror the Autobiographical Belief and Memory (ABMQ) ratings. The MCQ measure was introduced as an exploratory device in order to help understand the factors which influenced memory ratings. On the ABMQ, participants give a rating corresponding to the degree of memory they feel they have for the given event. The MCQ, on the other hand, breaks down the experience of remembering into a variety of component parts (e.g. visual imagery, emotional content, event coherence), each of which

may be experienced differently by participants. Thus, ratings on this measure can help explain in a more qualitative way the mental experience of the participants as they engage in the memory recovery task.

Visual imagery and emotional content are two of the primary characteristics associated with rich autobiographical memories (Cabeza & St. Jacques, 2007). It is thus interesting that the two MCQ items that specifically addressed seeing the event and feeling emotions associated with the event were associated with unique effects for constraint but not self-relevance. This may be due to the fact that a visual stimulus (i.e. a photograph) is being used as the suggestive medium, thus making it more susceptible to constraint effects. When details are provided visually it is harder for an individual to ignore or modify them if they appear unfamiliar or constraining when trying to remember the event in question. As such it may be more difficult to be able to visualize an event in one's mind and experience emotions associated with the event, when part of the stimulus provided to aid remembering contains something that does not "match" with one's autobiographical history.

Other items showed a different pattern. Hearing, event coherence, and belief in occurrence were influenced by both self-relevance and constraint at Time 2. Participants in the self-relevant, non-constrained condition gave higher ratings than did those in the self-relevant, constrained condition. This finding supports the original hypothesis, and is similar to the pattern of results found in the ABMQ Memory ratings. However, participants in the non-self-relevant, constrained condition gave higher ratings than those in the self-relevant, constrained condition, which was not expected. It was originally hypothesized that the opposite would be the case, or at the very least that these conditions

would generate similar ratings. This is because participants in the self-relevant, constrained condition are at least given a springboard to jumpstart the feelings of familiarity (via the provision of the self-relevant detail) that would lead to surprising fluency of processing. Those in the non-self-relevant condition are not given such a springboard, while at the same time are impeded from developing any fluency of processing due to the presence of a constraining detail. A possible explanation for this unexpected result is that, as mentioned above, a constraining detail impedes fluency of processing. It cannot be ignored or modified with ease when trying to remember an event. This in particular may be the case in photographic form versus narrative form, because the former is a much more vivid and salient stimulus. As such, the unfamiliar constraining detail is much more conspicuous, and cannot be easily dismissed. For this same reason, self-relevant details may have a *lesser* effect in a photographic medium than in a narrative medium. For example, when a person hears “your mother”, which is a self-relevant detail, they can imagine their mother in many different ways. When they are shown a picture of their mother, the picture may be taken from an angle that is unfamiliar, or the mother may be dressed/coiffed in a way that is not familiar to the individual. Thus, the photographically depicted self-relevant detail loses some of its power in arousing feelings of familiarity. Participants who are shown a photograph in which they can clearly see themselves and their parent, while at the same time are shown an unfamiliar detail, may have a harder time being able to remember. On the other hand, participants who are shown a picture with an unfamiliar detail, and not shown a clear picture of themselves and their parent are free to imagine what they may have looked like, what their parent may have looked like, what they may have been wearing, what

their facial expression may have been like, and the like. Therefore, these participants have the ability to develop feelings of familiarity to a greater extent, hence explaining why the mean ratings obtained from the participants in this group were greater than those obtained from participants in the self-relevant constrained group.

The explanation provided above can also be used to explain why coherence and belief were influenced by both self-relevant and constraint at Time 2, and not Time 1. Specifically, those in the self-relevant, non-constrained group could have an easier time believing that the event is true because the self-relevant details are not impeded in their role of arousing feelings of familiarity, due to the absence of constraining details. Those in the non-self-relevant, constrained condition can have an equally easy time believing that the event occurred as it did because the self-relevant detail, although not shown in the photograph, is suggested by the fact that the participant is told that their mother/father is posing with them. Therefore, they can imagine their parents however they wish, which may overpower the effect of the constraining detail on this item alone. Also, their belief that the event occurred the way it did is bolstered by the fact that they are told that all of the photographs were provided by their parents. Believing the event occurred as it did is related to how coherent the story of the event may be – the more coherent the story appears to be, the more likely that the event will be believed. The participants were interviewed three times over the course of one week, during each of which they were engaged in an intense memory recovery task. Additionally, the participants were asked to think about the photographs between interviews. Such frequent rehearsal can make an event appear more and more like a coherent story, which can in turn make it more

believable. These factors likely take time to develop, which is perhaps why significant differences were not found until the final interview.

Relationship between self-relevant and constrained details

Subjective Reports. Thus, it appears as though the properties of self-relevant and constraining details operate in specific manners when presented in photographic form. As described above, the power of self-relevant details may be reduced, because the detail is presented in only one way, which may not necessarily be as familiar to the individual as it would be if they were free to imagine it for themselves. Constraining details, on the other hand, may be more powerful as agents that impede fluency of processing, due to the fact that they are less easily modified or ignored by the individual when he or she is trying to remember the event. Additionally, it may be the case that self-relevant details are only weakened if presented along with a constraining detail. This is because the constraining detail draws the viewer's attention in a negative way and lowers fluency of processing to such an extent (or is so dissonant with the individual's working self concept) that the individual may come to reject the event as true. In their attempt to ensure that they are correct in rejecting the veracity of the event, the individual may scrutinize other details in the photograph, and may view the self-relevant detail as less familiar. When no constraining detail is present, the self-relevant detail (which is consistent with the individual's autobiographical history) may be allowed to exert its full power in arousing feelings of familiarity because there is nothing present to impede their formation.

Whittlesea and Leboe (2003) posited that fluency of processing may influence individuals' decision making by either increasing absolute fluency (i.e. speed of processing a stimulus is greater than for other, similar stimuli) or by increasing relative

fluency (i.e. speed of processing a stimulus produces a discrepancy between actual speed of processing and expected speed of processing). The researchers went on to conclude that the critical element in arousing feelings of familiarity is not the actual increase in fluency on its own, but the perception of surprise when a stimulus is processed faster than expected.

Using the hot-air balloon event, when individuals encounter this stimulus, they may initially not expect to remember the event. However, in the context of being told that the event happened and seeing themselves and their parent arouses feelings of familiarity which they mistakenly attribute to the entire event. Therefore, they process the stimulus more fluently than they initially expected, which can facilitate their acceptance of the event as true. This is precisely what appears to be occurring in the self-relevant, non-constrained condition. In the non-self-relevant, constrained condition, where the constraining detail is provided alone, the individual may either attempt to use this detail to help their “remembering”, or they can choose to ignore it when they are trying to remember the target event. After all, the detail may be unfamiliar, but so is the entire target event. As such, when the individual is attempting to remember the event, they can easily amalgamate the individual detail (i.e. the lighthouse in this case) along with the entire hot-air balloon ride event. Thus, the process of remembering is certainly not facilitated (i.e. no self-relevant detail is provided), but it is perhaps not impeded as much when the constraining detail is presented alone (i.e. without a self-relevant detail). This is because the constraining detail may not be as comparatively constraining relative to the entire target event. The event itself is unfamiliar, so when an unfamiliar detail is presented within an unfamiliar context, it may not jump out to the viewer as being as “out

of place” as it would if the context were familiar (or *made* more familiar via the presentation of a self-relevant detail).

In the case where a self-relevant detail is paired with a constraining detail, a conflict of processing may occur. Upon seeing the self-relevant detail, the individual recognizes themselves and their parent, and thus experiences surprising fluency as compared to what they initially expected to experience. However, the constraining detail by comparison is much more relatively constraining, and impedes the fluency of processing. Thus, the individual experiences a surprising *disfluency* of processing (i.e. they recognize themselves and their parent, and therefore expect to recognize the entire event, but for some reason, they do not). Therefore, they experience a fluency of processing disproportionately smaller than expected, resulting in a decrease in confidence that the event occurred, which could lead to the event being rejected.

In terms of the non-self-relevant, non-constrained condition, none of these fluency promoting or fluency impeding forces are at play, which may explain why this group was not statistically different from any other group besides the self-relevant, non-constrained group.

These findings can also be interpreted in terms of Conway and Pleydell-Pearce’s (2000) self-concept theory, which maintains that over time, individuals develop sets of self-schemas, which consist of memory representations of different concepts of the “self”. Different subsets of these schemas are active at any given time, and form what they term the individual’s “working self concept”, the goal of which is to maintain cognitive consonance. Therefore, any new information remembered and subsequently retrieved needs to be consistent with an individual’s sense of self. They argue that the goal of the

working self to maintain cognitive consonance is what dictates the memory retrieval models generated when an individual attempts to recall an event from the past. If a stimulus presented as a memory cue is consonant with an individual's working self-concept, then the memory retrieval model generated will facilitate the search for that memory. If, however, the stimulus presented is dissonant with the working self concept, the memory retrieval model generated will constrain the search for the memory.

In the present study, the photograph depicting the false event (i.e. a stimulus dissonant with the individual's working self concept) was constant across experimental conditions. Therefore, the only factors at play are the different types of details included in the photographs, depending on the condition. Using Conway and Pleydell-Pearce's (2000) model, participants in the self-relevant, non-constrained condition were provided with a memory cue stimulus that is more likely to be consonant with their working self concept (i.e. themselves and their parent). There is nothing in the photograph that is dissonant with their working self-concept (besides the event itself, of course, which as mentioned above is held constant across experimental groups). Thus, the memory retrieval model generated to search the autobiographical memory base would be quite broad, although specific to memories where the parent depicted in the picture is present.

In the self-relevant, constrained condition, there are two memory cue stimuli: one that is consonant with the individual's working self-concept (i.e. the self-relevant detail), and one that is dissonant with it (i.e. the constraining detail). Thus, the memory retrieval model generated would have been the narrowest of all the conditions, in that the instructions are to search for all instances where a particular parent was present, while also having a lighthouse present in the background.

In the non-self-relevant, constrained condition, the constraining detail is provided alone and represents a memory cue stimulus that is dissonant with the individual's working self concept. However, because there are no memory cues provided other than those that are constant across conditions (i.e. telling participants that their parents provided the photograph of them), the memory search model generated here will be broader than that generated in the self-relevant, constrained condition. Thus, ratings on the AMBQ and the three items on the MCQ listed above were understandably higher in the non-self-relevant, constrained condition than in the self-relevant constrained condition. Nevertheless, the memory retrieval model generated in the former condition is still narrower than that generated in the self-relevant, non-constrained condition. The reason for this is because the memory cue stimulus in the former condition is more likely to be dissonant with the individual's working self concept (i.e. unfamiliar lighthouse), whereas the memory cue stimulus in the latter condition is consonant with it (i.e. picture of self with parent).

Perhaps photographically presented self-relevant details promote false memory formation when they appear without the presence of constraining details. If they are presented along with a constraining detail, at least two processes may become activated, either of which will result in decreased memory ratings on subjective measures. Using Whittlesea's (1993) fluency of processing model, when self-relevant details are paired with constraining details, two opposing forces are at play: one that promotes and one that impedes fluency of processing. This results in a processing speed that is disproportionately smaller than expected by the individual, which can be interpreted to mean that the event is not familiar, leading to a rejection of the event as true. Using

Conway and Pleydell-Pearce's (2000) working self concept model, pairing self-relevant details with constraining details results in the generation of a more narrow memory search model, which reduces the likelihood that the event will be endorsed as being true.

Judges' Ratings. The judges' ratings, on the other hand, provide an objective evaluation of the narrative quality of event descriptions, and thereby whether false memories have been formed. In the present study, no significant differences were found in the judges' ratings between the experimental conditions. This was not surprising, in that the differential processes that are thought to be at play as dictated by the types of details presented in a given photograph are geared to influence the participants' feelings of remembering, not the volume of their verbal output. The fact that the subjective ratings differed across experimental conditions demonstrates that participants' feelings of remembering were influenced, although they may not have necessarily been able to "prove it" by describing the event in question to the extent that they would have been judged as having an image or a memory. Ideally, the participants would have provided a descriptive narrative in response to the photograph presented to them that differed in the units of memory and/or images identified by the judges according to their experimental condition. The fact that this was not the case does not detract from the fact that these processes appeared to be at play in terms of the participants' subjective experience.

These findings can be compared to a recent study by Strange, Hayne, and Garry (2008), where the authors presented 10 year-old children with photographs depicting a hot-air balloon event. Half of the children saw the hot-air balloon alone, whereas the other half saw a doctored photograph with themselves and their family members posing in the hot-air balloon. The first photograph can be likened to the non-self-relevant, non-

constrained condition of the present study, whereas the second photograph can be likened to the self-relevant, unconstrained condition. Strange et al. (2008) found that the children who had seen the hot-air balloon with themselves and their family posing inside were judged as having developed a higher percentage of false memories than children who had seen the hot-air balloon by itself. By contrast, the researchers found that children's own memory ratings did not differ significantly according to whether or not they saw themselves and their family members in the hot-air balloon.

In terms of the judges' ratings, the raters of transcripts can only use what was said by the participants when making their judgments of whether or not memories and/or images are present. Perhaps adults are more cautious and hesitant when describing events, and tend to filter their statements more than children. This results in adult descriptions being more tentative and lacking in rich detail which can be judged as either an image or a memory. In terms of the subjective ratings, a possible explanation for the lack of significant differences between the groups was that part of the intended self-relevant detail (i.e. the other family members posing in the balloon with the participant) were not held constant. Perhaps at times, it was an uncle, or an aunt, or a distant cousin that was present. This would have added an element of constraint to the photograph that was not intended, thus reducing the effect of the main self-relevant detail (i.e. the participant as a child). An alternative explanation could be related to the stage of cognitive development that the 10 year-old children are in. According to Piaget, children at this age are in the Concrete Operations stage, in which they are not yet capable of thinking abstractly nor logically, nor are they able to draw conclusions from evidence presented. Thus, the metacognitive skills that are thought to be at play within adults (i.e.

responding to surprising fluency or disfluency of processing) are likely yet to be acquired by the children in Strange et al.'s (2008) study.

Summary and implications

This study demonstrated, consistent with prior research, that individuals can become convinced that they remember an event that never actually occurred to them, through the presentation of a doctored photograph, the assertion that their parents provided the photograph, and by engaging in guided imagery exercises. Furthermore, the types of details presented in the photograph played a significant role in either reducing or enhancing the ratings the participants made of their memory for the target event. In some instances, the ratings increased from the first interview to the third. These findings have implications in both therapeutic and legal arenas.

In terms of therapy, clinicians must keep in mind that individuals can form memories of things that may not have occurred. Looking at a photograph, making a suggestion, or engaging in a guided imagery task can all be stepping stones on the road to developing a false memory. An individual who is emotionally distressed may strive to seek an explanation for their distress. Their overall suggestibility appears related to a desire for an explanation, followed by confirmatory bias in the memory search, such as when “repressed memory” or “forgetting” is held up as the explanation. Thus, when an individual is led, however unintentionally, toward thinking that certain things may have happened that could explain their distress, they may more easily accept such suggestions, out of a desire to have a concrete explanation for their symptoms. Once an individual makes the leap from being confused about their symptomatology to believing the suggestion that something (e.g. abuse) may have happened to explain it, any new piece of

information may be modified, dismissed, or embellished to the extent that it is consistent – or consonant – with the new theory they have come to believe. This is termed confirmatory bias (Nickerson, 1998). These types of situations – where an individual wants to believe a suggestion because it will help them understand themselves or their distressing symptoms – represent conditions where individuals may be more likely to be influenced by self-relevant information. This is because they are presumably at the very edge between belief and memory, and the feelings of familiarity that are aroused when self-relevant details are presented may be especially instrumental in helping the individual make the transition from believing to “remembering” – however tenuous that memory may be. Once they acknowledge that they “remember”, confirmatory bias facilitates the strengthening of this “memory”.

Additionally, there may be certain clinical populations that are more susceptible to suggestion. Individuals who have dissociative disorders are characterized as having a disruption in memory, identity, and perception. As such they may have difficulties in distinguishing actual autobiographical events from fictitious ones. Indeed, higher levels of dissociation have been found to be associated with memory errors and false memory formation in a variety of studies (e.g. Dorahy, 2001; Wright & Livingston-Raper, 2002; Wright & Osborn, 2005). According to the DSM-IV-TR, care must be taken when evaluating the accuracy of retrieved memories, especially with these clinical populations. It is clear from this body of research that clinicians must be cautious regarding the hypotheses that they form when attempting to ascertain the underlying causes of their patients' difficulties. Hypotheses which are based upon unremembered past events may lead to a dialogue that results in inadvertently guiding the patient to confirm this

hypothesis. For example, a clinician who felt certain that his client was experiencing certain symptoms (e.g. sudden and inexplicable fear of a family member or difficulties in sexual relationships) may attempt to facilitate his client's "remembering" by asking questions laden with self-relevant content, with the hope of transporting that patient back in time and into the environment where the hypothetical abuse took place. The patient may mistakenly "remember" being abused by virtue of the suggestion, the feelings of familiarity (or cognitive consonance) aroused via the self-relevant, personal details. This is where constraining details may play a vitally important role, in that they can be used to limit the "domino effect" of fluency of processing that may occur when self-relevant details are presented with the goal of arousing maximum feelings of familiarity to facilitate remembering. Encouraging an individual to attend to details that may not fit with the suggestion of abuse, or that have been ignored or modified by virtue of confirmation bias exhibited by the individual when trying to make information consistent with a memory of abuse may serve to minimize inaccurate or faulty remembering..

However, providing self-relevant details to aide a patient's remembering may be beneficial if used with vigilance. For example, other populations who may be vulnerable to false memory formation are trauma survivors who have developed Post Traumatic Stress Disorder. These individuals have actively suppressed the traumatic event that occurred to them, and tend to avoid any environmental cues which might remind them of this event. However, this avoidance is not completely successful, and results in intrusions (e.g. sudden flashbacks of memory fragments or nightmares of the event, which are quite frightening to the individual, and lead to further avoidance. What tends to happen, though, is that fear cues tend to generalize to include details that become more and more

remotely associated with the traumatic event. For example, an individual may have been raped in her dorm room at university. Flashbacks may include details of her room, such as the color of her sheets, the smell of her perfume, etc. Thus, these stimuli lead to a fear response because they remind her of the trauma, and are therefore avoided. The individual may start to avoid thinking about her dorm room in general, or even the entire residence building. These stimuli now generate a fear response because they remind her of the trauma. The generalization of stimuli can transfer broadly, for example leading to avoidance of anything that is related to bedrooms or universities. It is obvious that this is a maladaptive situation, and the goal of therapy with this individual would ideally focus on orienting her to the specific stimuli related to the traumatic event, rather than generalized stimuli. The result would be that the unrelated stimuli (e.g. the university, the dorm room, the perfume) would cease to evoke the fear response, thus lessening the impact of the disorder. These details are constraining in that they are inconsistent with the actual memory of the event. Certainly, it occurred at her university, in the residence hall, on her floor, but these details were not immediately present during the event, and are thus inconsistent with it. Encouraging her to identify this inconsistency may diminish the extent of the generalization of fear-inducing stimuli.

Finally, children represent a population extremely vulnerable to false memory formation. It has been demonstrated that children can come to “remember” highly implausible and surreal, such as having tea with the prince (Strange, Sutherland & Garry, 2006), or truly bizarre, ritualistic sexual abuse (e.g. *People v. Akiki*, 1993; *State v. Michaels*, (1994)). As children appear to be much more susceptible to false memory formation, further research is warranted in order to clarify exactly how they would

respond to the presentation of self-relevant and/or constraining details. This is certainly not to say that all recovered memories are untrue. Rather, it is important for therapists to be aware of the ways in which memory can be manipulated, and the conditions under which false memories can flourish optimally.

In the legal arena, the same principles apply. Individuals may be shown photographs of a crime scene, or may be questioned in a way that can help “facilitate their remembering”. Although leading questions are generally not permitted in the courtroom, attorneys will frequently attempt to ask them in a disguised manner. Leading questions, however, are not the only ones that are problematic. From the results of the present study, questions laden with self-relevant content (when the desire is for the witness to remember a given event) or with constraining content (when the desire is for the witness not to remember a given event) can be equally damaging. For example, if officers questioning eyewitnesses to a crime have a prejudice about aspects of the circumstances of the crime, they may inadvertently suggest a story line to the eyewitness and “helpfully” provide a lot of consistent details (i.e. ones that the eyewitness surely saw) but might add a detail or two based on their preconceived hypothesis as to what may have happened. Increased knowledge on the part of lawmakers about how memory can be manipulated by the content of memory cues can hopefully contribute to improved standards of interrogating witnesses.

Overall, the present study found that, in terms of participants’ subjective evaluations of their own memory, the types of details contained in photographs differentially influence memory ratings. Pairing self-relevant details with non-constraining details creates the most optimal condition for high subjective memory

ratings. However, presenting self-relevant and constraining details visually, as opposed to verbally, results in an interesting interaction between the two types of details. It appears as though the strength of self-relevant details is influenced by the presence (or lack thereof) of constraining details. When presented without constraining details, self-relevant details appear to work as hypothesized in that they promote feelings of familiarity and cognitive consonance, which results in significantly higher memory ratings than any of the other groups. When constraining details are added, however, it appears as though fluency is impeded by the constraining detail, and the strength of the self-relevant detail is too weak to overcome the disfluency, or dissonance, that results, leading to significantly lower memory ratings.

Limitations and future research directions

A possible limitation of this study, that may have contributed to the overall low false memory formation rate, is that individuals are becoming increasingly aware of digital imaging technology, and are thus more skeptical of the authenticity of photographic stimuli if they do not remember the event depicted therein. This may partially explain why so many participants guessed correctly which photograph was false at the end of the third interview, once told that one of them was doctored. Another limitation is that the cell sizes were unequal due to participants dropping out, thus compromising statistical power. Therefore, where some findings were marginally significant (e.g. the marginal effect of constraint on the ABMQ memory ratings), adding additional participants might have resulted in statistical significance. Also, all but two of the participants guessed the false photograph at the end of the third interview. Perhaps altering the angle from which the hot-air balloon was photographed would make it more

believable. Another improvement could be printing the photographs on photo-quality paper, which would increase their apparent authenticity. Finally, there was no way to guarantee that participants did not discuss the photographs with friends and/or family, which may have contributed to the low overall false memory formations rate.

In terms of future directions, research needs to be done to further investigate the relationship between *self-relevance* and *constraint*. This is important in order to be able to learn how to use these two details types in such a manner as to enhance memory recovery, but at the same time maximize accuracy of the memory, specifically to examine how false memory formation rate is affected by increasing the level of constraint. This can be done in one of two ways: a) by presenting increasing levels of constraining details in false photographs, and b) by coupling self-relevant details with other self-relevant, though contextually inconsistent, details. An example would be to include a picture of an individual's first grade teacher (a highly self-relevant detail) in the context of the individual's back yard (incorrect context).

Ultimately, effective memory search systems should strike an optimal balance between being able to identify familiar information, but not to the extent that memory searches become so extensive that they're no longer relevant to the context of the search. The items that are self relevant are (and must continue to be) flexible. Each day, new information becomes relevant to the individual, while other information loses relevance, thus the concept of self-relevance is constantly changing. Yet to be effective, the inclusion of new details as self-relevant must be selective to a point, to prevent the overgeneralization of familiarity. If memory search systems are too broad, the likelihood

that false memories occur can be enhanced, and when memory searches are too constrained, access to true memories may be impeded.

Additional directions could include examining how false memory formation rates are affected by increasing amounts of self-relevant details. Perhaps, there will come a point where self-relevant details will impede the formation of false memories because of the relative implausibility of so many familiar objects being grouped together. This could be thought of as *fluency saturation*: the point at which self-relevant details cease to enhance fluency of processing and subsequent memory formation, but rather impede it.

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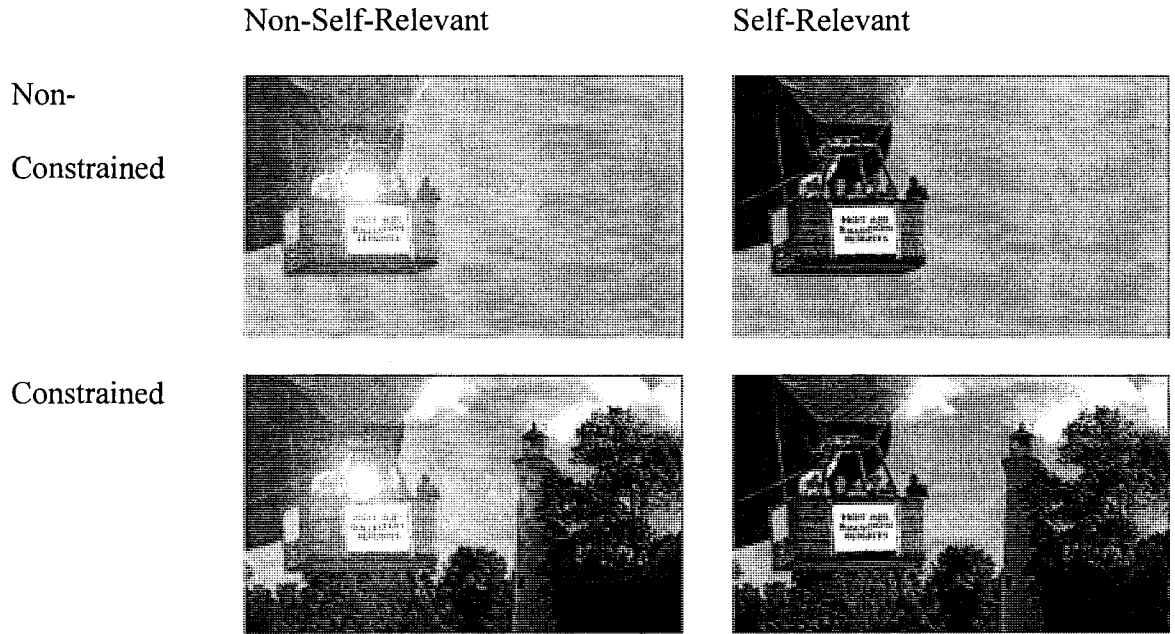
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Appendix A – Sample Doctored Photograph

Sample family photograph and an example of how it was modified according to the four experimental conditions.



Appendix B – General Consent Form

**CONSENT TO PARTICIPATE IN RESEARCH**

Title of Study: **Memory Recovery Techniques: How effective are they?**

You are asked to participate in a research study conducted by **Joanna Hessen (M.A. Student)** from the **Department of Psychology** at the University of Windsor. **The result of the study will contribute to the completion of a M.A. Thesis. This research is sponsored in part by SSHRC CGS – Master's Award No. 766-2007-0439.**

If you have any questions or concerns about the research, please feel to contact **Joanna Hessen (Principal Investigator)** at hessen@uwindsor.ca, or **Dr. Alan Scoboria (Faculty Supervisor)** at (519)253-3000, ext. 4090.

PURPOSE OF THE STUDY

This study is designed to assess the effectiveness of various techniques used in trying to assist in the recovery of childhood memories.

PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

- **You were asked to provide consent for the Primary Investigator to contact your parents to obtain photographs of you when you were a child.**
- **You will then be asked to attend three (3) separate sessions over the course of one (1) week. During these sessions, you were asked to remember a variety of childhood events, while looking at the photographs provided by your parents as memory cues.**
- **You were asked to provide all of the information you can think of regarding each event, without leaving anything out. In the event that you cannot remember a particular event you were asked to close your eyes and try to imagine what it may have been like to**

experience the event, how you may have felt that day, what you may have been thinking, who was with you during the event.

- All of your answers were audio-taped in order to be able to assess the quality of your memories for each event. You were asked to answer some questions regarding the quality of your memory for each of the events.
- You were provided with a booklet containing the photographs corresponding to the events you are being asked to remember. You were asked to look at this booklet between interviews to help you in remembering the events.
- Each interview will last approximately 30 minutes, with a total participation time requirement of 2 hours (including the preliminary session of signing the consent form and setting up the interview times). The three interviews will take place over the period of one week. You were reminded of your interview time by telephone call the evening prior to each interview.

POTENTIAL RISKS AND DISCOMFORTS

This study does not carry with it any foreseeable risks, discomforts, or inconveniences.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

There are no individual benefits from the participation in this study. Potential benefits to science and society expected from this research are such that the effectiveness of certain common memory recovery techniques were assessed. This plays a role in determining the most effective use of these techniques in therapy sessions, where the remembering of a given childhood memory is an important part of the therapeutic process.

PAYMENT FOR PARTICIPATION

There were no individual financial compensation for participation in this study. Upon completion of the three interviews, you were rewarded with three (3) experimental credits. At the end of all interview sessions, if you have attended all of them, you were entered into a draw for one of six (6) prizes of \$50.00.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and were disclosed only with your permission.

Your name will only be retained by the primary researcher, for the purposes of contacting your parents for your childhood photographs, to remind you of your interview session times, for assigning credits, and for contacting you regarding the results of the draw. You were given an identification code by the primary researcher, which is the only information the research assistants who interview you will have about you. After the study is over and the results of the draw are disseminated, all of your personal identification information were destroyed. The photographs were returned to you at the end of the third interview session in the same condition in which they were provided.

The interview sessions were taped and transcribed for the purpose of evaluating the quality of your memory for each event. Once transcribed and once the transcripts are rated regarding memory quality, both the tapes and transcripts were destroyed. Only the primary researcher will have access to the tapes and transcripts prior to their destruction.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. **You have the right to request that your data not be used in the study.**

FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings were made available to all interested parties upon completion, on the Research Ethics Board web site (www.uwindsor.ca/REB). Please provide your e-mail if you would like to receive a notification when the results become available for you to view.

Web address: _____TBA_____

Date when results are available: _October 31, 2008_____

SUBSEQUENT USE OF DATA

At times, it may be necessary to analyze data in conjunction with data from other studies. I agree that this data can be used in subsequent studies.

Do you give consent for the subsequent use of the data from this study?

Yes No

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. If you have questions regarding your rights as a research subject, contact: Research Ethics Coordinator, University of Windsor, Windsor, Ontario N9B 3P4; telephone: 519-253-3000, ext. 3916; e-mail: lbunn@uwindsor.ca.

SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study **Memory Recovery Techniques: How effective are they?** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

Name of Subject

Signature of Subject

Date

SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

Signature of Investigator

Date

Appendix D – Consent to Contact Parents



Consent to Contact Parents
Memory Recovery Techniques: How effective are they?

I, _____, provide permission for my parent(s)/guardian(s) to be contacted for the purposes of collecting information for a study of childhood events. I understand that this information were used solely for the purposes of the study, and will otherwise remain confidential. I further understand that I were contacted to participate in the remainder of this study, which will require approximately one and one half hours of my time, and were worth 3 experimental credits.

Please address the attached envelope to your parent(s)/guardian(s), but do not detach it from this form. Should you have parents or guardians living in different locations, please select the one whom you spent the majority of time with prior to the age of 6.

Signature

Student Number

Student's Phone Number

Appendix E – Letter of Information for Parents



Joanna Hessen
Department of Psychology
University of Windsor
Windsor, Ontario, Canada
September 1, 2007

Dear Sir or Madam:

Your child, _____, is participating in a study of childhood memory at the University of Windsor. She or he has provided permission (see attached letter) for you to provide events that occurred to her/him. We would appreciate if you would take a few minutes of your time and provide a number of photographs along with descriptions of a number of events which occurred to your child **prior to the age of 6**. Please review the categories provided below. If you know of any event(s) which your son/daughter experienced prior to the age of six in any category, please provide information about the activities which took place, the location, the people involved, and your child's age at the time. I would appreciate if you would provide as many photographs and corresponding descriptions as possible, whether or not they fit the categories provided. It is preferred that you seek specifically the photographs that your child has not seen.

For example, an event might be written: At the age of 4, at a friend of the family's wedding, spilled the punch bowl onto the father of the bride.

We request that you do not discuss this letter, nor the information you have provided with your child until such a time as the study has been completed. Upon the completion of their participation in the study, your child will receive a full explanation of the purpose of the study, all of the pictures you have provided in their original condition, as well as a copy of the list of events you have provided.

Please return the form to us using the pre-addressed envelope enclosed with this letter. Or, if you have digitalized photographs, you may email your response to address@server.

Appendix F - ABMQ

CHILDHOOD EVENT INVENTORY

Below are some events that may or may not happen to people **before the age of 6**. Please answer four questions about each event.

The first question has to do with how plausible it is that events like this happen to people in general. The second question asks how plausible it is that events like this could have happened to you. There are many events that may happen to some people in general but are not plausible for you (e.g. it is very plausible that many people got stung by a hornet when they were younger, regardless of whether they remember it; however, you may have grown up in an area of the world with no hornets and so it is unlikely that this could have happened to you, whether or not it did).

Also, many things happen that people do not remember having happened. People can know something happened to them, without remembering the event (for example, you probably know where you were born, even though you don't remember being born). Therefore, the third question asks your belief as to whether you think the event happened to you while the fourth question asks whether you actually remember this event.

Lastly, please keep in mind that all the following events ask questions about events that happen at or before the age of 6.

Event 1.**Choking on a small object, at or before the age of 6.**

A. How plausible is it that at least some people, before the age of 6, choke on a small object?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

B. How plausible is it that you personally, before the age of 6, could have choked on a small object?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

C. How likely is it that you personally, before the age of 6, did in fact choke on a small object?

Definitely did not happen 1 2 3 4 5 6 7 8 Definitely happened

D. Do you actually remember choking on a small object before you were the age of 6?

No memory of event at all 1 2 3 4 5 6 7 8 Clear and complete

memory of event

Event 2.**True Event experienced uniquely by a specific participant****A. How plausible is it that at least some people, before the age of 6, [INSERT EVENT]?**Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible**B. How plausible is it that you personally, before the age of 6, [INSERT EVENT]?**Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible**C. How likely is it that you personally, before the age of 6, [INSERT EVENT]?**Definitely did not happen 1 2 3 4 5 6 7 8 Definitely happened**D. Do you actually remember [INSERT EVENT] before you were the age of 6?**No memory of event at all 1 2 3 4 5 6 7 8 Clear and complete

memory of event

Event 3.**Going on a hot-air balloon ride, at or before the age of 6.****A. How plausible is it that at least some people, before the age of 6, go on a hot-air balloon ride?**Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible**B. How plausible is it that you personally, before the age of 6, could have gone on a hot-air balloon ride?**Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible**C. How likely is it that you personally, before the age of 6, did in fact go on a hot-air balloon ride?**Definitely did not happen 1 2 3 4 5 6 7 8 Definitely happened**D. Do you actually remember going on a hot-air balloon ride before you were the age of 6?**No memory of event at all 1 2 3 4 5 6 7 8 Clear and complete

memory of event

Event 4.**Receiving a bone density screening, at or before the age of 6.**

A. How plausible is it that at least some people, before the age of 6, receive a bone density screening?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

B. How plausible is it that you personally, before the age of 6, could have received a bone density screening?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

C. How likely is it that you personally, before the age of 6, did in fact receive a bone density screening?

Definitely did not happen 1 2 3 4 5 6 7 8 Definitely happened

D. Do you actually remember receiving a bone density screening before you were the age of 6?

No memory of event at all 1 2 3 4 5 6 7 8 Clear and complete

memory of event

Event 5.**Seeing a UFO at or before the age of 6.**

A. How plausible is it that at least some people, before the age of 6, see a UFO?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

B. How plausible is it that you personally, before the age of 6, could have seen a UFO?

Not at all Plausible 1 2 3 4 5 6 7 8 Extremely Plausible

C. How likely is it that you personally, before the age of 6, did in fact see a UFO?

Definitely did not happen 1 2 3 4 5 6 7 8 Definitely happened

D. Do you actually remember seeing a UFO before you were the age of 6?

No memory of event at all 1 2 3 4 5 6 7 8 Clear and complete

memory of event

Appendix G – Memory Characteristics Questions

On a 7-point scale (1 = low, 7 = high), please rate to what extent the following statements apply to you.

- 1) You were able to relive the event in your mind
- 2) You were able to see the event in your mind
- 3) You were able to hear the event in your mind
- 4) You were able to feel emotions associated with the event
- 5) You remember the event rather than just know that it happened
- 6) You remember the event as a coherent story
- 7) You believe the event occurred in the way remembered
- 8) You had talked/thought about the event in the past

Appendix I – Logistic Regression Analyses of Judges' Ratings

Logistic regression analysis of the frequency of judges' ratings at Time 1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	SR	.801	.745	1.155	1	.283	2.227
	C	-.134	.796	.028	1	.867	.875
	C by SR	-1.149	1.122	1.048	1	.306	.317
	Constant	-1.253	.567	4.883	1	.027	.286

Logistic regression analysis of the frequency of judges' rating at Time 2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1	SR	1.030	.739	1.940	1	.164	2.800
	C	.634	.736	.742	1	.389	1.885
	C by SR	-1.509	1.016	2.205	1	.138	.221
	Constant	-1.253	.567	4.883	1	.027	.286

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