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# Photograph type and content influences memory retrieval models that are too broad, too tight, or just right

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Photograph type and content influences memory retrieval models that are too broad, too  
tight, or just right

by

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University of Windsor

A Dissertation  
Submitted to the Faculty of Graduate Studies  
through the Department of Psychology  
in Partial Fulfillment of the Requirements for  
the Degree of Doctor of Philosophy at  
the University of Windsor

Windsor, Ontario, Canada

2013

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## ABSTRACT

Research to date suggests that non-event-specific photo/narrative pairings produce higher false memory rates than do event-specific photos. The former differ from the latter in that the former provide relevant imagery but omit the specific event to be recalled, thereby promoting novel imaginings and increasing the likelihood of false memories. Two studies sought to determine which type of photograph constitutes a superior retrieval cue. The first study explored the role of how the photograph was framed upon presentation. Thirty-six participants were randomly assigned to conditions as follows: 1) narrative alone, 2) narrative plus photograph introduced as having been taken during the event, and 3) narrative plus photograph introduced as having been taking during the time period that the event took place. Participants were asked to provide as much descriptive detail about their memories for four events allegedly provided by their parents, one of which included a childhood hot-air balloon ride with a parent. They rated their memory (and quality thereof) for each event. Additionally, participants' responses were rated as to the extent to which they constituted visual images or memories. The findings suggest that retrieval cues that favour the generation of a broader memory search model do play an important role in remembering. Both subjective and objective data demonstrated that the wider frame of reference of the "from that time period" condition led to higher false memory formation compared to the narrower frame of reference of the "during the event" condition. Overall, a photograph does not have to depict an event, nor even be viewed as being representative of the event, in order to exert a powerful influence on false memory formation. The second study examined the role of photograph content on false memory formation. Thirty-three participants were randomized to conditions as follows: 1) event-absent photograph, 2) non-

event specific photograph, 3) event-specific photograph. The event-absent and the event-specific conditions yielded false memories at an equal frequency. These two groups also formed autobiographical beliefs in the event's occurrence, with those in the doctored, event-specific photograph giving the highest ratings. Unfortunately, familiarity with the experimental design compromised the results of the second study.

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## **CHAPTER I**

### **Introduction**

The topic of “false” or “implanted” memories has become ubiquitous in both the psychology and criminal justice literature. The impetus for research in this area was originally born out of concern over the general accuracy of memory - most infamously, the accuracy of childhood memories of sexual abuse recovered during therapy. The fallibility of memory stems from its underlying reconstructive nature, a concept first introduced by Bartlett (1932) and elaborated upon by Neisser (1976). When one perceives the world, the cognitive system does not preserve a snapshot representation of what is perceived. Rather, a mental representation of the present experience is constructed. There is a gap between present experience and subsequent remembering of same. Presumably, something is stored. It follows, then, that remembering involves a degree of reactivation of the previously activated network. However, this reactivation is not akin to reactivating the exact same pattern as that present at the time of original perception. Remembering is an act of creating a present reconstruction of past perceptual and reflective states. This reconstructive process is not without error, in that some reorganization inevitably takes place. We fill in gaps based on expectations and assumption about what likely occurred, as informed, for example, by our general schematic knowledge. This process also can involve the incorporation of entirely novel information such that the end product - the memory – may not be a true reflection of the original perceptive state. Memory’s susceptibility to change has given rise to a large body of research which can be divided into two main streams: that involving distorted true memories and that involving completely novel or implanted memories (i.e. false memories).

### **Distortion of True Memories**

Prior research demonstrates that details within memories for true events can be altered. In fact, even “flashbulb memories” (defined as vividly detailed memories of the circumstances under which one first experienced a significant and emotionally meaningful public or personal event; e.g., Challenger space shuttle disaster, 9/11 terrorist attacks) often show inaccuracies as do “ordinary” memories (e.g. Neisser & Harsch, 1992, Talarico & Rubin, 2003). Nevertheless, there are elements of flashbulb memories that are more likely to be accurate, such as contextual details about the event.

As such, even the most vividly experienced of memories are susceptible to decay and interference effects. Regarding the decay theory of memory, it is proposed that memory fades over time such that the original memory trace slowly disintegrates and is increasingly less available for retrieval as a factor of time. According to Ebbinghaus’ classic research, the half-life of human memory is approximately one hour, absent regular rehearsal (Ebbinghaus, Ruger & Bussenius, 1913). Another mechanism by which memory can be altered is through interference. Interference theory suggests that new information interacts with information formerly encoded such that learning is impaired. Interference can be either proactive or retroactive (Jenkins & Dallenbach, 1924). The former involves the forgetting of new information due to information provided before the target event has occurred (e.g. remembering an event one way despite the provision of new information that refutes the original memory), whereas the latter involves forgetting due to information provided after the target event has occurred. In this case, the new (i.e. post-event information) may merge and integrate with the original memory and alter or displace it, increasing the likelihood that original memory being recalled will contain

inaccurate information.

When post-event information is inaccurate and relates to the original event, it is termed “post-event misinformation”. When individuals incorporate the new misinformation into their recall for the original event, this is termed the “misinformation effect” (Wright, Self, and Justice, 2000; Loftus, 2007). In Loftus and Palmer’s (1974) seminal misinformation study, participants viewed videotapes of car accidents and estimated the speed with which the vehicles were traveling at impact. Speed estimates were 20% higher when a strong verb such as “crashed” was presented while answering questions after viewing the videotape, contrasted with weak verbs such as “contacted”. Furthermore, when retested a week later, those questioned with “smashed” were more than twice as likely to report seeing a broken headlight, even though there was no broken headlight in the videotape.

The pernicious effects of misinformation have been repeatedly demonstrated in the literature over the years (Loftus, 2007). Although it has been suggested that peripheral details are easier to alter (Heath & Erickson, 1998), other studies have shown that it is possible to alter memory for a central detail as well (Okado & Stark, 2005).

### **Creation of Entirely False Memories**

However important in helping elucidate the mechanisms of what makes memory fallible, research examining the distortion of true memories does not address the fabrication of completely novel memories (Pezdek & Lam, 2007). As noted above, distortion of true memories can occur naturally through reconstructive remembering processes or can be induced. These processes involve the manipulation of details, whereas the overall integrity of the event remains intact. As such, these memories are

grounded in autobiographical reality, whereas false memories are not. The creation of false memories involves a significantly greater degree of distortion, which can carry consequences with greater implications.

Research into false memories was reinvigorated by the controversy over recovered memories of alleged childhood sexual abuse that were purportedly recovered during therapy, that appeared to in fact never have occurred. In some cases, individuals who had initially reported recovered memories of abuse following psychotherapy later withdrew their accusations (Schacter, 2001). Research examining the experiences of these individuals noted that coming to form this false memory resulted in an identity shift such that individuals came to partly define themselves survivors of childhood sexual abuse (Lief & Fetkewitz, 1995). The subsequent realization that what had appeared to be an autobiographical fact was actually untrue, especially one of such significance, not surprisingly contributed to distress in many of those who retracted their abuse memory claims. Moreover, the gap between the initial accusation and the withdrawal of the same led to significant collateral damage in many cases (legal cases, damaged reputations and careers of those falsely accused, destruction of families, and the like). That such significant and life-altering memory distortions appeared to be possible prompted researchers to examine the processes by which such claims could develop (de Riviera, 1997) as well as how they then came to be retracted (Ost, Vrij, Costall, & Bull, 2002).

Ethical considerations prohibit the experimental examination of how false memories of childhood sexual abuse can be formed. However, Loftus & Pickrell (1995) are credited with performing the first study to address this phenomenon, using the false event of being lost in a shopping mall as a child. To do this, the researchers presented

participants with 4 narratives describing events from their early childhood, all of which were allegedly provided by the participants' relatives (i.e. parents or older siblings). Three of these events were true, whereas one was a false narrative about how the participant had been lost in a shopping mall. Based on an interview with the relatives, a booklet of events was generated and sent to participants, who were asked to write as much as they could remember about each event description. Participants were then interviewed twice. At the conclusion of the second interview, 29% of participants fully or partially remembered having experienced this event (Loftus & Pickrell, 1995).

This methodological approach has since been termed the “familial-informant false-narrative procedure” (Lindsay, Hagen, Read, Wade, & Garry, 2004), the ‘implantation procedure’ (Otgaar, Candel, Merkelbach & Wade, 2009), or more colloquially the “lost in the shopping mall paradigm,” and has been employed in numerous studies and with a large variety of target false events. Strange, Gerrie and Garry (2005) found that collapsing across nine studies using false narratives alone, 33% of adults came to remember aspects of a suggested false event.

### **False Narratives**

Initial research into false memory formation has relied on the use of false narratives allegedly provided by others (i.e. parents, relatives) to study how this phenomenon occurs. Although clearly a powerful suggestive medium, a potential criticism of using narratives is that individuals perceive, and thus remember, events idiosyncratically. As such, they will describe them as occurring from their own perspective, which dictates how and what aspects of the event are remembered (Ross, 1997). Another individual present at the same time may describe the very same event



differently. As French, Sutherland, and Garry (2006) aptly summarize: “What is remembered does not equal what happened, and will vary for each person” (pp. 6). They reported that siblings who were asked to independently recall details of a specific common event overlapped on details only 24.7% of the time, thereby suggesting that the remaining 75.3% from each perspective contained details that differed purportedly to varying degrees.

As such, narratives are not an objective representation of fact. This can lead to their authenticity being questioned, even in circumstances where the event in question is actually true. Photographs, on the other hand, are rarely disputed. Even when we are increasingly more aware of imaging software programs that can alter photographs, the authenticity of our family photographs is rarely questioned - we just assume that they are the real thing and the event depicted in the photo did in fact occur (Strange et al., 2005).

### **False Photographs**

Wade, Garry, Read, and Lindsay (2002) extended the false memory research to study the influence of doctored photographs, positing that such photographs may be more effective in altering memory because of the trust placed therein as compared to a verbal account. They argue that family photographs constitute compelling evidence that the events depicted therein actually occurred. Furthermore, a photograph is full of rich perceptual details, which may act as cues for remembering the event (Lindsay et al., 2004). In order to test this, Wade et al. (2002) solicited four true photographs from participants' family, and doctored one of them to depict the participant with a parent in a hot air balloon. Participants were interviewed three times over the course of a week and shown the photographs each time. They were encouraged to try to remember the events,

and guided imagery and context reinstatement were employed to assist participants when they experienced difficulty remembering. At the conclusion of the third interview, 20% of participants formed complete memories of the false event and 33% formed images alone (i.e. descriptions of images associated with the event that the participant did not appear to experience as memories; Wade et al., 2002). It is notable that Loftus and Pickrell's (1995) definition of "partial" versus "full" remembering was very limited, and thus does not allow for a precise comparison with Wade et al. (2002). However, it appears that 50% of Wade et al.'s (2002) participants formed images or memories for the false event as compared to 29% of Loftus and Pickrell's (1995). This shows that doctored photographs constitute a powerful suggestive cue – one that may appear to be superior to narratives.

### **False Narratives Versus False Photographs**

Although Wade et al.'s (2002) results suggest that photographs may be more effective at promoting false memories than are narratives, such a conclusion requires a direct comparison of the two media. In order to do so, it is necessary to somehow equate the two suggestive media, which is exactly what Garry and Wade (2005) attempted. Using the hot-air balloon ride target event, the researchers gave half of their participants a narrative describing the event whereas the second half received a photograph depicting the event. At the conclusion of three interviews, approximately 32% of participants in the photograph condition were judged as having a memory for the event and approximately 18% formed images alone. In the narrative condition, approximately 40% of participants were judged as having a memory for the event and approximately 42% formed images alone. Garry and Wade (2005) originally reported their findings as a composite of images plus memories, which would suggest a larger difference in total false information

generated when comparing photographs to narratives (50% versus 82% respectively). Although a larger percentage of false memory formation occurred in the narrative condition as compared to the photograph condition, the difference (40% versus 32%) is not as practically meaningful. Nevertheless, it is striking that the percentage of imagery formation found in the narrative condition was double the percentage of imagery formation found in the photograph condition.

To explain the inconsistency of these findings with Wade et al.'s (2002) theoretical assertion that photographs trump narratives due to their vivid visual characteristics, Garry and Wade (2005) proposed that photographs impose constraints on the development of the type of fluent processing associated with remembering relative to narratives. The ambiguity of narratives allows individuals to generate their own details to flesh out their mental image for an event, whereas photographs limit the flexibility to freely imagine idiosyncratic details. Certain details depicted in the photograph may limit the recollection of other details, as well as the way in which the details depicted can be visualized, owing to the need to maintain consistency with the details as depicted in the photo. As such, photos may impose stronger limitations on finding matching information in memory, thereby increasing the likelihood that a false event will be rejected.

### **True Photographs as Assistive Cues**

However, deeming *all* photographs to be more memory-constraining as compared to narratives may be premature. As Strange et al (2005) point out, most individuals would not likely encounter a doctored photograph showing them engaging in something that they never did or being somewhere they had never been. Indeed, this may be why individuals continue to trust family photos, despite the awareness that doctoring is

possible. This raises the question, is it necessary to alter or otherwise falsify a photograph such that it depicts a specific target event in order for it to be an influential agent of false memory creation? After all, individuals sometimes turn to picture evidence for cues to help themselves remember - even in the absence of an exact photograph depicting the event to be remembered. Moreover, Lindsay et al (2004) observed that some memory recovery techniques encourage individuals to consult family photo albums to aid in recalling unremembered childhood events.

Lindsay et al. (2004) conducted a study to explore whether individuals would be more likely to endorse memory for a false event if they were shown a relevant picture to assist in their recall. In order to encourage participants to remember a false event, the authors employed the standard narrative paradigm described above with some modifications. First, the target false event was a childhood prank wherein participants allegedly got into trouble for having put a toy in their teacher's desk, which is arguably a more common (and likely more believable) event than is a hot air balloon ride. Second, participants were interviewed two times instead of three. Finally, all participants were presented with three narratives (two true and one false). However, one half of the participants also received a class photograph from the time period that the events were drawn from purportedly to help them remember. The results showed that 65.2% of participants in the narrative plus photograph condition were judged as having memories and 13% were judged as having images. Of those in the narrative alone condition, 22.7% were judged as having memories and 27% were judged as having images. Lindsay et al. (2004) argued the false narrative provides the suggestion whereas the photograph provides raw materials, that is, the visual details and images that can be pieced together to

form a false memory. Accordingly, not only can photographs operate as powerful facilitative devices, this study provides compelling evidence that they do not necessarily need to depict the target event to exert their influence in promoting false memories (Strange et al., 2005).

The idea that understanding information contained within a narrative can be enhanced by also presenting a photograph was first introduced by Bransford & Johnson (1972). In their study, they presented all participants with a story that was quite abstract and senseless, and half received a photograph to accompany the story. Those who heard only the story reported lower comprehension and remembered less of the story content. Those who received the accompanying photograph, on the other hand, reported higher comprehension ratings and remembered more of the story. The authors suggested that the photograph helped the participants create a context within which to comprehend the story. A necessary proviso is that in order to be helpful as comprehension aides, pictures must be relevant and related to the narrative, otherwise recall is curtailed (Harp & Mayer, 1997).

### **Common Factor: The Self**

Therefore, despite the debate regarding their relative superiority, narratives, true photographs and doctored photographs all have emerged as powerful retrieval cues (i.e. prompts used to induce the retrieval of memory) for inducing false memories. The manner in which these media have been employed in the literature thus far has been fairly consistent, thereby facilitating the above-mentioned comparisons between them in order to determine which results in the highest false memory formation rate. In all studies to date, constant factors include: 1) all participants being told that events (narratives and/or

photographs) were provided by the participants' parents; 2) the use of guided imagery to help promote remembering; 3) the normalization of forgetting, with the rationale that one has not thought of the events presented in a very long time; and relatedly, 4) the development of the expectation that memories can be retrieved (by virtue of the previous two points). The respective roles of these factors in false memory formation have been empirically demonstrated. Scoboria, Wysman, and Otgaar (2012) have highlighted the importance of source credibility as a critical component of false belief formation. Moreover, imagination and guided imagery are components of "repeated elicitation of the content" (Mazzoni & Kirsch, 2002), a processes routinely employed to facilitate "remembering" in the false memory literature. These strategies, when employed in combination with factors that increase autobiographical belief (prevalence information, forgetting rationale; Scoboria et al; 2006), augment the likelihood that false memories will be formed (e.g. Hyman & Pentland, 1996), and thereby constitute a "recipe" for false memory formation.

Although each type of suggestive medium is distinct from the others, a common factor among all three is the presence of some kind of self-relevant detail. In the literature to date, one key detail is the participant themselves, which is arguably the most influential self-relevant detail. There is consensus in the literature about the strong relationship between the self and autobiographical memory (Conway & Pleydell-Pearce, 2000). Moreover, the inherent self-referential nature of autobiographical memories is a key feature in distinguishing these types of memories from other types of memory and long-term knowledge stores (Brewer, 1986). In terms of the suggestive media used in false memory research to date, the subject is referenced when a false event is presented in

narrative form and when either photograph type is used, the subject is visually depicted therein.

### **Self-Relevant Details in Narratives**

The impact of self-relevant details within the false memory context was first investigated by Desjardins and Scoboria (2007). The authors considered the wide variability of false memory formation rates in the literature, and posited that in addition to the influence of event plausibility (Pezdek, Blandon-Gitlin & Gabbay, 2006), the widely varying number and type of details contained in narratives across studies likely played a role as well. Desjardins and Scoboria (2007) argued that in some studies, the narratives contained information idiosyncratic to the participant (e.g., the name of the participant's hometown, name of a family member), while in other studies, such self-relevant details were absent. They reported that studies which included self-relevant details tended to evidence higher false memory formation rates (about 70%) vs. lower memory rates (about 33%) in other false memory studies cited previously. Accordingly, Desjardins and Scoboria (2007) hypothesized that the presence of self-relevant details influence false memory formation.

To examine this hypothesis, Desjardins and Scoboria (2007) employed Garry and Wade's (2005) methodology, and Lindsay et al.'s (2004) false narrative. The latter was tailored to vary the inclusion of self-relevant details ("your friend Suzy", versus "a friend"), specific details (defined as "elements of the narrative that could be removed without altering the general script;" which included "revolting slime toy" versus "a toy"), both, or neither. They found that the inclusion of self-relevant information produced higher rates of memories or memory-like images (68.2%) as compared to suggestions that

did not include such information (36.4%). 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.

A possible explanation for these findings is that self-relevant details serve to promote fluency of processing, a concept related to Jacoby and Dallas' (1981) attributional view of memory and later elaborated by Whittlesea's (1993) fluency attribution hypothesis. According to this view, fluent (i.e. rapid) processing of stimuli is misinterpreted as familiarity that indicates having experienced said stimulus in the past. This theory was later modified to posit that it is *surprising* fluency of processing that elicits feelings of familiarity. These feelings result from a discrepancy between expected versus experienced processing fluency (discrepancy attribution hypothesis; Whittlesea & Williams, 1998). Therefore, by promoting feelings of familiarity which become misattributed to the false event, self-relevant details may facilitate the endorsement of the false event. The absence of self-relevant details provides sufficient latitude for individuals to elaborate on the stimulus provided. However, given that fluency of processing is less likely to occur under such conditions, research to date suggests that false memory formation rates are comparatively not as high (Desjardins & Scoboria, 2007).

### **Self-Relevant Details in Photographs**

Hessen-Kayfitz and Scoboria (2012) extended the work by Desjardins and Scoboria (2007) by exploring the effects of fluency promoting and fluency inhibiting details on memories when presented in doctored photographs. Employing the same general method, a doctored photograph was created to include fluency-promoting details,



fluency-impeding details, both, or neither. The goal was to determine which combination of photographic details created an optimal environment to foster false memory formation

In the study, parents of participants provided childhood photographs, and one photograph was used to create an image of the participant posing in a hot air balloon with one of their parents. The image of the hot air balloon was held constant, and fluency promotion was manipulated by either clearly showing the participant and their parent (a fluency promoting detail) or by obscuring them from view using a lens-flare effect. Fluency impediment was manipulated by either having a neutral background or a background with a lighthouse among some shrubs (an impeding detail). The results revealed that including fluency promoting details, while omitting fluency impeding details (e.g. clear view of participant and parent while omitting the lighthouse in the background), created a more optimal environment for false memory formation, in that the highest subjective memory ratings were found in this condition. Fluency-promotion alone showed no direct influence on memories by way of main effects, in contrast to Desjardins and Scoboria's (2007) findings as outlined above.

Hessen-Kayfitz and Scoboria (2012) proposed that that details presented in photographs are more conspicuous (as compared to narratives), and thus harder to dismiss or attenuate when trying to remember an event. Accordingly, fluency promoting details may have a *lesser* effect when presented in a photographic medium than in a narrative medium. For example, when a person hears “[you] and [your mother] in a hot air balloon”, [your mother], being a self-relevant detail, is fluency promoting, and they can imagine their mother in many different ways. When shown a picture of themselves and their mother in a hot air balloon, the picture of the mother may be taken from an angle

that is unfamiliar, or the mother may be dressed in a way that is not familiar to the individual. Thus, the photographically depicted fluency-promoting detail loses some of its power in that it restricts what is searched for in memory to the specific details depicted (e.g. memories of “mom with that particular haircut, wearing that outfit,” as opposed to just “mom”).

### **Metacognitive Operations Governing Acceptance and Rejection of Events**

The idea that a fluency promoting detail is less powerful when presented in photograph versus narrative form may be more of a contextual artifact than a feature of the detail itself. That is to say, doctored photographs and false narratives both imply a very specific context in which the fluency promoting detail is presented (i.e. the event occurred as described and should thus be remembered in this manner). False narratives, however, allow more room for cognitive maneuvering where the details are concerned than do doctored photographs. In doing so, false narratives permit more contextual flexibility such that fluency promoting details can exert greater power. The individual trying to recall the event is thus afforded greater latitude to use those fluency promoting details as a springboard to generating additional fluency promoting details with which to generate a mental product suitable enough to be labeled as a memory. The doctored photographs used in studies to date, on the other hand, provide a visual representation of the suggested event. If the photograph is intended to be accepted as an accurate representation of the event - which it is - then the implied expectation is that the event should be remembered as depicted, and that each detail of the photograph should be remembered as depicted. If any memory that happens to be elicited in response to the photo cue fails to meet these strict exclusion criteria, the event is less likely to be

accepted as true. Put another way, the threshold for event acceptance is higher such that the end result is an inability to make a decision about the occurrence of the event (i.e. neither acceptance nor rejection).

### **Metacognitive Beliefs**

Judgments about the past occurrence of an event involve a complex metacognitive decision-making process which Mazzoni and Kirsch (2002) proposed is comprised of two factors: 1) information available about the event at the moment of making a decision about its occurrence; and 2) metacognitive beliefs that individuals hold regarding memory. Considering the first factor using the hot air balloon ride event, examples of information held by individuals include knowledge of having gone to amusement parks as a child, having gone on scary rides, having been with their parents during activities done when young, and the like. Referencing the second factor, individuals hold certain beliefs about memory, such as that memories fade over time (Cornoldi, 1998), that it is not possible to remember events that occurred very early in life, that events experienced in life are encoded and stored somewhere in memory, that encoded information can be retrieved with some effort, and that memory retrieval can be assisted with cues.

Mazzoni and Kirsch (2002) contend that determining whether an event occurred involves attempting to generate a mental representation, which is then evaluated according to one's metacognitive beliefs about the qualitative aspects of memories (i.e. contextual, semantic, affective, perceptual, and information about cognitive operations; Johnson, Hashtroudi, and Lindsay, 1993). They also include less specific qualities such as familiarity and specificity (Johnson, Raye, Mitchell, & Ankdowich, 2011). The degree to which the mental product measures up to these criteria determines whether or not it

will be deemed to be a memory. The threshold for this judgment process is flexible, which is advantageous as it allows for the retrieval of memories encoded at various levels of quality and specificity. If the criteria were rigid, many memories would be lost to us given that attempts to remember them could never satisfy very strict threshold criteria. However, a byproduct of this flexibility is the probability of false memories occurring, as will be discussed in greater depth below.

The discussion above concerns processes that occur when some kind of event-consistent mental product is generated. Mazzoni and Kirsch (2002) propose that when an adequate mental product cannot be generated, people must decide whether the absence of memory is diagnostic of the event not having occurred (Strack & Bless, 1994). This occurs via inference, and is based on at least three metacognitive beliefs; 1) the more time that has elapsed between encoding and retrieval increases the likelihood of forgetting, so not having a sufficiently good mental product in such a case would not be diagnostic of non-occurrence; 2) events that occurred early in life (i.e. before the offset of childhood amnesia) also are likely to be forgotten; and 3) the more distinctive the event, the more likely it is to be remembered, whereas less distinctive events are less likely to be remembered. Therefore, not remembering an event that is deemed to be rare or unusual in some way may suggest that the event did not actually occur.

Mazzoni and Kirsch (2002) contend that if lack of memory is considered to be diagnostic of the event not having occurred, then the decision that the event did not occur can be made without needing to consider any further information. If, on the other hand, lack of memory is not diagnostic of non-occurrence, the decision about whether or not the event occurred must take into consideration other information. This process involves the

evaluation of any additional available information, such as information that has been provided to aid in decision making (i.e. information provided by an experimenter in a study or by a family member).

Thus, new information can alter both the way in which an event is remembered, as well as impact the final decision regarding event occurrence - a key step in the creation of false autobiographical beliefs (Mazzoni & Kirsch, 2002; Scoboria, Mazzoni, Kirsch & Relyea, 2004). In the case of infrequent events (e.g. hot air balloon rides), individuals might judge the event as having a low likelihood of being true. However, increasing the perception of the plausibility of an event (e.g., through the provision of prevalence information; Mazzoni, Loftus & Kirsch, 2001; Scoboria et al. 2006) also should increase belief in the event having occurred, as has been empirically demonstrated (see Mazzoni & Kirsch, 2002 for a review).

### **Autobiographical Beliefs**

Once a false autobiographical belief has been created, Mazzoni and Kirsch propose that proceeding to the development of a false memory involves two factors acting in concert: 1) changes in the threshold criterion according to which mental products are evaluated as to the degree to which they constitute a memory, and 2) the development of higher quality mental products related to the target event. Both factors are critical in producing a decision that one remembers an event. The key role that beliefs play is that they influence the threshold criterion. As noted above, this threshold is flexible and can be reduced if belief in the event is increased. This reduction in the threshold enhances the likelihood that mental products will be deemed as good enough to constitute memories. Enhancing the quality of mental products can be accomplished via “repeated elicitation of

the content” (Mazzoni & Kirsch, 2002) which occurs during imagination, context-reinstatement, and guided imagery - all processes routinely employed to facilitate “remembering” in the false memory literature. These methods, when employed in combination with factors that increase belief (prevalence information, forgetting rationale; Scoboria et al; 2006), augment the likelihood that false memories will be formed (e.g. Hyman & Pentland, 1996).

To return to the findings of Hessen-Kayfitz and Scoboria (2012), the vivid and specific retrieval cue presented (i.e. the doctored photograph containing the fluency-promoting details) may have created a highly stringent criterion against which to compare the mental products generated in response to it. In other words, the threshold for event acceptance was made to be higher by this particular photograph. The fluency-promoting details in this case are less powerful as they limit the ability to freely imagine an event and enhance the quality of the mental product generated in response to the cue. As such, according to the Mazzoni and Kirsch (2002) model, the provision of information (i.e. that photographs were provided by parents, the rationale normalizing the forgetting of childhood events, and the like) may have sufficiently raised belief such that the event was not rejected. However, the two factors that might translate elevated false belief into false memory (decreasing threshold criterion and/or developing higher quality mental products) may not have occurred optimally.

### **Metacognitive Monitoring Processes and The Self**

Overall, the process of accessing, retrieving and evaluating information obtained from an autobiographical memory search depends on a series of metacognitive monitoring processes. These processes have been studied extensively in the literature

(e.g. Burgess & Shallice 1996; Koriat, Goldsmith & Pansky, 2000; Johnson et al., 1993; Johnson et al., 2011).

Additionally, as mentioned above, the importance of the relationship between autobiographical memory and the self is endorsed by a number of researchers in the area of autobiographical memory. Two theories that encompass both concepts (metacognitive monitoring processes and the self) in relation to one another are self-schema theory (Conway & Pleydell-Pearce, 2000) and source monitoring theory (Johnson, Hashtroudi & Lindsay, 1993). Each theory, as well as the idiosyncratic ways in which retrieval cues contribute to false memory formation, within each, will be discussed in turn.

### **Self-Schema Theory**

Conway and Pleydell-Pearce's (2000) self-schema theory is a model adapted from the work of Markus and Ruvolo (1989) and Markus and Nurius (1986), which introduces the concept of a self-memory system (SMS) in which autobiographical memory is constructed. The SMS is comprised of an autobiographical knowledge base (a multilevel store of information about the self; see below for further detail) as well as the working self concept. Referencing the latter, the authors propose that long-term memory representations of different aspects of the "self" form into sets of self-schemas. Only a subset of these schemas are active at any given time. Currently active schemas comprise the working self, which is a constantly changing view of the self and what it may become. Conway and Pleydell-Pearce (2000) reference Higgins' (1987) theory of the self which posits that there are three domains of the self: 1) the actual self (representations of attributes that one actually possesses); 2) the ideal self (representations of attributes one would like to possess); and 3) the ought-self (representations of attributes one thinks one

should possess). Discrepancies between these three dimensions of the self give rise to negative emotional experiences. Higgins (1987) emphasized that memories which suggest discrepancies between the actual self and the ought and ideal selves are the most affect-laden, and are accompanied motivation to reduce this negative affect. The central goal of the working self is to reduce discrepancies, and thus plays a critical role in the encoding of autobiographical knowledge and the construction of memories during remembering. The cues representing the innocuous false events employed in the literature do not contribute to the same intense and destabilizing affective states associated with more fundamental discrepancies (e.g. discrepant morals and values). However, the features of self-discrepancy theory espoused by the SMS suggest that a sufficient degree of intrapersonal tension and discomfort is triggered when an individual is presented with a cue suggestive of an autobiographical event that they do not immediately remember. This negative affect, in turn, gives rise to a motivation to reduce the discrepancy.

The discrepancy-reducing goal of the working self functions as a negative feedback mechanism, complete with an input, a standard for comparison, and output (Austin & Vancouver, 1996). If a discrepancy is detected between the input and the standard, the output is modified accordingly so as to reduce this discrepancy and associated negative feelings. Two ways in which this modification is accomplished are attempts at justification (labeling the input 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 input is outweighed). 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 goals of the working self are posited to play a key role in regulating cognitive stability. They are also integral in both the encoding and the retrieval of autobiographical knowledge, which is classified into three broad levels in Conway's model: lifetime periods, general events (which are further divided into repeated events and specific events), and event-specific knowledge (ESK; see Fig. 1).

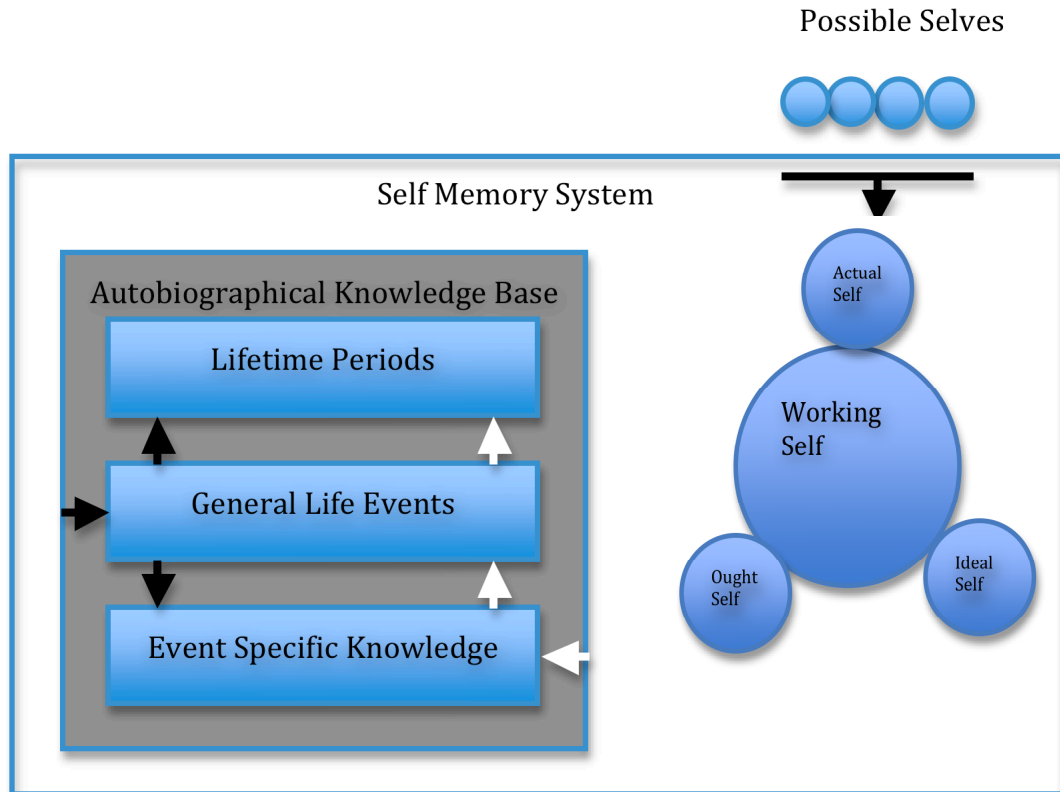
These knowledge levels are organized in a hierarchical fashion (Barsalou, 1988). For example, various details within ESK (i.e. wedding dress, reciting vows, signing a marriage license) are organized as part of a specific general event (i.e. wedding day), which is in turn part of a lifetime period (e.g. graduate school versus entry into professional life). When a stable pattern of activation occurs across each of these autobiographical knowledge areas, this is termed an autobiographical memory. The three levels of autobiographical knowledge moderate the construction of autobiographical memories. These levels limit which area of the knowledge base a given cue can access. Central control processes that moderate access to and output from the autobiographical knowledge base also limit autobiographical memory construction. This is done in accordance with the working self concept's goal of maintaining cognitive consonance. In order to do so, the working self acts as a "gate keeper" of sorts by dictating the generation of memory retrieval models with specific parameters which either facilitate or impede access to the autobiographical knowledge base. So, for example, if an externally-presented retrieval cue is dissonant with current goals of the self (i.e. does not "fit" into the memory repertoire of an individual) then the retrieval model generated will impede

access to the autobiographical knowledge base, and the likelihood of the successful retrieval of an autobiographical memory product is decreased.

Conway and Pleydell-Pearce (2000) originally conceptualized the Self-Memory System (SMS) as being comprised of the autobiographical memory base and the working self concept. The theory was later modified to include an integrated “long term self”, which includes the autobiographical knowledge base and the “conceptual self” (Conway, Singer & Tagini, 2004). The latter can be thought of as a collection of abstract versions of the self in the context of different episodic experiences, as well as versions of possible selves (ostensibly influenced by personal desires for the self as well as societal influences on what the self should be). Despite this adjustment to the SMS, the basic components are nevertheless the same. Namely, the working self (a currently active subset of self-schemas) initiates a retrieval model to access the autobiographical knowledge base (which is now housed in the new “long term self”), doing so according to a set of goals, the most prominent of which is to reduce discrepancies between the possible selves (which is a component of the new “conceptual self”).

As such, the SMS can be conceptualized as a central control centre which generates patterns of activation which represent specific memories, either through generative or direct retrieval (Conway, 1996). The first search strategy (generative retrieval) consists of a iterative three stage process as follows: 1) elaboration of a memory search cue and the establishment of verification criteria; 2) matching the cue to patterns of activation in the autobiographical knowledge base (i.e. memories); and 3) accessed memories are compared to the verification criteria wherein only knowledge that is not prohibited by working self goals remains. This process can occur in cycles until the

Figure 1. Schematic Representation of Self-Memory System (Conway & Pleydell-Pearce, 2000)



verification criteria are satisfied, and can be conceptualized as a discrepancy-reducing negative feedback loop (Conway & Pleydell-Pearce, 2000). The verification criteria thus serve as a metacognitive monitoring process that evaluates the retrieval products to ensure that the requisite threshold has been met in order to deem the product to be a memory.

This elaborate retrieval process can be by-passed if a cue is sufficient to elicit a stable pattern of activation in the autobiographical knowledge base at the level of ESK (see white arrow, Fig. 1). The stable pattern of activation suggests congruence with the autobiographical knowledge base. As such, the working self concept does not need to engage in the discrepancy-reducing cue-elaboration phase of generated retrieval, and a less onerous direct search strategy can be employed instead. According to Conway and Pleydell-Pearce (2000), ESK is most strongly associated with imagery. Moreover, its activation may trigger auto-noetic consciousness (a sense of recollectively experiencing the past or “mental time travel”) which is a key component in episodic remembering (Tulving, 1983) and gives the individual that sense of rapidly activated information about the qualitative characteristics of a retrieval product. According to this logic then, if such a highly specific cue designed to access the autobiographical knowledge base and elicit an activation pattern at its most detailed level (i.e. ESK) fails to induce imagery or auto-noetic processing where such induction is clearly expected, then it stands to reason that such a failure results in the termination of the retrieval process and the memory search is deemed to have failed. In other words, cues designed to access ESK are held to the highest congruence standard: either a stable pattern of activation must occur, or the working self-concept “gate keeper” prohibits access to the autobiographical knowledge

base. Moreover, the formation of an activation pattern in the first place is quite tenuous, depends on the specificity of the cue, and how that cue is processed with reference to its ability to activate ESK (Conway and Pleydell-Pearce, 2000).

Given the framework of the SMS model and its retrieval processes, what constitutes the “ideal” retrieval cue? Although cues that tap into the autobiographical knowledge base at the level of ESK may seem like optimal choices for retrieving a memory, Conway (1996) states that general events are actually the preferred level of entry into the knowledge base when attempting to bring about recall of an event. Entry at this level has the advantage of allowing the individual to access a collection of candidate general events rather than be limited to one. Moreover, although individuals have “fast access” to lifetime period and general event knowledge (Burgess & Shallice, 2000), when individuals are given a retrieval cue and prompted to retrieve a memory, the retrieval model generated by the working self is such that initial retrieval attempts are made at the level of general event knowledge (see black arrow, Fig. 1).

Conversely, cues that are designed to access autobiographical knowledge at the level of ESK limit the individual in that spreading activation moves from that specific point in ESK and activates a single general event and then a single lifetime period. For example, when attempting to cue an individual to retrieve a memory of taking a hot air balloon ride at an amusement park at the age of six, a cue at the ESK level might be to show a picture of the specific hot air balloon, which then may activate the single general event (going on a hot air balloon ride) situated within a single lifetime period (six years of age). This works well if the specific ESK cue hits the mark, as a stable activation pattern will be established that will then be linked into the working self goal structure and result

in a memory (Conway & Pleydell-Pearce, 2000). But if the specific ESK cue fails to activate knowledge at that level and must attempt to activate knowledge at the next level in the hierarchy (specific general event of going to that particular amusement park and taking a hot air balloon ride), the spread of activation may be too diffuse to generate a stable and focused enough pattern of autobiographical knowledge activation that can be deemed to constitute a memory (Conway & Pleydell-Pearce, 2000).

A cue at the general event knowledge level, on the other hand, might be a picture of a non-specific amusement park, which will purportedly activate a collection of general events (various trips to amusement parks). Given the relative ambiguity of this cue (as compared to an ESK-level cue), the retrieval strategy employed will be generative retrieval, which as described above results in the iterative generation of retrieval products until the verification criteria are satisfied and the requisite threshold has been met in order to deem the product to be a memory. In sum, it is the nature of the cue provided that dictates the type of retrieval model generated. It is here that errors may occur via the intentional provision of misleading or entirely false retrieval cues, which in turn can result in false memory formation. Exactly how this occurs will be discussed in detail, following the review of the second key theory.

### **Source Monitoring Framework**

Johnson, Hashtroudi, and Lindsay's (1993) Source Monitoring Theory (SMF) conceptualizes memory as being a result of the cognitive processes that comprise our daily experiences (Lindsay, 2008). The very process of encoding an experience is filtered by our perceptions, attitudes, and interpretations of the situation. This view suggests that memories result from both perceptual and reflective processes, and that a combination of

flexible decision criteria and judgment processes at retrieval, coupled with the qualities of the mental representation, determine whether or not a memory will be accurately attributed to its origin or not. The meaning of the information, the physical surroundings, the emotions at the time, are all included in this memory by-product which can be used to provide cues about the source of the information. Thinking about experiences reactivates them according to the same attitudes and expectations present at encoding. Thus, memories are a combination of actual experience as well as imagery, fantasy and inference (Bransford & Johnson, 1973).

According to SMF, remembering is inferential: It involves processes through which attributions are made about the origins of mental experiences. Mental components such as images, emotions, perceptions, and thoughts are attributed to a source (Johnson, Hashtroudi & Lindsay, 1993). This source attribution is aided by a variety of cues, such as environmental cues or qualitative and quantitative cues from memory (Nash, Wade, & Lindsay, 2009). Cues are critical in that they have the capacity to revive many different features of a previously experienced event. Some may evoke a great deal of emotion whereas others may evoke more perceptual information. Which specific features a cue evokes depends on various factors. One such factor is the very nature of the cue itself, according to the principle of Transfer Appropriate Processing (or Encoding Specificity; Tulving & Thompson, 1973), which posits that the best retrieval cues are ones that match the conditions present at encoding. According to the source monitoring framework, various perceptual features of events (e.g. visual, auditory) are processed by different neural networks in the brain, which are then consolidated into an integrated memory representation. This process is called *binding* and is critical to the formation of

autobiographical memory (Newcombe, Lloyd & Ratliff, 2007). Binding, in turn, is key to the auto-noetic (i.e. mental time travel, or the ability to mentally place ourselves in the past) quality of remembering described above. The stronger the binding of event fragments, the more likely it is that a large number of these fragments will be retrieved, such that the event will be re-experienced as vivid and coherent memory in response to a cue. Retrieving a personally-experienced event from memory is thought to elicit auto-noetic consciousness (i.e. as if one has traveled back in time and can reflect upon their experience). A cue may trigger a particular feature of a past event, although the extent to which the entire event (i.e. a collection of composite features) is revived as a concrete memory depends on how well the constituent features have been bound together. Reflecting on a newly experienced event (i.e. engaging in elaborative encoding) strengthens binding and consolidates the memory for that event (Wixted, 2004). Moreover, SMF posits that the act of memory retrieval itself results in memory traces of that instance of retrieval - a kind of "meta-remembering." Memory cues, however, rarely serve to retrieve a single event memory but rather a whole multitude of events that share features/episodic information triggered by (or related to) the cue that retrieved them (Lindsay, 2008). Furthermore, abstract knowledge, expectations, scripts and schemas are also evoked. These multiple episodes combine with general knowledge in order to pinpoint the specific memorial information that is sought. This enhances the efficiency of the system, because if the only way that a specific memory could be retrieved is by providing a specific cue, there would be no point of retrieval because the cue itself would constitute the sought after memory (Lindsay, 2008).

Once a memory is retrieved, the next task is to evaluate its source. The source



monitoring framework addresses the process by which individuals discriminate memories of externally generated information (i.e. perceived events) versus internally generated information (i.e. imagined events). Overall, monitoring of source is the result of evaluative processes by which the various characteristics of a mental experience are weighed and attributed to a specific origin, or source. The most important characteristics used in attributing source of memories include perceptual (sensory) information, contextual (place and time) information, semantic detail, affective information, and cognitive operations (the experience of organizing, elaborating, retrieving and identifying a given memory) that occur during encoding.

According to Johnson, Hashtroudi, and Lindsay (1993), mental experiences differ on several clearly defined dimensions. Namely, memories that originate from external experiences contain richer perceptual detail, more contextual detail, more semantic detail, and more affective detail. Conversely, memories that originate from imagination and from thinking about the perceived event contain more details about the cognitive processes that took place to generate them (i.e. thinking about thinking about the memory). The metacognitive evaluation processes that occur when judging the source of a memory take advantage of these inherent differences.

Source monitoring can occur in a heuristic manner (i.e. takes place quite rapidly and non-deliberatively) based on the characteristics of the mental experiences that are activated (Johnson et al., 1993). If the characteristics are consistent with those of true perceptual experiences, the mental experience will be judged to be a memory. Source monitoring can also involve slower, systematic (conscious) reasoning processes, which involve metacognitive beliefs about memory and can dictate retrieval of subsequent

material from memory with which to verify the source of the original mental representation. For example, a vivid memory of flying unaided is likely to be attributed as being a fantasy rather than a true recollection of a past experience, on account of knowledge that flying is impossible (Lindsay, 2008) Research has shown that individuals hold sets of beliefs about memory from a very early age (Cornoldi, Gobbo & Mazzoni, 1990), which include beliefs that information encoded and stored in memory can be retrieved and that this retrieval takes effort but that it can be assisted with the provision of retrieval cues (Mazzoni & Kirsch, 2002).

Which judgment process is activated is largely a factor of retrieval context and cues provided, cost of error, and amount of distraction at the time of encoding (Johnson, 1993). In informal contexts where memory accuracy is not paramount, judgment processes and evaluative criteria will be lower. Additionally, situations where one either already believes or wants to believe that the event occurred will yield more liberal judgment criteria. It is under these circumstances that the risk for source monitoring errors is high. If motivation to remember an event is high, the liberal judgment criteria can result in the conclusion that something was experienced, when in fact it may only have been imagined. As Conway (2005) put it when discussing his work with confabulating frontal lobe patients, “experiencing one’s fantasies as memories is clearly maladaptive, but it may nonetheless constitute an effective strategy for maintaining coherence.” That is to say, if there is a motivation to remember something as being a true memory rather than the product of imagination, source monitoring errors can be a useful tool employed by the working self to maintain coherence.

Both processes serve to verify each other to ensure accurate remembering and

source attribution. They also require setting criteria for making judgments and then for comparing retrieval products with these criteria (Lindsay, 2008). Each process will have its own sets of criteria. For example, according to the more rapid heuristic processes, the criteria for judging a retrieval product to be a memory for a real event (versus an imagined one) may be that it has to contain more perceptual, contextual, semantic, or affective information, rather than information on cognitive operations. Additionally, each type of information may be assigned a weight that is used to determine source. For example, perceptual information may be assigned a higher weight for a recent event versus a more temporally distant event (Lindsay, 2008). The more systematic controlled processes, on the other hand, may involve judgment criteria that consider (and delimit) the degree of inconsistency that a retrieval product can have with what is known (Johnson, Hashtroudi & Lindsay, 1993). Put another way, episodic information that results from retrieval processes must be sufficiently consistent with information contained in an individual's autobiographical knowledge base in order for the source to be deemed to be an actually experienced event. Finally, in addition to the qualitative characteristics of the images generated by a retrieval cue, individuals may use the degree to which a mental experience is familiar to them - the greater degree of familiarity and ease with which a mental experience comes to mind (i.e. fluency of processing) is seen as consistent with a real memory (Nash, Wade & Brewer, 2009).

### **Summary and Common Factors**

Conway and Pleydell-Pearce (2000) propose a self memory system in which the autobiographical knowledge base is reciprocally engaged with the working self such that, when activated, an autobiographical memory is constructed. A key concept in this system

is the initial cue - the stimulus that serves as the initial prompt to commence the retrieval process - as this is the piece of information on which all subsequent elaboration and verification is based. Johnson, Hashtroudi, and Lindsay (1993) propose a framework, which suggests that remembering is based on an inferential process wherein mental products are attributed to a particular source based on key qualitative characteristics. This typically occurs automatically, although more systematic process exists for instances where the heuristic processes fail to satisfactorily label a source.

These two models share some important similarities in terms of how they conceptualize memory retrieval. First, both models encompass two pathways of retrieval, one that is more direct and rapid whereas the other is more analytic, deliberate and systematic. With reference to the latter (slower, more deliberate) retrieval process, both the Self-Memory System (SMS) and the Source Monitoring Framework (SMF) endorse the use of criteria according to which retrieval products are evaluated. In terms of SMF, the criteria are based on key memory characteristics (i.e. perceptual, semantic, contextual, affective, or cognitive-operational information) and serve to aide in evaluating the source of the mental product. This evaluation stage is impacted by motivation. If one is motivated to conclude that something is a memory, the evaluation criteria may be relaxed to maximize the possibility of such a conclusion. This is done to maximize coherence – a central goal of the working self. In terms of SMS, these criteria are generated based on information held in the autobiographical knowledge base, and serve to ensure that retrieval products are not dissonant with the goals of the working self. Additionally, there are general criteria as to what mental states are representative of a real memory (e.g. imagery rich in sensory perceptual properties), a concept similar to SMF as described

above.

Finally, both models underscore the importance of retrieval cues. According to SMS, cues to general events are actually the preferred level of entry into the knowledge base (Conway, 1996) when attempting to bring about recall of an event. In fact, when individuals are given a retrieval cue and prompted to retrieve a memory, the initial retrieval attempts are made at the level of general event knowledge because it is this level that allows the remembered to access a large amount of autobiographical data. Cues that are designed to access autobiographical knowledge at the level of ESK limit the individual to a single general event, thereby narrowing the breadth of the memory search. In terms of SMF, cues that are sufficiently general to invoke activation of memory information from a multitude of different episodes that share common features with the cue are ideal. When an event is encoded, many aspects and features of that event are bound together (and are further related to similar events). A general enough cue will allow not only features similar to the cue to be activated, but will also allow related features to be activated, thereby increasing the likelihood that the sought-after event will be retrieved.

Although they share some important similarities, a key distinction between SMS and SMF is that the latter does not propose a unique theory of basic memory processes, nor does it explicitly note the construct of the working self. Indeed, by design SMF has little to say about the nature of basic memory processes such as encoding, storage and retrieval mechanisms. The framework emphasizes metacognitive appraisal of the origins of information that is retrieved from memory, however it comes to be there. However, the framework is based on established assumptions about the mechanisms that contribute to

source judgments, and does acknowledge that the self is amongst many factors that shape these judgments, which are adopted into its explanations for how and under what circumstances these mechanisms fail. It is to these memory failures, from the perspectives of both theoretical frameworks, which we will turn to next.

### **Implications for False Memory Formation**

Despite what appears to be an elaborate and autobiographically-grounded memory retrieval process, the system is not fool-proof and errors do happen. As referenced above, the downside of the flexibility of the threshold for making decisions about whether a mental representation constitutes an autobiographical memory is that it creates a margin of imprecision (Mazzoni & Kirsch, 2002). Factors that lower the threshold (e.g. increased belief in the occurrence of the event) combined with those that enhance the quality of mental products generated in response to a cue (e.g. imagination, context-reinstatement, guided imagery) can contribute to false memory formation. For example, if an individual experiences fluency at the time of recall and is able to generate a rich and vivid mental representation in the absence of information that suggests the representation originates in a non-memorial source, the likelihood that this product will satisfy the threshold criterion for being labeled as a memory increases. It is in these instances that false memories can occur. However, given the flexibility of the threshold criterion, it is possible to develop a false memory even in the absence of a rich mental representation, providing that the threshold is lowered in other ways. Metacognitive beliefs play a major role in influencing this threshold. This is the reason that we are able to remember events that occurred a long time ago (and thus expect to be faded and less vivid than more recent memories), but it is also the conduit for false memory formation.

Hyman and Kleinknecht (1999) posited the following three-stage process according to which false memories can be formed: 1) Individuals must deem the event to be plausible; 2) individuals must be able to generate an image or a narrative of the event; and 3) individuals must misattribute these images/narratives as being memories (i.e. commit source monitoring errors). The Mazzoni and Kirsch model (2002) and the Nested Model (Scoboria, Mazzoni, Kirsch & Relyea, 2004) both posit an additional stage of autobiographical belief generation preceding the imagery generation stage. That is to say, before individuals seek to generate event-specific imagery, they must first come to believe with sufficient conviction that the event constitutes part of their autobiographical past. According to this model, plausibility, belief, and memory are independent constructs and are nested such that memory implies belief, which implies plausibility but not the other way around. Although manipulations that increase belief may have no direct impact on affecting memory ratings, this increase in belief plays an important role in lowering the threshold for the evaluation of mental products that are constructed in response to cues. Simply providing individuals with prevalence information has been found to increase event plausibility ratings, while adding a rationale for why an event may be forgotten has been found to increase autobiographical belief ratings (Scoboria, Lynn, Hessen & Fisico, 2008). Although increasing plausibility has been found to influence belief ratings, and increasing both these constructs is necessary for influencing memory ratings, increasing these constructs alone is not sufficient to produce false memories (Scoboria, Mazzoni, Kirsch, and Relyea, 2004).

The fluency with which mental products are generated is a key aspect in the subjective experience of memory (Kelley & Jacoby, 1996). One way of increasing

fluency is through imagination of an event, which has been demonstrated to increase individuals' likelihood judgments that events occurred in the past (Garry, Manning, Loftus & Sherman, 1996; Garry & Polaschek, 2000), as well their memories for the event (Mazzoni & Memon, 2003). This phenomenon is termed imagination inflation and may occur irrespective of event plausibility (Sharman & Scoboria, 2009). Counterfactual thinking (i.e. imagining alternatives to reality) both about the past and the future, has also been found to inflate estimates about the likelihood that an event has occurred or will occur (Garry et al, 1996). Moreover, Goff and Roediger (1996) demonstrated that the more frequently an event is imagined, the more likely it is to be incorrectly judged to have actually taken place. In terms of SMF, false memories can occur when mental experiences from one source are misattributed to a different (inaccurate) source (Lindsay & Johnson, 2000). In terms of the SMS, false memories can occur via the repeated, cyclical remembering process that occurs during generative retrieval. Specifically, the cue elaboration phase can fail such that a cue for the generation of a memory for a false event (e.g. doctored photograph) can recombine with candidate mental products generated in response to that cue. The resulting output becomes progressively distorted such that final retrieval product (a collage of candidate mental products intermingled with the misleading cue) can be deemed to "match" the verification criteria generated at the start of the search, thereby resulting in a false memory.

It appears, then, that false memory formation may be the result of a misleading retrieval cue in combination with elaborative processing that results in a mental product that is mistaken as a memory. The fluency with which this mental product is generated enhances the likelihood of such a mistake being made. A key factor in promoting fluency



of processing (and by extension, false memory formation) has been the presence of self-relevant details in suggested events - most commonly, information about or images of the subject themselves. This has been demonstrated when using false narratives as the suggestive medium (Desjardins & Scoboria, 2007). However, when using photographs (either doctored or true) as a suggestive medium, the relative strength of the self as a fluency promoting retrieval cue is less clear. A review of the literature through the lens of the two theories outlined above may serve to refine the understanding of the memory formation mechanisms therein, and to subsequently clarify the steps in order to deepen that understanding.

To review, narratives, true photographs and doctored photographs have each emerged as powerful retrieval cues for inducing false memories, with some debate about their relative superiority. Although each type of suggestive cue is distinct, the presence of some kind of fluency promoting detail unites them. In the literature to date, a frequently used fluency promoting factor has been the presence of one or more self-relevant details. As above, the primary purpose of the present research is to investigate the evidently variable influence of fluency-promoting details in doctored and true photographs as one of the factors in either facilitating or limiting false memory formation.

Of the three suggestive media used to date (false narratives, false photograph, and true photographs), false narratives offer the fewest restrictions on ease with which mental products can be generated. Looking at false narratives and false photographs specifically, those in Garry and Wade's (2005) narrative condition generated a considerably large amount of imagery by the first encounter with the stimulus, which came to be judged by a sizeable proportion as memory by the participants in the third interview. This was

reflected in the fact that the percentage of memories approximately quadrupled from the first to third interview in the narrative condition, whereas it only doubled for those in the photograph condition. A possible explanation is that although the photograph provides very rich perceptual details, it also constrains key aspects of processing (i.e. via the implication that the event occurred exactly as depicted and thus should be remembered that way). The result is an attenuation of the total amount and/or quality of images formed, thereby lowering the overall percentage of 'memory' formed. Put another way, when individuals first encountered the photograph, they struggled to generate a mental representation. Upon continued exposure, their ability to form a mental representation increased given the vivid visual characteristic of the stimulus. However, the overall image generation was impeded in the face of the rigid cue. Those in the narrative condition formed a larger albeit less focused mental representation, and by re-encountering the narrative during the interviews appeared to judge this imagery threshold as sufficient to be labeled a memory.

Conceptualizing these findings from the SMS perspective, the doctored photograph cue is at the level of event-specific knowledge (ESK). It represents a highly vivid and specific cue, thereby restricting spreading activation to only one single life event (or one episode) from one single life period. Because the false event did not occur, the cue will fail to activate knowledge at the ESK level and will attempt to activate at the general event knowledge level. The resulting pattern of autobiographical knowledge activation will be too diffuse to be readily considered a memory (Conway & Pleydell-Pearce, 2000), hence the lesser degree of false memory formation in Garry and Wade's (2005) photograph condition. Moreover, the doctored photograph is a cue that may favour

the direct retrieval mechanism because it implies that the event occurred exactly as depicted (and thus must be remembered so). As such, the threshold criterion against which constructed mental products are compared is raised. When fluent generation of imagery consistent with the event does not occur, this may be deemed diagnostic of the event not having happened (Mazzoni & Kirsch model, 2002).

The narrative is also a highly specific cue. However, due to its relatively less constraining nature, it activates autobiographical knowledge at the general event level, and thus enhances spreading activation such that a larger amount of events are activated. Also, given its relative ambiguity, a generative retrieval process is employed which, as described above, consists of an iterative three stage process including retrieval cue elaboration and establishment of verification criteria, matching the elaborated cue to activated memories, which are then compared to the verification criteria. As this cycle continues across iterations, the narrative lends itself better to the modification and distortion, which likely occurs based on the discrepancy-reducing goal of the working self. Although discrepancies – and resulting emotional disruption - between aspects of the self occur on a continuum, instances in which one is presented with a cue ostensibly representative of an autobiographical event that cannot be readily remembered is a circumstance that contributes to sufficient emotional disruption, and corresponding motivation to resolve same. All told, greater activation may take place at the general event level, the preferred level of entry into the autobiographical knowledge base (Conway, 1996), and for which narrative cues appear to be best suited.

In terms of SMF, false memories can occur when mental experiences from one source are erroneously attributed to a different source (Lindsay & Johnson, 2000). A large percentage of participants in Garry and Wade's (2005) narrative condition generated images at the very first interview. Repeated contact with the narrative created favorable conditions for source monitoring errors to occur. That is to say, the more rapid, heuristic retrieval process that are initially employed according to SMF likely resulted in an incorrect attribution to past occurrence (i.e. that the imagery is due to the event having actually occurred in the past rather than because it had been imagined at the previous interview). This source identification, albeit incorrect, may have been bolstered by the degree to which the mental experience elicited feelings of familiarity, a factor that is consistent with a real memory (Nash, Wade & Brewer, 2009).

A significantly smaller percentage of individuals in the photograph condition generated imagery at the first interview, and thus reality monitoring errors at interview two were less likely. Heuristic retrieval would have failed to identify the source of the imagery generated at the second interview and thus the more systematic, deliberate retrieval process would have been employed as a "checkpoint," thereby resulting in lower likelihood of endorsement of the false event. Also, an overall lack of familiarity with the mental products generated may have contributed to a greater likelihood of event rejection. Thus, it appears as though conditions wherein imagery generation is enhanced results in a higher amount of false memory formation, as the source of that imagery is misattributed to the past. But is it just about being able to generate images, or do the images need to have certain qualitative characteristics?

Considering these findings in the context of Lindsay et al.'s (2004) study, it

appears as though the narrative with photograph condition capitalizes on both the rich perceptual details that photographs provide as well as the descriptive but non-constraining nature of the narrative. Based on the percentage of images and memories in the narrative alone versus the narrative plus photograph conditions, it appears that participants in both conditions are using the narrative to generate an image of the target event in their mind. However, it is possible that the mental images of those in the “with photo” condition are enhanced on account of the vivid perceptual - but non-specific - details of the photograph. The rich mental representation that is generated meets the criteria for being judged a “memory.” Thus, it appears that rather than image generation itself, being able to generate highly perceptually vivid imagery enhances the likelihood of source attribution errors, thereby creating optimal conditions for false memory formation.

According to both the self-memory-system (SMS) and the source-monitoring framework (SMF), the explanation for what is occurring in the narrative alone condition is identical to that of the narrative condition in Garry and Wade’s (2005) study outlined above. Conceptualizing the narrative with photograph condition from the SMS perspective, the photograph adds rich visual cues which are non-specific (i.e. the photograph does not depict the actual event in question) which enhances activation at the general event level of the autobiographical knowledge base. Given that both the narrative and the true non-specific photograph are non-constraining stimuli, the cycles of generative retrieval benefit from the flexibility that is present with narrative alone. They also capitalize on the rich visual cues in the photograph, which are filled in with activated event-related imagery accessed through contact with episodic memory system (i.e. past instances of having seen – but not experienced - a hot air balloon, either in pictures,

movies, commercials). The resulting vivid mental imagery is more likely to be deemed to be a memory, and thus the false event is more likely to be endorsed as true.

From the SMF perspective, Lindsay et al.'s (2004) narrative with photograph condition provided rich perceptual details that related to the participants' first grade experiences. Exposure to the narrative led to the generation of imagery associated with the false event. Seeing their elementary school classmates in the photograph provided salient cues, resulting in activation of memories of past interactions and experiences. The activated memories in the context of the false narrative likely resulted in the blending of these two sources of information to produce a compelling image of the false event (Lindsay et al. 2004). This is consistent with Johnson et al. (1988) who posit that memories similar in perceptual characteristics or semantic content are more likely to be confused. So, if one remembers interactions with one's classmates from elementary school, these memories can be confused with the imagery generated in response to the narrative (and enhanced by the vivid perceptual details in the photograph) such that the false event is endorsed as true. Moreover, it has been empirically demonstrated that rehearsing imagined events can serve to preserve and embellish them (Suengas & Johnson, 1988). Here, the assistive photograph allows for the heuristic (automatic) processes of source monitoring to prevail once the slower more systematic ones have done the initial work of generating event-specific memory-like images. The heuristic processes are further facilitated by the delay between interviews, such that by the second interview, the initial imagery becomes misattributed to an external source (i.e. having previously experienced the event) instead of an internal one (i.e. imagining this event).

### **Summary of Current Knowledge and How to Proceed**

The research to date suggests that narratives on their own potentially facilitate a wide range of imagery, but the images are less perceptually vivid compared to viewing a photograph. Doctored, event-specific photographs potentially facilitate a more narrow range of imagery, but the images are richer due to the externally available vivid visual properties of photographs. A narrative paired with a true, non-event-specific photograph potentially maximizes the quantity and quality of the images, which are then more likely to be experienced as memories. Again, a caveat here is that in order for a non-specific true photograph to be a retrieval cue for a particular event, it must be paired with a narrative that provides a sufficient description of the event that is to be retrieved. The advantage of a doctored photograph is that no such narrative is necessary - the photograph on its own with a brief label identifying the event and the people present is sufficient to cue what should be remembered.

In sum, the fact that false memories can be induced has been established in the literature. Frequency of false memory formation has varied depending on the particular suggestive medium employed and the relative balance of details therein. Moreover, event-specific photographs have been compared with narratives, the latter yielding a higher false memory formation rate than the former (Garry & Wade, 2005). However, there has been no comparison made between photograph types in the literature to date. This is, what still remains to be determined is which type of photograph (non-event-specific or event-specific) constitutes a superior retrieval cue and what relative roles are played by the implied frame of reference and/or the detail content of each photograph type. Accordingly, the purpose of this research program was to “dismantle” the photographs used in the literature to date and examine how the component parts contribute to the

underlying mechanism by which they induced false memory formation. The hot-air balloon ride target event was used for continuity with existing research and to allow for comparison with same. This research is unique in that it is the first time that the underlying components within a photograph are separated to examine their respective influences on false memory formation. Moreover, it is the first time that an event-absent photograph and an event-specific photograph are directly compared to one another.

### **Study 1**

The first step is to note the fundamental way in which doctored photographs and true photographs are different - not in terms of visual content but in terms of the implied message regarding the breadth of the frame of reference, or context - of the photographic cue (i.e. general event category cue versus single specific event cue). To date, doctored photographs have depicted the exact event that is suggested. In the true photograph study to date, however, the photograph was a non-specific image from the same life period as the suggested event, but which was not taken on the day that the event occurred. As such, not only is the content of the photograph different but also what the photograph signifies is different, and hence the photograph is likely used quite differently when searching for a memory. Both the Self-Memory System (SMS) and the Source Monitoring Framework (SMF) make similar predictions about relative rates of false memory formation in each condition.

The doctored photographs used in research to date imply a narrow frame of reference ('during the event'). As such, it activates the autobiographical knowledge base at the level of ESK and limits spreading activation to one single event from one single life period. The generative retrieval memory search model will be constrained by very



specific verification criteria based on the photograph content. Similarly such a rigid retrieval cue likely limits freedom of imagination. Thus, the opportunity for source monitoring errors is reduced, which reduces the degree of false memory formation that can occur.

To determine if the different content of the two photograph types alone influences false memory formation, or if the frame of reference implied by the content plays a part as well, these two factors must be separated. The frame of reference implied by doctored photographs cannot be manipulated, as it is tied to the content (i.e. if the photograph shows the event in question, one cannot suggest that it is merely a “related” photograph). However, it is possible to do so with a true photograph, which is what is examined in the first study. Namely, the instructions with which the photograph is presented to the participants will be manipulated such that one group will be told that the photograph is “from that time period” whereas the other group will be told “this is a photograph taken during the event.” Examining how exposure to the same photograph in the presence of different information about the photo will allow for the separation of these two potentially confounding influences (i.e. content and frame of reference) on retrieval cue processing. Using the methodology employed by Lindsay et al (2004) and the hot air balloon ride target event employed by Garry and Wade (2005) three conditions were created: 1) Narrative alone; 2) Narrative + True Photograph (from that time period); and 3) Narrative + True Photograph (“taken during the event”). Both photograph conditions included the presentation of a photograph of the participant posing with either parent against a nondescript background (i.e. grass, trees, and the like). The no photograph (narrative alone) condition served as a control to allow for comparisons with Lindsay et al.’s (2004)

findings.

This research is important in that it strives to empirically demonstrate that the way in which a visual stimulus is utilized in the effort to retrieve autobiographical memories can be influenced by the frame of reference implied by the accompanying instructions.

### **Hypotheses.**

***Hypothesis 1.*** According to both SMS and SMF, it was predicted that the “from that time period” photograph would yield higher false memory formation rates, subjective belief and memory ratings, and higher memory quality ratings than would the “no photograph” condition (see Figure 2). This was based on Lindsay et al.’s (2004) findings and is consistent with both SMS and SMF. In the case of the former, the photograph adds rich visual cues which enhance the activation at the general event level of the autobiographical knowledge base. The resulting vivid mental imagery is more likely to be deemed to be a memory than that formed secondary to a narrative alone, and thus the false event is more likely to be endorsed as true. In the case of SMF, the assistive photograph provides the vivid perceptual details that enhance the images created by the narrative. This enhanced imagery promotes the more rapid, heuristic processes of retrieval, which is more likely to bring about source monitoring errors, thereby increasing the likelihood of false memory endorsement.

***Hypothesis 2.*** It was also predicted that the “no photograph” condition would yield higher false memory formation rates, subjective belief and memory ratings, and higher memory quality ratings than would the “photograph taken during event” condition. This is consistent with Garry and Wade’s (2005) findings, as well as with both SMS and SMF. In the case of the former, the photograph activates the autobiographical knowledge

base at the ESK level of the autobiographical knowledge base. This highly specific entry point constrains spreading activation and the degree of imagery generated, which is less likely to be deemed to be a memory than is the narrative alone. In the case of SMF, the assistive photograph provides the vivid perceptual details, but the narrow temporal frame of reference limits the degree of imagery generated. Accordingly, greater and more deliberate cognitive operations are necessary to generate retrieval products. The resulting memorial features of the retrieval products are less likely to be misinterpreted as arising from perception. As such, source monitoring errors are less likely to occur, thereby decreasing the likelihood of false memory endorsement. The narrative alone, however, allows for greater freedom in generating event-specific imagery which enhances source-monitoring errors, and in turn, false memory formation.

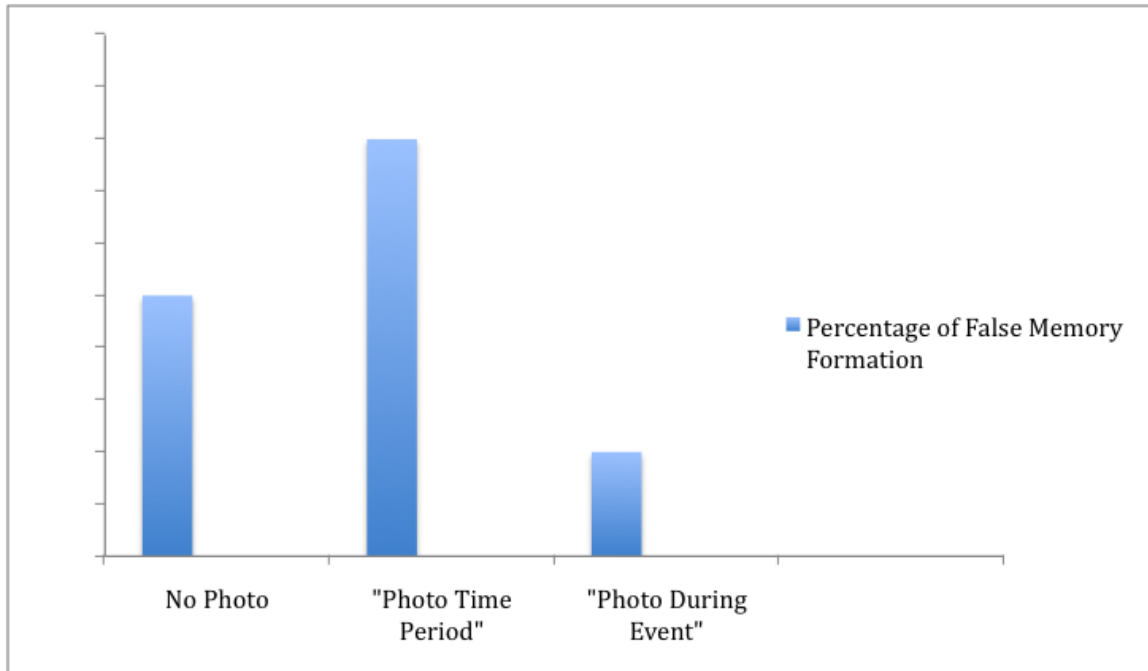
***Hypothesis 3.*** It was also predicted that the wider “from that time period” temporal frame of reference would yield higher false memory formation rates, subjective belief and memory ratings, and higher memory quality ratings than would the narrower “photograph taken during the event” temporal frame of reference (see Figure 2). According to SMS the wider frame of reference allows for activation at the general event level of the autobiographical knowledge base such that many different (but related) episodes consistent with the cue will be triggered (i.e. many different amusement parks, all the fun times had with dad, all the fun times had with mom, going on fun rides). Conversely, the narrower temporal frame of reference restricts activation to the ESK level such that cues are interpreted literally (i.e. when was I with dad specifically, wearing that hat, at this particular amusement park) with the expectation that rapid, autoneotic processing should be aroused. If this does not occur, spreading activation will be too

diffuse to bring about a stable pattern of activation across all three levels of the autobiographical knowledge base hierarchy, and the event is thus less likely to be endorsed as true. Similarly, SMF predicts that the wider frame of reference will foster the generation of a greater amount of event-related mental imagery, which with repeated imagination can result in a higher likelihood of source monitoring errors. In the narrower temporal frame of reference, on the other hand, the images generated will be limited to ones that are highly similar to the ones depicted in the photograph, thereby decreasing the likelihood of source monitoring errors.

## **Study 2**

I subsequently examined if there was a “middle ground” between non-specific true photographs and event-specific doctored photographs that capitalizes on the benefits of both types while omitting the detriments of each. This was done by creating a doctored photograph that was non-event specific. Using the hot air balloon ride target event, this photograph combined a generic true photograph of an individual posing with their parent against a nondescript background, but included the inserted image of a hot air-balloon in the background. The advantage of such a photograph was that it combines the non-constrained nature of a non-event specific true photograph (i.e. the target event of actually taking a hot air balloon ride is not depicted) while at the same time presenting a visual cue related to the target event. However, another notable difference between true photographs and doctored photographs that needed to be addressed before a methodologically sound comparison could be made is the fact that true photographs are authentic whereas doctored photographs are not. The digital alteration of the photograph itself may result in the stimulus being interpreted differently than its non-altered

Figure 2. Predicted rate of false memory formation as a function of experimental condition



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

counterpart. This represented a confound that needed to be remedied, while still preserving the unique message conveyed by each stimulus in order for a true comparison to be made. A true photograph, as employed in false memory research to date, has depicted fluency-promoting details while remaining vague and non-event specific (i.e. participant visible but not engaging in the target event). The background in this case is not critical to the message conveyed by the stimulus. Therefore, this was the locus where the stimulus was doctored to address the noted confound, while keeping the message of the stimulus intact – as will be illustrated in more detail below. The critical point here is that underlying messages conveyed by the various photographs are predictive of false memory formation rather than simply the fact that they are altered.

Using the methodology employed by Lindsay et al (2004) along with the hot air balloon ride target event employed by Garry and Wade (2005), three conditions were created: 1) Doctored, event-absent photograph (depicting the participant and parent posing against a nondescript background), which provided a very wide frame of reference for generating idiosyncratic imagery but with the absence of visual cues relating to the target event; 2) Doctored non-event-specific photograph (depicting the participant and parent, doctored to be posing against a nondescript background with a hot air balloon floating in the sky), which provided a very wide frame of reference for generating imagery while also providing visual cues relating to the target event; and 3) Doctored event-specific photograph (depicting the participant and parent, doctored to be posing inside the basket of a hot air balloon) which provide a narrow frame of reference for imagery generation given that the visual cues provided are organized in a specific way that restricts freedom to generate other images related to the event. All conditions

included a brief description denoting the event, the age of the participant at the time, and a sentence describing what took place. Also, all three photographs were doctored so as to appear against the exact same background, thereby addressing the methodological confound identified above.

This study represents the first time that a traditional (i.e. event-specific) doctored photograph was compared with an event-absent photograph. To date, the only study employing an event-absent photograph also included a detailed narrative, and yielded a combined false memory and imagery formation rate of 72.8% (Lindsay et al, 2004) as compared to an average 50% combined false memory and imagery formation rate for doctored photographs (Wade et al, 2002; Garry & Wade, 2005). Although Lindsay et al. (2004) employed a completely true, unaltered photograph, the event-absent doctored photograph in the present study extracts the essential elements within that cue that impact false memory formation (absence of target event, presence of subject and other self-relevant details). However, it would be premature to conclude based on these findings that event-absent photographs will yield higher false memory formation rates than will doctored photographs. One important consideration is that a hot air balloon ride is rated low on personal plausibility in Ontario (Scoboria, Hessen-Kayfitz, Fisico, unpublished data). Although no data exist regarding personal plausibility ratings of Lindsay et al.'s (2004) childhood prank target example, it is arguable that this event is more likely to occur at a higher frequency than the hot air balloon ride event.

Nevertheless, results suggesting that event-absent doctored photographs (i.e. most similar conceptually to otherwise true photographs) promote higher false memory formation than do more explicitly doctored photographs would have interesting

implications in both therapeutic and legal settings - especially when the former are paired with a narrative that is inaccurate (intentionally so or not). Such findings would imply that the likelihood of circumstances resulting in false memories are higher in the real world than previously thought. Individuals in therapeutic settings seek answers for their distressing symptoms, and are susceptible to accepting suggestions that offer explanations for same. Once they form a belief, confirmatory bias suggests that new information presented may be modified, dismissed, or embellished to the extent that it is consistent with the new theory they have come to believe (Nickerson, 1998). Certain clinical populations are more susceptible to suggestion (e.g. dissociative disorders are characterized by disruption in memory, identity, and perception). 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). Children represent another population that is extremely vulnerable to false memory formation. It has been demonstrated that children can come to “remember” highly implausible events (Strange, Sutherland & Garry, 2006), or even truly bizarre, ritualistic sexual abuse (e.g. *People v. Akiki*, 1993; *State v. Michaels*, 1994).

In legal settings, individuals may be shown crime scene photographs, or may be questioned in a manner designed to enhance their remembering. Although individuals are highly unlikely to be presented with a doctored photograph (although in some jurisdictions, presenting fabricated evidence to elicit a confession is permitted; Nash, Wade, and Brewer, 2009), initial research findings suggest that such extreme measures may not be necessary in order to successfully create false memories (Lindsay et al, 2004). Therefore, the ease with which false memories can be formed has far reaching and serious



implications - especially if such memory errors can come to occur via seemingly innocuous visual stimuli paired with subtle suggestion.

### **Hypotheses.**

*Hypothesis 1.* It was predicted that doctored, event-absent photographs would yield a higher false memory formation rate, subjective belief and memory ratings, and higher memory quality ratings than would doctored, event specific photographs (see Figure 3). According to SMS, an event-specific photograph constitutes a retrieval cue at the level of ESK. Because the false event did not actually occur, the rigid specificity of the cue would fail to sufficiently activate knowledge at the ESK level and spreading activation would be too diffuse to generate a sufficiently stable and focused pattern of autobiographical knowledge activation to be readily considered a memory (Conway & Pleydell-Pearce, 2000). Moreover, the doctored, event-specific photograph cue may favour the direct retrieval mechanism. Failure of rapid remembering may signal that the event did not happen. A doctored, event-absent photograph, on the other hand, constitutes a retrieval cue at the lifetime period level of the autobiographical knowledge base. Although not the preferred general event level, it would allow for a greater opportunity for a stable pattern of activation across all three levels of the autobiographical knowledge base. As such, a greater amount of mental imagery of related event features would be activated. Similarly, SMF posits that the highly specific nature of the even-specific photograph retrieval cue would serve to constrain imagination. As such, less opportunities for source monitoring errors would arise by virtue of rapid heuristic retrieval processes. The more systematic, deliberate retrieval process would be employed as a “checkpoint,” which, combined with an overall lack of familiarity with the mental products generated,

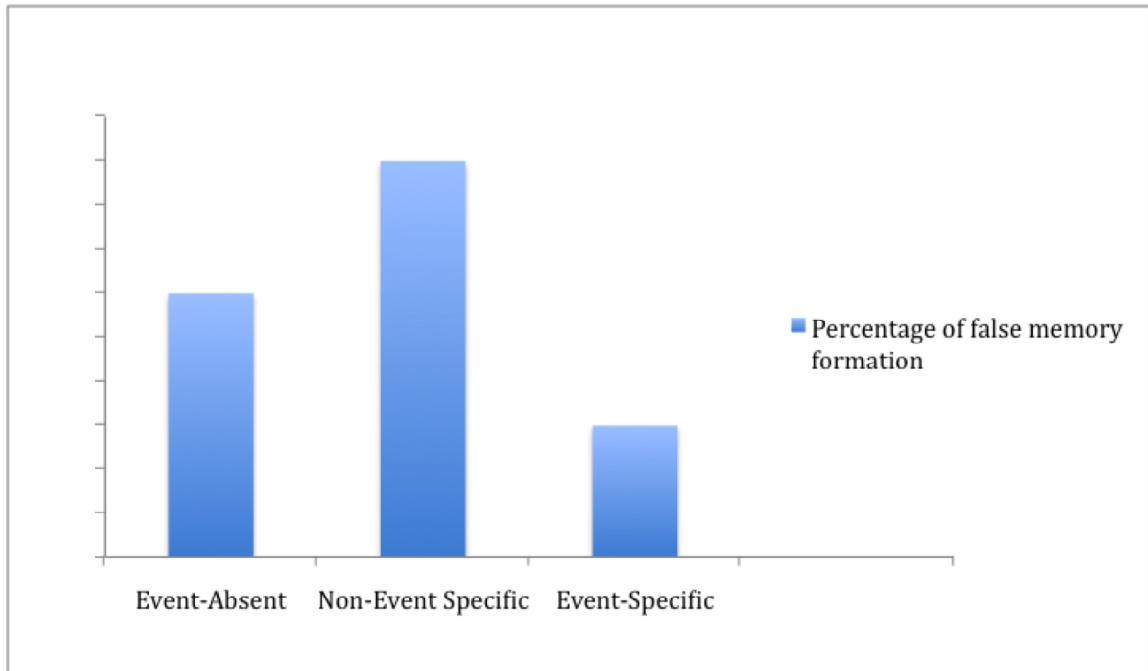
would contribute to a greater likelihood of event rejection. Conversely, doctored, event-absent photographs would foster comparatively greater imagination, thereby increasing the likelihood of rapid, heuristic processes. This, in turn, would result in source monitoring errors that remain unchecked, given that the imagery would be generated in concert with the visual stimulus of the photograph, one of the key characteristics of true memories.

***Hypothesis 2.*** It was predicted that doctored, non-event specific photographs would yield the highest false memory formation rate, subjective belief and memory ratings, and higher memory quality ratings as compared to both doctored, event-absent photographs and doctored, event-specific photographs (see Figure 3). I proposed that doctored, non-event specific photographs constitute the ideal retrieval cue in that it accesses the autobiographical knowledge base at the general event level. Similarly, given that both self-relevant and target-event-related cues are presented in a non-specific format, the raw materials for imagery generation, binding of elaborated retrieval cues with mental products, and subsequent source monitoring errors are in place. In fact, the act of having to piece together the “raw material” cues in the photograph (i.e. oneself, one’s parent, the hot air balloon) into a mental representation of a hot air balloon ride with one’s parent is similar to Berstein, Whittlesea, and Loftus’ (2002) study. The authors asked their participants to rate how confident they were that they experienced various events in childhood. Some of these events were presented as anagrams (i.e. “I broke a dwinow,” instead of “I broke a window”), and results suggested that participants endorsed greater confidence in having experienced these events than the ones not in anagram form. The surprising fluency experienced by the individuals when they solved

the anagram was misattributed to having experienced the event.

This can be compared to the present study, wherein participants needed to work to generate a mental representation of the target event, but are provided with highly vivid retrieval cues while not being constrained at all in the types of images they form. That is to say, the memory retrieval model generated is ideal. Doctored, event-absent photographs, conversely, result in too wide a memory retrieval model and doctored, event-specific photographs result in too narrow a memory retrieval model. In sum, it appears as though it could be a matter of “too broad, too tight, or just right!”

Figure 3. Predicted rate of false memory formation as a function of experimental condition



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

## CHAPTER II

### Study 1 Method

#### **Participants and Setting.**

Of the 350 participants invited to participate, 70 provided their parents' contact information. Forty-one responses from parents were received, two of which needed to be disqualified due to the individual having actually taken a hot air balloon ride as a child. Additionally, three participants repeatedly never attended the first session. As such, the sample included 36 University of Windsor students (29 female) between the ages of 17 and 30 ( $M = 19.5$ ,  $SD = 1.8$ ). Participants received either cash (\$20 for attending all three sessions) or academic credit as compensation, and were also entered in a raffle for 2 prizes of an audio player.

#### **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 contain groups of people in social situations, and to the degree possible, photographs that the participant has not seen before. For each photograph, parents were asked to provide a brief narrative of what was 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 would be returned to them in the original condition provided. Upon receipt, the materials were reviewed. If appropriate for the study, the participant was contacted and scheduled for the first interview; they were randomized to groups at this point.

**Booklets.** If in the appropriate condition (see below), four photographs were selected from those provided and scanned at high resolution. A booklet was created, which contained four narratives (three true and one that was false) that described an event. For participants assigned to one of the two “with photo” conditions, a booklet of four 4 X 6 black and white photographs was created. The photograph accompanying the false narrative included the participant and their parent in the foreground, set against a nondescript background of grass and trees. There was one photograph on each page printed at high resolution (1200 dpi). Participants were told that photographs were black and white because the originals submitted needed to be scanned, digitalized, and returned to their parents in good condition and that the printer used only enables black and white printing. Although color printing adds richer visual detail, which may impact the vividness of imagery (and by extension promote greater false memory formation), black and white printing allows for more seamless digital manipulation. This has been the printing method of choice in the previous studies of this kind, thereby allowing for matched comparison between studies. Finally, by rendering all photographs black and white, the photograph representing the false event is less likely to stand out as having been altered. An obvious trade-off is that by making all photographs look different from the originals may have slightly reduced their overall memory-promoting power - which may partially explain the slightly lower percentage of recall for true events compared to existing research.

**Creation of Conditions.** Prior to the first session, participants were randomly assigned to the three experimental conditions: 1) Narrative alone; 2) Narrative + True Photograph (from that time period); and 3) Narrative + True Photograph (“taken during

the event”). The photograph contained the participant and their parent posing against a neutral non-descript backdrop. The configuration of detail in photographs is depicted in Figure 4. The narrative employed, adapted from Garry and Wade (2005), was:

*When you were between [4–6] years old, you and your [mom/dad] went up in a hot air balloon in [participant’s home town]. You didn’t go far off the ground because the ropes anchoring the balloon were still attached. It was around May/June.*

### **Measures.**

**ABMQ.** Participants completed the Autobiographical Belief and Memory Questionnaire (Scoboria, Mazzoni, Kirsch, & Relyea, 2004; Appendix I). 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 Hessen-Kayfitz and Scoboria (2011). 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 false event was placed third. This was done so that the false event did 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 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, two independent judges who were blind to the experimental condition classified participants as having either (1) no images; (2) images only; or (3) memories for each of the four events. This procedure is consistent with Lindsay et al.'s (2004) criteria. Participants who reported actual memories were coded into the *memory* category, whereas those who described 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 details that were not contained in the photographs, descriptions of what they may have been thinking and feeling, and 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 events using questions Garry and Wade (2005; Appendix J) adapted from Berntsen, Willert, and Rubin (2003). 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 reviewed by the University of Windsor Research Ethics Board. Participants were asked to provide parental contact information, and were told that their parents would be contacted for the purpose of obtaining non-sensitive information about their childhoods. Once parents provided 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 (see Table 1). This procedure is also identical to that used by Hessen-Kayfitz and Scoboria (2011). 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 descriptions of events. The narratives were ordered so that the first, second, and fourth were true events and the third was the false event. The narrative was read aloud to the participant by the research assistant. If in one of the "with photograph" conditions, the accompanying photograph was presented with the instructions, "here is a photograph taken during the event to help you remember," or, "here is a photograph taken during that time period to help you remember." After each narrative was read, and with the narrative (plus photograph if appropriate) remaining in front of them, the participant was asked to describe everything they could remember about the event without leaving anything out. In situations where the participant did not remember the event, he or she was told that many people have difficulty remembering events that happened long ago as they had not thought about them, and was then engaged in a guided imagery exercise wherein he or she was instructed to concentrate for a few minutes and to try to bring the

Figure 4. Illustration of the three experimental conditions in Study 1.

*When you were between [4-6] years old, you and your*

*[mom/dad] went up in a hot air*

*balloon in [participant's home*

*town]. You didn't go far off the*

*ground because the ropes*

*anchoring the balloon were still*

*attached. It was around May/June.*

*When you were between [4-6]*

*years old, you and your*

*[mom/dad] went up in a hot air*

*balloon in [participant's home*

*town]. You didn't go far off the*

*ground because the ropes*

*anchoring the balloon were still*

*attached. It was around May/June.*

*When you were between [4-6]*

*years old, you and your*

*[mom/dad] went up in a hot air*

*balloon in [participant's home*

*town]. You didn't go far off the*

*ground because the ropes*

*anchoring the balloon were still*

*attached. It was around May/June.*

No Photograph	Here is a photograph from that time period	Here is a photograph taken during the event
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Note: Circle added to camouflage identity of participant

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, and the season. Then they were asked what, if anything, they could remember. If they could not remember any further details, the next photograph was introduced and the above procedure was repeated. In situations where the participant freely recalled a complete memory for the event (i.e. stated that they remembered and/or provided an elaborate verbal account which included details not provided in the cue), they were simply asked if there were any additional details they could recall before the next photograph was introduced. Participants' verbal event descriptions were audio recorded during the first and last interviews for the purposes of transcription and scoring of inter-rater agreement.

Once participants were unable to remember any more details about each of the photographs, they were asked to fill out the memory 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 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, in that the participant was asked to describe everything they could remember about the event without leaving anything out, and the decision to employ guided imagery was employed based on the same criteria. 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. After Interview 3, once participants completed the memory questionnaire, they were asked to complete the ABMQ. They were then asked how frequently they thought about events during the week, 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 it was. Finally, the research assistant disclosed the false event, and participants were debriefed.

Table 1.

*Timeline and content of the three interviews*

Interview #1	Interview #2	Interview #3
<ul style="list-style-type: none"> <li>• Told photos provided by parents.</li> <li>• Asked to provide maximum details (i.e. free recall).</li> <li>• Guided imagery (if event not remembered).</li> <li>• MCQ Administered</li> </ul>	<ul style="list-style-type: none"> <li>• Asked to provide maximum details (i.e. free recall)</li> <li>• Guided imagery (if event not remembered).</li> </ul>	<ul style="list-style-type: none"> <li>• Asked to provide maximum details (i.e. free recall)</li> <li>• Guided imagery (if event not remembered).</li> <li>• MCQ Administered</li> <li>• ABMQ Administered</li> <li>• Guess False Photograph</li> <li>• Debriefing</li> </ul>

## CHAPTER III

### Study 1 Results

#### Judges' ratings

To review from above, the transcripts from the first and third interviews were rated as either constituting (1) no images; (2) images only (only reporting what the participant saw in the photograph and describing where the event may have taken place); or (3) memories (reporting what the participant saw, but also adding details that were not contained in the photographs as well as descriptions of what they may have been thinking and feeling what it may have been like to have experienced the event) for each of the four events. Examples of each classification are illustrated in Table 2.

**Overall true image and memory formation.** In order to provide a comparison for the yield of false memories formed, participants' memories for their true events were analyzed. Analysis of judges' ratings of interview transcripts for all three conditions revealed that at Interview 3, 88.89% of participants were judged to have memories for the three true events, compared to 73.58% at Interview 1. Furthermore, 98.15% of participants were judged to have generated images or memories at Interview 3, as compared to 89.81% at Interview 1.

**Overall false images and memories formed.** Analysis of judges' ratings of interview transcripts for all three conditions revealed that at Interview 3, 20% of participants were judged to have memories for the false event, compared to 20.59% at Interview 1. Furthermore, 48.57% of participants were judged to have generated images or memories at Interview 3, as compared to 55.88% at Interview 1. These differences were not statistically significant ( $p > 0.1$ ).

**False memory formation rates across groups.** Logistic Regression was used to analyze the frequencies of the judges' ratings of interview transcripts (see Table 3). Binary logistic regression can be used to predict a dichotomous outcome variable – in this case either the presence/absence of memory or imagery - from a set of independent variables that may be continuous, discrete, dichotomous, or a combination thereof. Although discriminant analysis can also be used to predict group membership, this approach requires continuous (versus categorical) independent variables. Logistic regression is the preferred approach when independent variables are categorical – in this case, these were the three experimental conditions.

The dependent variables examined were “memory versus no memory,” as well as “images plus memories versus no images or memories.” Analyses were conducted by creating dummy coded group contrast variables based on a priori hypotheses. To review, it was hypothesized that higher false memory formation rates would occur in “photograph from that time period” conditions as compared to the “no photograph” condition, and that the “no photograph” condition would yield higher false memory formation rates than would the “photograph taken during the event” condition. It was also hypothesized that higher false memory formation rates would occur in the “from that time period” context compared to the “photograph taken during the event” condition. In terms of the first hypothesis, at both Interview 1 and Interview 3, no significant differences were found in analyses on images plus memories ( $p = .455$  and  $p = .855$ , respectively) nor on memories alone ( $p = .105$  and  $p = .292$ ). Looking at memories alone, it is notable that at Interview 1, 40% of participants in the “from that time period” condition developed memories as compared to 8.33% in the “no photo” condition. Nevertheless, as above, this difference

Table 2.

*Examples of transcripts falling into the No Images, Images only, or Memory categories*

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No Images	“Um, I don’t remember this at all. [SILENCE] I honestly have no recollection of ever taking a hot air balloon ride. [SILENCE]. No, I’ve got nothing.
Images Only	I don’t remember anything. *pause* I don’t know; I’m imagining me and my dad in a purple hot air balloon for some reason. And it’s raining outside but I don’t know who else is with us. Um... I think I would’ve been pretty excited. And at that age I probably thought we went pretty high off the ground, so it might’ve been a little bit scary too. Um... But I’m having trouble actually picturing actually being in that event because I don’t remember it.
Memories	I know my mom, my dad, my brother, and me were all together that day. Um... I remember, um, the hot air balloon having, um, being really colourful on the top. I, I think Sue and Becca were there, because I don’t remember going up in the hot air balloon with my mom, but I remember Sue being there. So maybe I went up with my mom and Becca went up with her mom, or, um... yeah, just me and my mom went up in the hot air balloon, but there was a man that was operating the hot air balloon. Um, he was trying to explain to me – well, in childish terms – trying to explain to me how the hot air balloon worked. Um, I remember being frightened because I didn’t understand how it would land once it went up. Just lots of people around. And I’m pretty sure that it was an event that had, like, a barbeque fundraiser thing going on too, because I’m pretty sure I remember eating a hot dog that day. That’s it.

---



Table 3.

*Percentage of image and memory formation for false event per judge's ratings by experimental condition and time*

	Interview 1			Interview 3		
	None	Images	Memories	None	Images	Memories
No Photo	25.00%	66.67%	8.33%	41.67%	41.67%	16.67%
Photo During Event	66.67%	16.67%	16.67%	66.67%	25.00%	8.33%
Photo Time Period	40.00%	20.00%	40.00%	45.45%	18.18%	36.36%

Note: No Photo, n at I1 = 12, n at I3 = 12; Photo During Event, n at I1 = 12, n at I3 = 12;

Photo Time Period, n at I1 = 10, n at I3 = 11.

Figure 5. Percentage of memory formation for false event per judges' ratings by experimental condition at Interview 3

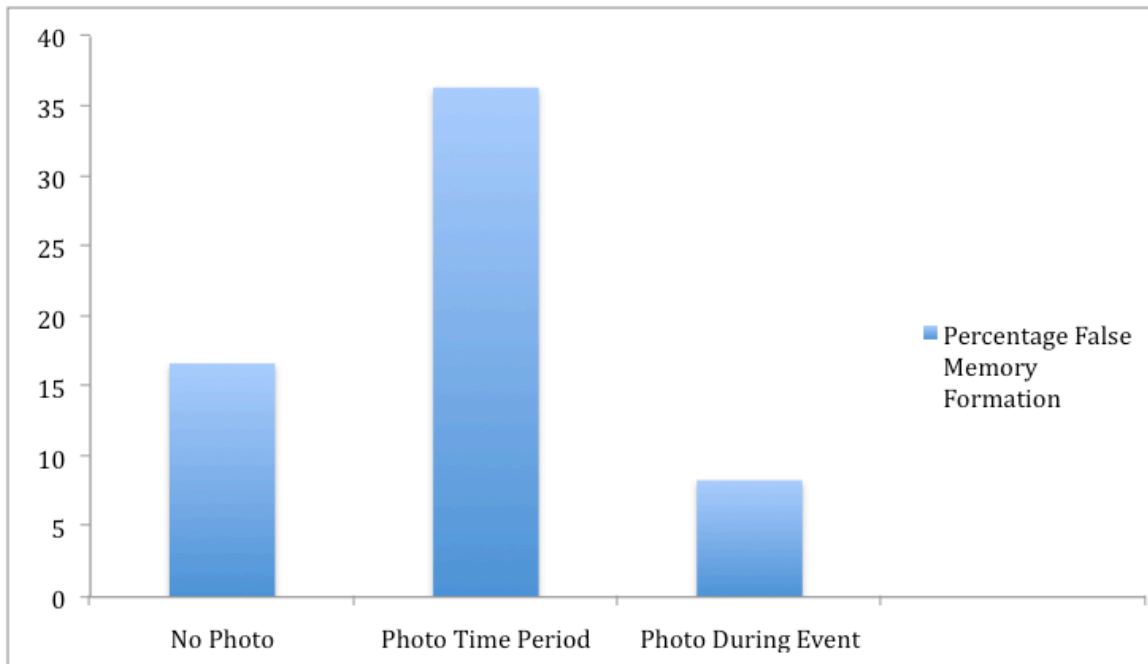


Table 4.

*Percentage of image and memory formation for true events per judge's ratings by experimental condition and time*

	Interview 1			Interview 3		
	None	Images	Memories	None	Images	Memories
No Photo	0.00%	13.89%	86.11%	0.00%	0.00%	100.00%
Photo During Event	5.56%	25.00%	69.44%	0.00%	8.33%	91.67%
Photo Time Period	10.00%	16.67%	73.33%	5.56%	19.44%	75.00%

Note: No Photo, n at I1 = 12, n at I3 = 12; Photo During Event, n at I1 = 12, n at I3 = 12; Photo Time Period, n at I1 = 10, n at I3 = 11. Proportions are reported across all true events (3 per participant).

was not statistically significant ( $B = .966$ ;  $SE = 6.14$ ;  $Wald = 2.63$ ;  $p = .105$ ,  $\text{Exp}(B) = 2.71$ ).

Regarding the second hypothesis that the “no photograph” condition would yield higher false memory formation rates than would the “photograph taken during the event” condition, analyses on memories alone revealed no significant effects at either time (both  $p = .544$ ). However, at Interview 1, 33.34% of participants in the “photograph taken during the event” context developed images or memories compared to 75% in the “no photo” condition ( $B = .896$ ,  $SE = .453$ ,  $Wald = 3.92$ ,  $p = .048$ ,  $\text{Exp}(B) = .408$ ). This was a statistically significant difference. This difference was not maintained at Interview 3 ( $B = .515$ ,  $SE = .424$ ,  $Wald = 1.48$ ,  $p = .224$ ,  $\text{Exp}(B) = .598$ ).

Regarding the third hypothesis that higher false memory formation rates would occur in the wider “from that time period” context as compared to the narrower “photograph taken during the event” condition, at Interview 1, 33.34% of participants in the “photograph taken during the event” context formed images or memories, as compared to 60% in the “from that time period” context ( $B = .549$ ,  $SE = .445$ ,  $Wald = 1.53$ ,  $p = .217$ ,  $\text{Exp}(B) = 1.73$ ). At Interview 3, 33.33% of participants in the “photograph taken during the event” context formed images or memories, as compared to 54.54% in the “from that time period” context ( $B = .438$ ,  $SE = .431$ ,  $Wald = 1.03$ ,  $p = .309$ ,  $\text{Exp}(B) = 1.55$ ). Similarly, at Interview 3, 8.33% of participants in the “during the event” condition generated memories as compared to 36.36% in the “from that time period” condition. This difference was not statistically significant ( $B = .919$ ;  $SE = 0.609$ ;  $Wald = 2.28$ ;  $p = .131$ ,  $\text{Exp}(B) = 2.507$ ).

Finally, at Interview 1, 40% of participants in the “from that time period” formed memories compared to 25% in the other two groups ( $B = 1.54$ ;  $SE = .893$ ;  $Wald = 2.98$ ;  $p = .085$ ,  $Exp(B) = 0.21$ ). No significant differences were found at Interview 3 in this regard ( $B = 1.39$ ;  $SE = .880$ ;  $Wald = 2.48$ ;  $p = .115$ ,  $Exp(B) = 4.00$ ). No significant differences were found for images plus memories at Interview 1 ( $B = .238$ ;  $SE = .765$ ;  $Wald = 0.10$ ;  $p = .755$ ;  $Exp(B) = 1.27$ ) nor at Interview 3 ( $B = 0.35$ ;  $SE = .73$ ;  $Wald = .228$ ;  $p = 0.63$ ;  $Exp(B) = 1.42$ ).

### **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 memory evaluations. Hypotheses for group differences on these ratings paralleled those of objective judges’ ratings. Given that the data violated the assumption of normality necessary for parametric tests, Mann-Whitney U planned comparisons were performed. Analyses failed to support the first two hypotheses in that no significant differences in memory ratings (i.e. the degree to which they claimed to remember the target event, as assessed by the ABMQ Memory item) occurred between the “no photo” condition compared to the “photograph taken during the event” condition ( $U = 47.00$ ,  $p = .160$ ) nor between the “no photo” and the “photograph taken during that time period” conditions ( $U = 49.00$ ,  $p = .198$ ). However, significantly higher memory ratings occurred in the “from that time period” context compared to the “photograph taken during the event” context ( $U = 30.00$ ,  $p = .014$ ), thus supporting the third hypothesis. Moreover, a significant difference was found between the “from that time period” group as compared to the “no photo” group collapsed with the “photograph taken during the event” group ( $U = 77.00$ ,  $p = 0.024$ ).

Although no significant differences were found between groups on general plausibility and belief, a linear trend for Personal Plausibility approached significance,  $F(1, 34)$ ,  $p = .074$ , wherein the highest ratings occurred in the “from that time period” condition and the lowest in the no photo condition. A difference in Personal Plausibility ratings in the “from that time period” condition compared to the other two conditions combined was approaching significance  $F(1, 34) = 4.12$ ,  $p = .051$ .

### **Memory Characteristics Questionnaire (MCQ)**

All items of the MCQ tended toward the floor of the scale. Given that both homogeneity of variance and normality of distribution assumptions were violated, analyses of the Memory Characteristics Questionnaire (see Appendix J) ratings were conducted using the non-parametric Kruskal-Wallis test. No significant differences were found between groups for all eight items at Interview 1 ( $p = 0.18$  to  $p = 0.87$ ) or at Interview 3 ( $p = 0.14$  to  $p = 0.86$ ). Planned comparisons using Mann-Whitney U tests also revealed no significant differences at either time point ( $p = .31$  to  $p = .98$ ). To test for change over time between groups, repeated measures ANOVAs were conducted for all eight items. A significant within-subjects effect was found for the emotion item,  $F(1, 33) = 7.65$ ;  $p = .01$ ). Also, a slight trend for change over time was found for “relive the event”,  $F(1, 33) = 2.79$ ,  $p = .10$ , and for “see the event”,  $F(1, 33) = 3.15$ ,  $p = .09$ . However, no between-groups effects were found ( $p = .17$  to  $p = .73$ ).

### **Participants' guesses**

Finally, in terms of participants' guesses about which event was false at the end of the third interview, only one participant guessed incorrectly. This participant was in the “photograph from that time period” context.

### Study 1 Discussion

The primary purpose of Study 1 was to determine how the same true photograph introduced with different information about its frame of reference (i.e. whether it was taken during the event or during the time period that the event occurred) would differentially impact the breadth of memory retrieval models generated, and in turn, false memory formation. The findings suggest that a photograph introduced as representing the time period during which the false event took place generates higher false memory formation compared to one that is said to represent the actual event. Individuals in the former condition are free to use the vivid visual cues of the photograph as a springboard to generate their own, related visual imagery, rather than be limited to trying to generate a mental representation restricted to the visual cues in the photograph. That is to say, the manner in which the photograph is framed determines what one searches for, and in some framings, what is searched for is more narrow. Excessively narrow searches are problematic when it comes to retrieval (or fabrication), as they restrict access to autobiographical memory. This makes it more difficult to generate candidate mental products when trying to retrieve an event. The inability to generate a suitable mental product can then be deemed as diagnostic of event non-occurrence, and the event is more likely to be rejected.

A cue representing a narrower frame of reference refers to a single event, and thus preferentially favours activation at the ESK level. This knowledge level is most associated with imagery and a sense of “pastness” (Conway, 1992), and is thought to trigger auto-noetic consciousness (a sense of recollectively experiencing the past or “mental time travel”), a key component in episodic remembering (Tulving, 1983). This,

Table 5:

*Means and standard deviation for all Autobiographical Belief and Memory*

*Questionnaire (ABMQ) variables at Interview 3*

Condition	General Plausibility		Personal Plausibility		Belief		Memory	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
No Photo	5.00	1.54	4.50	1.88	3.58	1.62	2.00	1.21
Photo During Event	4.42	1.98	4.67	1.78	4.00	1.86	1.50	1.45
Photo Time Period	5.25	1.91	5.83	1.64	4.33	2.43	3.17	2.04

*Note: N for all conditions = 12*



Figure 6. *Mean Autobiographical Belief and Memory Questionnaire (ABMQ) Memory ratings at Interview 3*

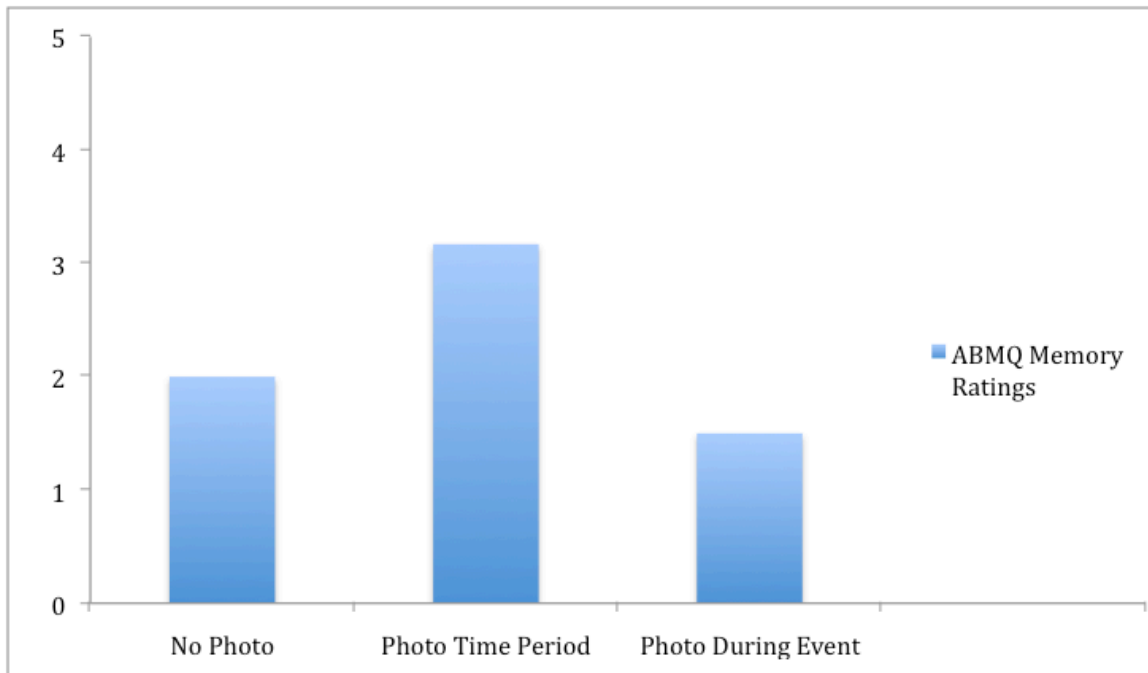


Table 6.

*Means and standard deviation for all Memory Characteristics Questionnaire (MCQ) variables at Interview 1 and Interview 3*

Item	Interview 1						Interview 3					
	No Photo		Photo During Event		Photo Time Period		No Photo		Photo During Event		Photo Time Period	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Relive event	1.25	0.62	1.17	0.39	1.58	1.24	1.42	0.67	1.42	0.67	1.92	1.40
See the event	1.75	1.48	1.42	0.90	1.67	1.50	1.92	1.44	1.58	0.67	2.21	1.62
Hear the event	1.08	0.29	1.25	0.62	1.58	1.16	1.25	0.45	1.33	0.89	1.58	1.24
Feel emotions	1.58	0.79	1.33	0.49	1.29	0.75	2.08	0.90	1.92	1.08	1.71	0.86
Remember/know	1.33	0.89	1.17	0.58	1.63	1.46	1.25	0.62	1.33	0.65	1.92	1.62
Coherent story	1.00	0.00	1.08	0.29	1.54	1.47	1.17	0.40	1.25	0.87	1.71	1.51
Believe occurred	1.08	0.29	1.25	0.87	1.63	1.20	1.17	0.58	1.33	0.89	1.92	1.50
Talked/thought	1.08	0.29	1.00	0.00	1.08	0.29	1.42	1.44	1.17	0.58	1.33	0.89

*Note: N for all conditions = 12*

in turn, gives the individual a sense of rapidly activated information about the qualitative characteristics of a retrieval product. If rapid, auto-noetic, “reliving-the-moment” type processing does not occur, spreading activation will be too diffuse and the event is thus less likely to be endorsed as true. In other words, cues intended to preferentially activate ESK prompt the generation of a narrow memory search model and are held to the highest degree of scrutiny: either a stable pattern of activation must occur, or the working self-concept “gate keeper” prohibits access to the autobiographical knowledge base.

Conversely, the wider framing preferentially favours activation of the autobiographical knowledge base more so at the general events level, rather than at a specific single event level. A broader memory search model is generated, which fosters a more stable pattern of activation across the autobiographical knowledge base than does activation at the event-specific level. This is consistent with the previously-introduced concept of constraint, in that the wider framing confers less constraint on the ability to generate idiosyncratic event-related imagery. The freedom to imagine, as well as repeated imagination as occurred in the present study, serves to increase fluency of processing, familiarity, and vividness while decreasing awareness of the cognitive operations used to generate the image in the first place (Henkel, 2004). The result is that the features that distinguish imagined from experienced events become blurred and less distinct as markers of source, thereby promoting source monitoring errors (Henkel, 2004). A narrower framing, by contrast, attenuates the degree of imagery formed. As has been demonstrated previously, cues that constrain imagination decrease the likelihood of source monitoring errors thereby reducing opportunities for false memory formation (see Garry & Wade, 2005; Hessen-Kayfitz & Scoboria, 2012).

Comparing the present findings with existing literature, it is notable that the “no photo” condition is similar to Garry and Wade’s (2002, 2005) and Lindsay’s (2004) narrative alone conditions. Additionally, the “photo during that time period” condition is similar to Lindsay’s (2004) true photograph condition and the “photo during event” condition is similar to Garry and Wade’s (2005) doctored photograph condition – with respect to the frame of reference within which the photograph is interpreted. In the present study, imagery and memory formation was higher in the “no photo” condition than in the “photo during the event” condition. However, this effect appeared to be largely driven by a large percentage of image formation in the “no photo” condition. This is consistent with Garry and Wade’s (2005) and Lindsay’s (2004) pattern of findings in that those in a narrative condition typically generated a greater percentage of imagery as compared to those in a photograph condition (doctored, event-specific and non-doctored, non-event-specific, respectively). This phenomenon is consistent with the argument that narratives confer a greater freedom to imagine event details idiosyncratically. In sum, the findings from the present study replicate those of Garry and Wade (2005) when comparing a false narrative to an event-specific false photograph. However, these findings extend the previous work by demonstrating that when the frame of reference is explicitly manipulated, the pattern of findings reverses. That is to say, the photograph that is interpreted as representing a broader (versus narrower) frame of reference confers greater false-memory promoting power compared to a narrative.

Although narratives alone confer greater freedom to imagine event details, this imagery generation does not become attributed to memory, as observed by low subjective memory ratings in this group. It is possible that imagery generation in this condition is

more effortful and requires significantly more cognitive operations (qualitative feature that is not typically associated with autobiographical memories) than it would in the context of an assistive photograph. Referencing the decrease in imagery generation across time in this condition, it appears that individuals initially do engage in the retrieval task and generate a mental representation of some kind. However, when this mental representation is evaluated according to metacognitive beliefs about memory, it does not meet the criterion threshold and thus the event is rejected. Alternatively, the lack of a suitable mental product is deemed to be diagnostic of event non-occurrence. As such, when presented with the narrative retrieval cue in the third session, a large percentage of individuals are simply not initiating a memory search as they have determined that the event did not occur.

Although not statistically significant owing to possible lack of power on account of a small sample size, both objective judges' memory ratings and participants' own subjective memory ratings were higher in the "during that time period" condition compared to the "no photo" condition. This is consistent with Lindsay's (2004) findings in that their narrative with photograph condition resulted in a higher false memory formation rate compared to the narrative alone (i.e. no photo) condition. In the case of SMS, the broader frame of reference implied by the photograph encourages entry into the autobiographical knowledge base at the general event level. The resulting imagery – possibly more vivid on account of the rich visual and self-relevant cue of the photograph – is more likely to be deemed to be a memory than that formed secondary to a narrative alone, and thus the false event is more likely to be endorsed as true. In the case of SMF, the assistive photograph provides vivid perceptual details that enhance the images created

by the narrative. This phenomenon is termed “feature importation,” which involves taking phenomenological features from one source (i.e. photograph) and inserting into the mental product generated whilst trying to remember a target event (Henkel, 2011). In this manner, the mental product imagined acquires features that are characteristic of actual perceptual experience, thereby promoting source monitoring confusions. Additionally, this enhanced imagery promotes the more rapid, heuristic processes of retrieval, which is more likely to bring about source monitoring errors, and in turn increasing the likelihood of false memory endorsement.

Finally, both objective judges’ memory ratings and participants’ own subjective memory ratings were highest in the “photo during time period condition” as compared to the other two conditions combined. This finding was supported by significant differences in the ABMQ subjective personal plausibility ratings, in that individuals in the “photo during time period” condition considered the false event to be more personally plausible than did those in the other two conditions. In this condition, the narrative orients individuals to the vivid visual cues of the photograph, which in turn orients them to examine a particular time period when the event may have occurred. This condition allows for the rapid generation of mental products of sufficient quality to be deemed a memory, as reflected in the high false memory formation rate in the first session.

The ease of forming vivid and event-specific mental products— or fluency of processing — may have contributed to feelings of familiarity, thus making the event seem more autobiographically plausible. The perception of the plausibility of an event has been demonstrated to increase belief in the event’s occurrence (Mazzoni, Lofus & Kirsch, 2001). Although no statistically significant differences in belief were noted, increased

personal plausibility, coupled with methods to enhance the quality of mental products (i.e. imagination, context-reinstatement, and guided imagery), increase the likelihood of false memory formation (Scoboria et al., 2004). The “no photo” photograph condition promotes the generation of mental products, but ones that lack the necessary qualitative characteristics to be labeled as memories, whereas the “photo during the event” condition restricts the freedom to generate mental products by virtue of the narrow frame of reference within which the photograph must be processed. The “photo during time period” condition seems to capitalize on the broader framing while using the narrative to anchor the memory search such that the generation of mental products is guided. This may serve to enhance the “feature importation” phenomenon noted above (Henkel, 2011).

Again, on account of a possible lack of power due to the small overall sample size, the findings from the objective judges’ ratings were largely limited to trends approaching significance. Aside from a lack of power, a possible reason for trends observed in the objective rating not attaining significance may be that even if participant felt confident in their memory for the event (and gave a high memory rating), this subjective experience may not have been verbally expressed with sufficient descriptive detail so as to be coded as a memory by the judges. This highlights the importance of including both objective and subjective measures when conducting false memory research. It is the extent to which an individual perceives him or herself as remembering something that carries a larger weight in legal and therapeutic settings.

The Memory Characteristics Questionnaire (MCQ) was used primarily as an exploratory measure to help understand the qualitative factors (e.g. visual imagery, emotional content, event coherence) that may have influenced the ABMQ memory

ratings as participants engaged in the memory recovery task. Unfortunately, aside from a significant increase over time on item 4 (emotional content), no other differences were found. However, it is notable that emotional content is a primary characteristic associated with rich autobiographical memories (Cabeza & St. Jacques, 2007). As such, as they continued to re-engage with the experimental stimuli, participants endorsed an elevation in emotional experiencing associated with the event, which may have impacted their ABMQ memory endorsements.

Finally, the fact that at the end of the study, all but one participant guessed correctly as to which event was false bears comment. Possible explanations include the role of demand characteristics and participant compliance, in that participants may have inferred the purpose of the study and either consciously or unconsciously modified their responses in line with what they thought the experimenter wanted. However, it is notable that both objective and subjective measures of memory showed significant and predicted differences. Moreover, the patterns of imagery and memory generation in each condition are consistent with both theory and with existing literature. As such, it seems likely that individuals genuinely formed false memories, and that they provided verbal output and subjective ratings reflective of this. Moreover, once they made a decision to not reject the event (i.e. formed an even tentative belief in the event's occurrence), confirmation bias may have played a role to entrench this belief and prevent event rejection. Confirmation biases inflate confidence in one's beliefs such that these are strengthened and are resistant to change, even if presented with new evidence to the contrary.

Although definitive diagnostic conclusions about what truly occurred are not possible, the findings from the present study have important implications in terms of



external validity. To wit, in therapeutic and legal settings, participants own accounts as well as their subjective evaluation of their experiences is what carries the most weight. Put simply, if one claims that they remember something, and can provide enough descriptive detail to convince a therapist, a judge, or a jury that they remember, the origin and strength of that memory is rarely questioned.

## CHAPTER IV

### Study 2 Method

#### Participants and Setting

Of the 300 participants invited to participate, 42 provided their parents' contact information. Thirty-five responses from parents were received. Two participants were unable to be reached for scheduling. As such, the sample included 33 University of Windsor students (32 female) between the ages of 17 and 30 ( $M = 19.5$ ,  $SD = 1.8$ ). Participants received either cash (\$20 for attending all three sessions) or academic credit as compensation for participation, and were also entered in a raffle for 2 prizes of an audio player.

#### Design and Materials

**Soliciting information from parents.** These procedures were identical to those in Study 1.

**Booklets.** Four photographs were selected from those provided and scanned in at high resolution. One of these photographs was doctored using Adobe Photoshop<sup>®</sup> and was accompanied by a narrative which described the hot air balloon ride. A booklet was created, which contained four 4 X 6 black and white photographs, one on each page printed at high resolution (1200 dpi). All conditions included a brief description denoting the event, the age of the participant at the time, and a sentence describing what took place. Participants were told that photographs were black and white because the originals submitted needed to be scanned, digitalized, and returned to their parents in good condition and that the printer used only enables black and white printing.

**Creation of Conditions.** Prior to the first session, participants were randomly assigned to the three experimental conditions: 1) Doctored, event-absent photograph

(depicting the participant and parent, doctored to be posing against a nondescript background); 2) Doctored non-event-specific photograph (depicting the participant and parent, doctored to be posing against a nondescript background with an inserted hot air balloon floating in the sky); and 3) Doctored event-specific photograph (depicting the participant and parent posing inside the basket of a hot air balloon). All photographs were doctored using Adobe Photoshop<sup>®</sup>. The hot air balloon in both doctored photographs was the same stock image as that employed in the original Wade et al (2002) study, whereas the image of the participant and their parents was obtained from the photographs provided by parents. Regarding the latter, the original photograph provided by parents was altered to remove all content aside from the participant and their parent (i.e. other people, background, and the like). These images were then resized, shaded/brightened, and/or adjusted for relative spacing so as to fit into the stock image of the hot air balloon. In the second condition, it was presented in the immediate background behind the participant and their parent, whereas in the third condition, an image of the participant and their parent was inserted into the hot air balloon image. All three photographs were doctored. The configuration of detail in photographs is depicted in Figure 7.

### **Measures**

The measures were identical to those used in Study 1. Regarding the coding of audio taped session transcripts, judges attained an inter-rater agreement of 88% on the actual transcripts; disagreements were resolved through discussion.

### **Procedure**

The procedure was identical to that used in Study 1, the only difference being that no narratives were read aloud to the participant, and the photographs were not introduced

with any form of framing instruction as in the first study. Each photograph was placed in front of the participant, and they were asked to describe everything that they could remember about the event without leaving anything out.

Figure 7. *Illustration of the three experimental conditions in Study 2.*

Doctored Event-Absent



Age: 4-6

Event: Hot air balloon ride

Description: You and [mom/dad] went up in a hot air balloon at an amusement park

Doctored Non-Event-Specific



Age: 4-6

Event: Hot air balloon ride

Description: You and [mom/dad] went up in a hot air balloon at an amusement park

Doctored, Event-Specific



Age: 4-6

Event: Hot air balloon ride

Description: You and [mom/dad] went up in a hot air balloon at an amusement park

## CHAPTER V

### Study 2 Results

Near the middle of data collection for this study, it was discovered that some participants were aware of the purpose of the study. The reason for this is that the textbook used in the fall term of the introductory psychology course discusses the original hot air balloon studies upon which the current work is based in detail. At the end of the procedure in this study, participants were subsequently asked to identify the purpose of the study prior being debriefed. Those who indicated that they had (i.e. identified that they thought it was a false memory study) were asked what had given them the impression that the study was exploring false memories. Response variously included reference to speaking, learning, or reading about such research in class. Some also made explicit reference to having seen what appeared to be the exact same stock hot air balloon photograph in a textbook. As the data quality for these participants is unusable, analyses were only conducted on the data set omitting participants identified as being aware of the study's intent (i.e. valid participants;  $N = 19$ ).

#### Judges' Ratings

**Overall images and memories formed.** Analyses found that at Interview 3, 33% of participants were judged to have memories for the false event, compared to 5% at Interview 1,  $t(17) = 2.56, p = .030$ . Furthermore, 38% of participants were judged to have generated images or memories at Interview 3, as compared to 21% at Interview 1,  $t(17) = 1.84, p = .083$ , although this difference was not statistically significant.

**False memory formation rates across groups.** Logistic Regression was used to analyze the frequencies of the judges' ratings of interview transcripts. To review from

above, it was hypothesized that doctored, event-absent photograph would yield higher rates of false memory formation as compared to doctored-event-specific photograph. It was also hypothesized that doctored, non-event specific photographs would yield the highest false memory formation rate as compared to both doctored, event-absent photographs and doctored, event-specific photographs.

At both Interview 1 and Interview 3, the analyses revealed no significant effects in this regard, thus the hypotheses were not supported. The frequency of image and memory formation in the doctored, event-absent and doctored, event-specific groups was identical (42.86%), and the doctored, non-event specific group did not form any images or memories (0.00%). At Interview 1, 14.29% of participants in the doctored, event-absent group formed memories – the only group to form memories alone at this time point (see Table 7).

At Interview 3, 42.86% of participants in the doctored, event-absent photograph condition formed images or memories as compared to 57.15% in the doctored, event-specific photograph condition ( $B = .575$ ,  $SE = 1.808$ ,  $Wald = .284$ ,  $p = .594$ ,  $\text{Exp}(B) = 1.778$ ). Regarding memory formation alone, 42.86% of participants in each condition formed memories.

### **Autobiographical Belief and Memory Questionnaire (ABMQ)**

Hypotheses for group differences on these ratings were the same as for the objective judges' ratings. Given that the data violated the assumption of normality necessary for parametric tests, Mann-Whitney U planned comparisons were performed. Although analyses failed to support the hypotheses, nor were there any significant differences found between groups on plausibility and belief ratings, exploratory analyses revealed an

overall quadratic trend approaching significance for belief,  $F(1,18) = 1.36, p = .074$ ).

Pairwise comparisons using LSD post-hoc tests found a difference between the doctored, non-event-specific photograph condition and the doctored, event-specific condition that was approaching significance ( $p = 0.056$ ) in that the participants in the latter condition gave higher ratings on this item than did those in the former.

### **Memory Characteristics Questionnaire (MCQ)**

Given that both homogeneity of variance and normality of distribution assumptions were violated by all of the items, analyses of the Memory Characteristics Questionnaire (see Appendix J) ratings were conducted using non-parametric tests.

At Interview 1, differences approaching significant were found between groups for the following MCQ items: relive event,  $X^2(2, N = 19) = 5.75, p = .056$ ); see event,  $X^2(2, N = 19) = 5.75, p = .056$ ); hear the event,  $X^2(2, N = 19) = 5.75, p = .056$ ); and feel emotions,  $X^2(2, N = 19) = 5.74, p = .057$ ). Planned comparisons to test hypotheses using Mann-Whitney U tests revealed differences approaching significance in memory quality ratings for the above items in that participants in the doctored, event-absent photograph condition gave higher ratings than did those in the doctored, event-specific photograph condition, thereby providing partial support for the first hypothesis at Interview 1 (all  $U = 14.00, p = .061$ ). No differences in memory quality ratings were found between participants in the doctored, event-absent condition compared to the doctored, non-event-specific photograph condition, nor between participants in the doctored, non-event-specific photograph condition compared to the doctored, event-specific photograph condition (all  $p > 0.10$ ).



Table 7.

*Percentage of image and memory formation per judge's ratings by experimental condition and time – valid participants*

	Interview 1			Interview 3		
	None	Images	Memories	None	Images	Memories
Doctored, Event-Absent	71.43%	14.29%	14.29%	57.14%	0.00%	42.86%
Doctored, Non-Event-Specific	100.00%	0.00%	0.00%	100.00%	0.00%	0.00%
Doctored, Event-Specific	71.43%	28.57%	0.00%	42.86%	14.29%	42.86%

Note: Doctored, Event-Absent Photo, n at I1 = 7, n at I3 = 7; Doctored, Non-Event-Specific, n at I1 = 5, n at I3 = 4; Doctored, Event-Specific, n at I1 = 7, n at I3 = 7.

Figure 8. Percentage of memory formation for false event per judge's ratings by experimental condition at Interview 3

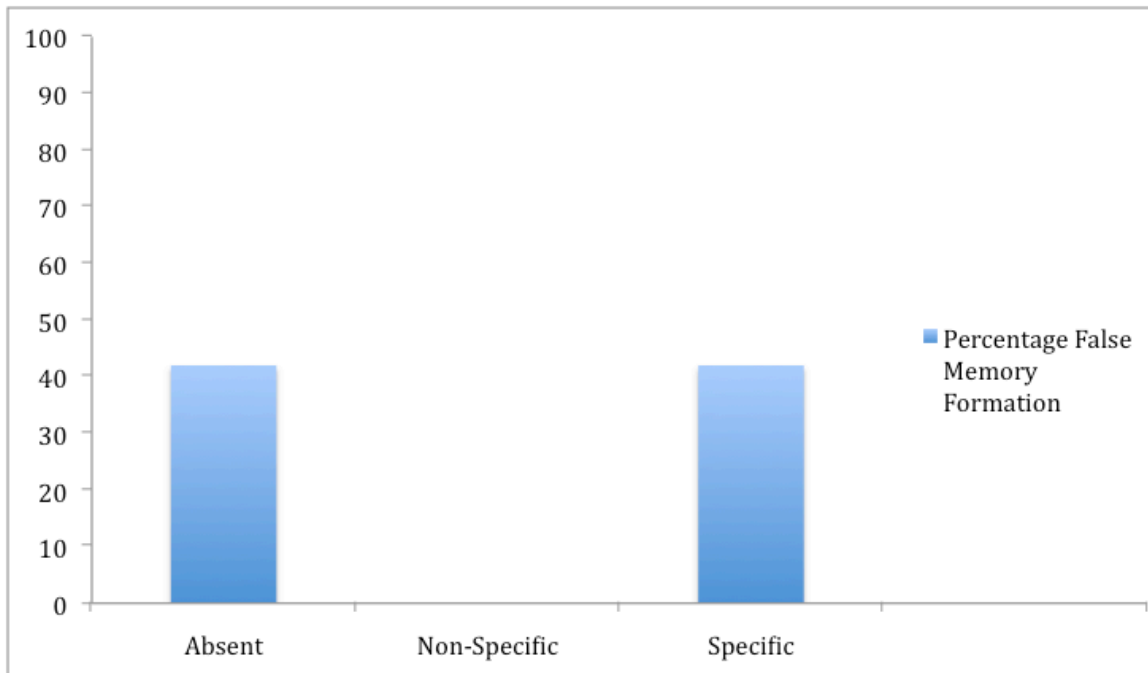


Table 8.

*Means and standard deviation for all Autobiographical Belief and Memory*

*Questionnaire (ABMQ) variables at Interview 3 – Valid participants*

Condition	General Plausibility		Personal Plausibility		Belief		Memory	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Doctored, Event-Absent	4.43	1.61	4.57	1.51	3.86	1.95	1.71	1.11
Doctored, Non-Event-Specific	4.40	1.52	4.00	2.00	2.00	1.00	1.00	0.00
Doctored, Event-Specific	4.71	2.14	4.29	2.56	4.86	3.24	1.29	0.76

Note: Doctored, Event-Absent, N = 7; Doctored, Non-Event-Specific, N = 5; Doctored, Event-Specific, N = 7.

No significant differences were found between groups for all eight items at Interview 3 (all  $p > 0.1$ ). Planned comparisons using Mann-Whitney U tests also revealed no significant differences (all  $p > 0.1$ ). Finally, aside from one group that showed slight deviation from rating items on the scale floor, there was zero variance for most of the items. As such, any analyses involving the Interview 1 data for these two groups (including contrasts between groups at Interview 1 and Interview 1/Interview 3 contrasts) could not be conducted.

### **Participants' guesses**

Finally, in terms of participants' guesses about which photograph was false at the end of the third interview, only one participant guessed incorrectly. This participant was in the doctored, event-specific photograph condition.

### **Study 2 Discussion**

The primary purpose of Study 2 was to determine if there existed a “middle ground” between event-absent doctored photographs and event-specific doctored photographs, which capitalizes on the benefits while minimizing the detriments of each photograph type. An important caveat to the following discussion is that any explanations or conclusions are made very tentatively. Prior exposure to the experimental stimulus (i.e. the image depicting the original hot-air balloon study) was not experimentally manipulated and it is simply not known how many participants were in fact exposed to same. As such, it is entirely possible that the valid data in fact includes individuals who had been exposed to the false memory study/photograph in class and had figured out the purpose of the study – but who were not identified as such.

To review, doctored-event specific photographs imply a narrow framing for

Table 9.

*Means and standard deviation for all Memory Characteristics Questionnaire (MCQ) variables at Interview 1 and 3*

Item	Interview 1						Interview 3					
	Doctored, Event-Absent		Doctored, Non-Event-Specific		Doctored, Event-Specific		Doctored, Event-Absent		Doctored, Non-Event-Specific		Doctored, Event-Specific	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Relive event	1.64	1.21	1.00	0.00	1.00	0.00	1.45	1.04	1.73	1.19	1.36	0.67
See the event	1.64	1.21	1.00	0.00	1.00	0.00	1.45	1.04	1.55	0.93	1.45	0.93
Hear the event	1.64	1.12	1.00	0.00	1.00	0.00	1.45	1.04	1.18	0.40	1.18	0.60
Feel emotions	1.91	1.38	1.00	0.00	1.00	0.00	2.27	1.27	1.82	1.25	1.73	1.27
Remember/know	1.27	0.65	1.00	0.00	1.00	0.00	1.36	0.92	1.54	1.03	1.00	0.00
Coherent story	1.27	0.91	1.00	0.00	1.09	0.30	1.36	0.92	1.18	0.40	1.09	0.30
Believe occurred	1.46	1.21	1.09	0.30	1.00	0.00	1.55	1.04	1.36	0.67	1.45	1.04
Talked/though	1.09	0.30	1.00	0.00	1.00	0.00	1.00	0.00	1.36	1.21	1.00	0.00

memory retrieval as dictated by their content. That is to say, because they depict the target event, the implied frame of reference is that they were taken during the event. Additionally, despite conveying rich perceptual details, doctored, event-specific photographs constrain key aspects of processing (i.e. via the implication that the event occurred exactly as depicted and thus should be remembered that way). The resulting memory search model is narrower, thereby attenuating the total amount and/or quality of images formed, and in turn lowering the overall percentage of 'memory' formed. Doctored, event-absent photographs, on the other hand, imply a broader framing within which to interpret the photograph. The breadth of the memory search model created in response to this cue allows for greater freedom to generate a mental representation of the target event. As Study 1 has demonstrated, this feature fosters false memory formation.

In pursuit of a middle ground, a doctored, non-event specific photograph was thought to capitalize on the temporal narrowed frame of reference that would focus the generation of a memory search model. Simultaneously, owing to the fact that the participant was not depicted as engaging in the actual event, the level of constraint on processing would be reduced. That is to say, individuals would be free to use the visual cues in the photograph to generate an idiosyncratic image of what the event would have looked like. This type of photograph was thought to preferentially encourage activation of the autobiographical knowledge base at the general event level. Similarly, given that both self-relevant and target-event-related cues are presented in a non-specific format, the raw materials for idiosyncratic imagery generation, binding of elaborated retrieval cues with mental products, and subsequent source monitoring errors would be in place.

Predicted differences in objective memory judgments and subjective memory ratings were not observed. By the end of the third interview, both those in the event-absent and event-specific conditions were judged as having an equal frequency of memory formation. A possible explanation for this pattern of memory progression from Interview 1 to Interview 3 may be that – although not an ideal cue for autobiographical *memory* formation - the photographs in these two conditions were deemed more autobiographically *believable* than that in the non-event specific condition, as was found in the subjective belief ratings. As such, participants in the two former conditions continued to engage in attempts at memory retrieval, which contributed to verbal output that was deemed by objective raters to constitute a memory. Nevertheless, these individuals did not subjectively experience the mental products retrieved to be of sufficient quality to be deemed as memories, as was reflected in their subjective memory ratings. Conversely, those in the latter condition may have deemed the inability to generate any kind of mental representation to be diagnostic of event non-occurrence, deemed the event to be less autobiographically believable (as compared to the other two conditions) and thus they abandoned attempts at memory retrieval. This was reflected in both their verbal output and their own ratings of their memory for the event.

Overall, subjective memory ratings were at or near the scale floor. However, the doctored, event-specific photograph yielded the highest belief ratings, followed by the doctored, event-absent photograph, followed by the doctored, non-event-specific photograph. In the case of the former, the photograph constitutes a highly personalized suggestive cue compared to the former. Such cues have been demonstrated to promote false autobiographical belief formation (Scoboria, Mazzoni, Jarry & Bernstein, 2012).

Quite simply, if an individual is shown a photograph that they are told was provided by their parents (credible source), and the photograph depicts them engaging in an event (personalized suggestion), they are likely to find the event autobiographically believable even if they do not endorse a memory for same. Unless given explicit reason for doing otherwise, individuals generally trust photographs as being legitimate. This evidentiary status of photographs bolsters their suggestive power to convince the viewer of the event's occurrence (i.e. photograph inflation effect; Henkel, 2011; Henkel & Carbuto, 2008).

Turning to the event-non-specific condition, it was thought that this photograph would yield an ideal memory retrieval model, whereas doctored, event-absent photographs would result in one that is too wide and doctored, event-specific photographs would result in one that is too narrow. Unfortunately, this condition did not yield any imagery or memory judgments, nor did it yield particularly high subjective belief ratings. One possible explanation is that the methodological manipulation was not as compelling for some reason. Although theoretically grounded, the specific manner in which the stimulus was constructed may have been a methodological flaw that could only have been discovered once data was collected. Perhaps instead of minimizing disadvantages and capitalizing on advantage inherent in the other two photograph types, this photograph ended up doing just the opposite. The doctored, non-event-specific photograph represents a substantial but fairly unsophisticated digital manipulation (i.e. involved the simple insertion of a hot-air balloon image into what otherwise looks like a legitimate photograph) compared to the other two conditions. In a culture where digital alteration is becoming increasingly common, individuals are aware of the ease with which details can



be inserted into otherwise true photographs, such that it may have been called out as false with greater ease. The doctored, event-specific photograph, on the other hand, involves a much more sophisticated and complex digital manipulation that may have conferred a degree of believability to it. Given that encountering such carefully digitally altered photographs of oneself is highly uncommon, even those who immediately concluded that they did not remember the event did not reject the veracity of the photograph.

An alternative explanation deserving of equal consideration is that, contrary to what was theoretically hypothesized, this particular photograph did not represent an ideal memory retrieval cue. It was thought that, by providing a visual cue that contained components of the target event but did not actually depict the event, participants would be more free to generate their own idiosyncratic event-related imagery, thereby increasing the likelihood of source-monitoring errors. However, the manner in which the photograph was constructed may have nevertheless conveyed too much event-specificity for the cue to work as it had been intended to. Instead of being technically flawed as proposed above, it is the inherent message that is communicated by the photograph content that the event-related mental image that is constructed must match the exact hot-air balloon in the exact way in which it was depicted. Albeit slightly less so than the actual event-specific photograph, it may nevertheless have been too specific, and thus not provided sufficient freedom to imagine the event entirely idiosyncratically. In fact, based on objective data, no mental products were generated in response to this cue at any time point.

Assuming, however, that participants did form some types of mental products, but failed to provide sufficient verbal output to be objectively judged as imagery, it would appear that generating imagery was most difficult in this condition compared to the other

two. Effortful imagery generation involves a degree of cognitive operation - a qualitative feature that is typically not associated with autobiographical memories (Johnson, Hashtroudi & Lindsay, 1993). Conversely, if no mental products were indeed generated, Mazzoni and Kirsch (2002) propose that the next step is to decide whether the absence of memory is diagnostic of the event not having occurred (Strack & Bless, 1994). This process is based on metacognitive beliefs that individuals have about memory, which include: 1) the more time that has elapsed between encoding and retrieval increases the likelihood of forgetting, so not having a sufficiently good mental product in such a case would not be diagnostic of non-occurrence; 2) events that occurred early in life (i.e. before the offset of childhood amnesia) are also likely to be forgotten; and 3) the more distinctive the event, the more likely it should be remembered, whereas less distinctive events are less likely to be remembered. Therefore, not remembering an event that is deemed to be fairly rare or unusual like a hot air balloon ride may suggest that the event did not actually occur and thus neither autobiographical beliefs nor memories were formed.

Comparing the present findings to the existing literature, it is notable that the doctored, event-specific photograph is similar to Garry and Wade's (2005) doctored photograph condition and to Hessen-Kayfitz and Scoboria's (2012) self-relevant, unconstrained condition. Garry and Wade (2005) found that at the conclusion of three interviews, approximately 32% of participants in the photograph condition were judged as having a memory for the event and approximately 18% formed images alone. Hessen-Kayfitz and Scoboria (2012) found an 18.65% frequency of memory formation and a 28.41% frequency of imagery formation. In the present study, 42.86% of participants

were judged as having a memory for the event and 14.29% formed images alone. As such, these findings are consistent, if not superior to these studies.

Overall, the present study demonstrates that individuals in the event-absent and the event-specific conditions were found to form memories at an equal frequency. These two groups also formed autobiographical beliefs in the event's occurrence, with those in the doctored, event-specific photograph giving the highest ratings. Providing a description sufficient to be judged as a memory by an objective judge, coupled with the subjective endorsement in autobiographical belief in the event's occurrence (even in the absence of a subjective memory for same), has important implications. As noted in the first study, it is the extent to which an individual believes in the occurrence of an event that carries a larger weight in legal and therapeutic settings, as will be discussed below.

## CHAPTER VI

### General Discussion

The purpose of this work was to determine which type of photograph (non-event-specific or event-specific) constitutes a superior retrieval cue. These two photograph types differ in both content (i.e. one depicts the target event and one does not) as well as in the frame of reference implied by that content, which in turn impact the breadth of the memory search model generated. Referencing the frame of reference, doctored event-specific photographs imply that they are representative of the event exactly as it occurred, whereas non-event-specific photographs are not as restrictive in this regard. As such, to determine which is a superior retrieval cue, these two factors needed to be separated and studied in turn.

#### **Role of frame of reference on memory retrieval model**

The first study sought to examine how the manner in which a photograph is framed would influence false memory formation. The frame of reference implied by event-specific photographs is content-restricted. Because the event itself is depicted in the photograph, this type of photograph does not lend itself to searching for information beyond the specific moment depicted (i.e. other trips to amusement parks, other instances of being on a scary ride). In other words, a doctored, event-specific photograph has a very constrained frame of reference. Non-event-specific photographs, on the other hand, can be introduced as representative of the event itself, or of the time period during which the event occurred. This is because the event is not depicted therein, and thus nothing in the content of the photographs restricts the ability to introduce them as representative of either frame of reference. Given their malleability in this regard, true photographs were

used to study whether the frame of reference plays a role in generating a memory retrieval model that facilitates false memory formation.

The findings suggest that retrieval cues that favour the generation of a broader memory search model do play an important role in remembering. Both subjective and objective data demonstrated that the wider temporal frame of reference of the “from that time period” condition led to higher false memory formation compared to the narrower frame of reference of the “during the event” condition. As such, it cannot be simply concluded that merely adding a photograph to a false narrative will enhance false memory formation. It is the manner in which that photograph is framed when it is presented that determines how the photograph is processed (and the breadth of the resulting memory retrieval model generated), that is central to its facilitative power in enhancing or impeding false memory formation. A broader frame of reference allows for a photograph to be used/processed as an aide to enhance the natural, idiosyncratic imagery elicited by the narrative. Imagery is not restricted by trying to remember the event within the specific confines of the photograph. Rather, the photograph provides rich and vivid raw materials to complement the event-related imagery conjured up by the narrative (e.g. “Here is one park I’ve been to around this age; perhaps the event occurred here or perhaps it was elsewhere). A narrower frame of reference causes a photograph to be processed more rigidly, in that whatever mental products are generated must include the visual cues in the photograph (e.g. “Here is the park where the event occurred; I must remember the event as occurring in this park”).

Overall, a photograph does not have to depict an event, nor even be viewed as being representative of the event, in order to exert a powerful influence on false memory

formation. Additionally, the pattern of imagery and memory formation over time suggests that a false narrative paired with a photograph representative of a wider temporal frame of reference results in rapid imagery and memory facilitation. Although both the no-photo and “photo time period” conditions both yield rapid imagery development, the latter theoretically yields a more stable pattern compared to the other two conditions.

Additionally, the “photo time period” condition yielded immediate and stable memory formation. As noted above, this condition yielded the highest personal plausibility and belief ratings compared to the other two conditions, albeit not statistically significant.

Although high ratings on these factors are not sufficient to produce false memories (Scoboria et al., 2004), the degree to which the mental representation is enhanced leads to the image now exceeding the threshold according to which mental products are evaluated, which in turn may serve to enhance the speed and stability with which false memories are formed.

### **Role of photograph content on memory retrieval model**

The second study sought to determine whether there existed a “middle ground” between non-specific true photographs and event-specific doctored photographs that capitalizes on the benefits while omitting the detriments of each. The event-absent and the event-specific conditions yielded false memories at an equal frequency. These two groups also formed autobiographical beliefs in the event’s occurrence, with those in the doctored, event-specific photograph giving the highest ratings. This pattern of findings is not consistent with the original experimental hypotheses. As previously noted, conclusions drawn from the findings are intended to be cautious.

Regarding the doctored, event-absent photograph and the doctored, event-specific

photograph, it was originally hypothesized that the former would yield a higher false memory formation rate than the latter. The theoretical rationale for this has been outlined above. Briefly, the event-absent photograph conferred what was thought to be an advantage by allowing for the generation of idiosyncratic imagery whereas the event-specific photograph was thought to constrain imagination to match the exact cue depicted. Comparing this condition with the “photograph from that time period” period condition of the first study, the photograph is visually the same. However, the provision of the narrative in the first study provides a storyline to guide how the visual cues in the photograph are pieced together to generate event-related mental products. Without the benefit of such a narrative, the participants in the event-absent condition may have had a more difficult time constructing mental products, thereby impacting their ability to form autobiographical beliefs to the extent that those in the event-specific condition could. Referencing the latter, the rigid specificity of the cue served to restrict the generation of idiosyncratic event-related mental products. However, the fact that the photograph displayed the participant engaging in the target event, coupled with the credible source information as well as a rationale about why events that occurred long ago are more difficult to remember, prevented the immediate rejection of the event despite initial difficulties in remembering. These factors, in concert, likely served to elevate the personal plausibility of the event. As previously noted, increased event plausibility has been empirically demonstrated to increase belief in the event having occurred (see Mazzoni & Kirsch, 2002 for a review).

To test these phenomena, specifically comparing event-absent and event-specific photographs, a possible direction may be to pair a narrative with each photograph type.

That way, the narrative can guide the nature of the event-specific imagery that is generated, and the impact of each photograph type can be studied. Additionally, the facilitative impact of each photograph type can be further examined by presenting a narrative at session 1 followed by a photograph of either type at session 2, or vice versa. This is similar to Wade, Garry, Nash, and Harper's (2010) recent study, wherein they presented participants with either a narrative followed by a doctored photograph, a doctored photograph followed by a narrative, narrative at both time points, or a doctored photograph at both time points. Findings suggested that highest false imagery and false memory formation occurred when a narrative was presented first, followed by a doctored photograph.

Moreover, given the unexpected findings regarding the doctored, non-event-specific condition, which was anticipated to yield the highest false memory formation, two possible conclusions were put forth. One was that the methodology was flawed such that the manipulation simply did not work. The second conclusion was that this condition actually created the most difficult task of imagery and memory formation for the reasons outlined above. A possible solution to the problem may be to show a true photograph of the participant with their parent (i.e. event-absent photograph) plus a separate photograph of a park with hot-air balloons. This eliminates any rejection based on perception of image doctoring, thereby addressing the first conclusion for the finding, while retaining the theoretical integrity of the manipulation in that the self-relevant and event-relevant "raw materials" are presented. The other two conditions can remain the same and a comparison can be made between all three. Additional related future research directions will be discussed below.



## Summary and implications

In sum, findings from the first study support the hypothesis that a wider frame of reference plays a facilitative role in false memory formation as compared to one that is quite narrow, as it fosters the generation of a more inclusive memory search model. It is important to note that these findings do not imply a linear relationship between the width of the temporal frame of reference and false memory formation. In fact, both SMS and SMF suggest that there exists a threshold beyond which further widening of the temporal frame of reference will serve to impede memory formation. To illustrate, asking an individual if they remember singing at a bar in the first semester of graduate school; at a bar while in graduate school, or at a bar when they were in their 20's represents an increasingly wider temporal frame of reference. As the frame widens, the quality of the cue becomes less powerful such that a memory is less likely to be accessed.

These findings are also important because they carry greater external validity that do doctored photographs – despite the increasing popularity and use of digital imaging software. That is, in therapeutic and legal settings, individuals are unlikely to encounter photographs that are digitally altered to such an extent as to depict them doing something that they did not do. In the case of therapy settings, they may peruse old family albums or family videos. In legal settings, they may view crime scene photographs (images after a crime has been committed, not images of the crime being committed) or photographs of potential suspects (who are not engaging in the criminal act, of course). In either case, individuals may be looking at these visual information sources in the context of a suggestion (i.e. “somebody in your family abused you - who could it have been?” or, “the person who committed the crime had black hair, one of the people in these

photographs did the crime – which one was it?”). Evidently, a photograph does not have to depict an event in order to exert a powerful influence on false memory formation.

In general, conclusions about the findings in the second study must be made more cautiously in light of the unanticipated experimental confound. Indeed, no definitive findings were revealed vis a vis memory formation. Nevertheless, personal plausibility and autobiographical belief emerge as important factors common to both studies. As above, in the first study, the photograph with the wider temporal frame of reference also yielded the highest personal plausibility and belief ratings as compared to the other two conditions, albeit not statistically significantly different. In the second study, the doctored, event-specific photograph condition yielded the highest personal plausibility and belief ratings.

Belief in the occurrence of an event and memory for an event are separate entities (Mazzoni & Kirsch, 2002; Scoboria et al., 2004). In fact, research has demonstrated that experimental manipulations can impact belief but not memory ratings (Hart & Schooler, 2006; Scoboria, Lynn, Hessen & Fisico, 2007). Thus, one can believe something occurred, even if they have no memory for that occurrence (e.g. although one generally does not remember being born, most individuals believe that this event occurred).

When false memories do form, autobiographical beliefs do as well (Desjardins & Scoboria, 2007; Hessen-Kayfitz & Scoboria, 2011). Autobiographical beliefs are an important construct, in that it has been demonstrated that it is the belief in an event's occurrence that motivates behavior change – whether or not a memory has developed (Scoboria, Mazzoni, Jarry & Bernstein, 2012; Geraerts, Bernstein, Merckelbach, Linders, Rayemaekers, & Loftus, 2008). Bernstein, Laney, Morris, and Loftus (2005) found that

by falsely suggesting that individuals had gotten sick on food during childhood led to an alteration in attitude toward anticipated future behavior of eating that food. However, these findings concern anticipated behavior. Scoboria, Mazzoni, and Jarry (2008) found that suggesting false past events serves to influence actual future behaviors. Berkowitz, Laney, Morris, Garry, and Loftus (2008) similarly found that suggesting to participants that they had had a negative versus a positive experience at Disneyland involving one of the characters influenced future behaviors (e.g. not being willing to pay as much for a Pluto souvenir). Moreover, the influence of false beliefs has been demonstrated to persist. Gerarts, Bernstein, Merckelbach, Linders, Raymaekers, and Loftus (2008) demonstrated that providing participants with a false suggestion that they had gotten ill on egg salad contributed to an intent to avoid this food, as well as significantly reduced their consumption of this type of food – both immediately as well as 4 months later.

Event plausibility, in turn, has been demonstrated to play an important role in the formation of false autobiographical beliefs and memories (Scoboria et al., 2006). Mazzoni & Kirsch (2002) have argued that the plausibility of an event is evaluated to determine the degree to which it could have occurred, which then dictates a decision to either suspend or engage further retrieval efforts. Moreover, Scoboria, Mazzoni, Jarry, and Shapiro (2012) recently demonstrated that only extremely implausible events were rejected. However, if the suggestion caused even a one-point increase above the floor level of plausibility, this contributed to notably stronger belief ratings. The implication here is that even events that are initially deemed relatively implausible can result in strong belief endorsements, provided they are not to be so implausible so that their status as impossible is maintained following the provision of other information supportive of the

possibility of the occurrence of the event. Although possibly an improbable event, the hot-air balloon ride event is arguably not an impossible event – as compared to, say, seeing a live dinosaur or flying. Thus, it appears that false belief formation can occur with relative ease, provided that plausibility is enhanced.

False belief formation in and of itself is not necessarily always a bad thing. In fact, research has shown that false beliefs about fattening food can result in healthy consequences (Bernstein, Lainey, Morris & Loftus, 2005). Similarly, false beliefs about past negative experiences involving alcohol consumption can influence alcohol preferences (Clifasefi, Bernstein, Mantonakis & Loftus, 2013). Research on confabulations (i.e. strongly held false beliefs) suggests they may shape one's perception of reality in a more positive direction, a sort of "wish-fulfillment bias" (Turnbull, Jenkins & Rowley, 2007). Although reminiscent of Quixotic themes of the triumph of irrationality and idealism versus reality (and despair), this is consistent with Conway's (2005) proposition that motivated confabulation can be a means of maintaining self-coherence.

However, the formation of false beliefs also has a dark side. An example of the deleterious impact of false beliefs can be found in legal setting, specifically regarding the circumstances that contribute to false confessions. Kassin and Wrightsman (1985) propose three psychologically distinct types of false confessions: 1) voluntary false confessions; 2) coerced-compliant false confessions; and 3) coerced-internalized false confessions. The latter type is most rare, and occurs when individuals come to believe that they have committed crimes of which they are truly innocent. A perusal of the literature shows no shortage of real-life case examples (e.g. Gudjonsson, 1992;

Gudjonsson & MacKeith, 1990; Kassin, 1997; Loftus & Ketcham, 1994) bolstered by controlled laboratory research demonstrating that not only that individuals can be induced into giving a false confession, but that they form a belief about their guilt despite being innocent (Horselenberg, Merckelbach, & Josephs, 2003; Kassin & Kiechel, 1996; Redlich & Goodman, 2003).

One explanation for this phenomenon lies in certain interrogation styles (e.g. the Reid Technique; Inbau, Reid, Buckley & Jayne, 2001), which contain techniques that ultimately seek out to undermine individuals' confidence in their own innocence, promote a sense of confusion and heightened suggestibility whereby individuals come to question themselves, their memory, and their beliefs (Gudjonsson, 1992). Interrogation tactics employ various strategies which have been demonstrated to impact the formation of false autobiographical beliefs (Conti, 1999), including visualization and imagination (Garry & Polaschek, 2000). Interrogation techniques wherein individuals are exposed to information that they had no prior knowledge of, such as viewing photographs, descriptions of the crime (Henkel & Coffman, 2004), coupled with the suggestion of culpability, has been demonstrated to foster source misattributions (Johnson et al, 1993) in that individuals can come to attribute the source of information (i.e. knowledge of the crime details) to one source (i.e. having committed the act) versus another (i.e. having been given the information during the interrogation).

Although individuals can form false memories of having committed a crime, it is remarkable that merely forming a belief of same is sufficient to elicit a false confession. An important factor in enhancing susceptibility to misinformation is the authority or credibility of the source of said information (Toglia, Ross & Ceci, 1992). More recently,

Scoboria, Wysman, and Otgaar (2012) have highlighted the importance of source credibility as a critical component of false belief formation. Participants asked to remember a set of false events endorsed higher belief for the occurrence of these events when told that *all* the events had been provided by parents (full source credibility) versus being told that *some* had been provided by parents (incomplete source credibility). Moreover, inclusion of true events as well as false events served to enhance the credibility of the source (i.e. was taken as proof that parents had indeed been contacted and provided information) thereby increasing false belief endorsement, even when participants were told that only half of the events had been provided by parents. These results demonstrate the true power of credible source suggestion.

The ease with which false beliefs can be formed also has important implications in therapeutic work. Indeed, source credibility is at least one factor, coupled with a rationale normalizing the forgetting of events (and motivation to remember), that played a major role in the events that led to the genesis of this body of research – namely, false memories of child sexual abuse “recovered” during therapy. Additionally, a strong suggestion from a well-meaning therapist based on an interpretation of a set of diffuse symptoms was made. Another source of suggestion oftentimes came from “The Courage to Heal” (Bass & Davis, 1988), a book that was a common therapeutic resource at the time preceding the development of the infamous false memory cases. Written by individuals with no professional psychology training, the book was dedicated to aiding the recovery of false memories of child sexual abuse (Merskey, 1998). It included statements normalizing the forgetting of memories of abuse, asserting that the absence of memory should not be taken to mean the absence of abuse, and normalizing that it is difficult to believe that

abuse really occurred in the absence of a memory for it. These and other statements directly address the metacognitive beliefs that individuals have about memory (Mazzoni & Kirsch, 2002) and encourage individuals to not consider lack of memory as being diagnostic of event non-occurrence. These suggestive influences, paired with therapeutic tasks informed by the forgone conclusion that abuse occurred and thus memories must be recovered, contributed to the formation of false memories.

Given the above, clinicians are wise to keep in mind the ease with which false memories and false beliefs can be formed. Individuals come to therapy seeking understanding or an explanation for symptoms, thereby creating an environment ripe for the formation of a false belief or memory in the context of a carelessly offered suggestion or hypothesis. Certain clinical populations are particularly susceptible to suggestion. For example, individuals who have dissociative disorders are characterized as having a disruption in memory, identity, and perception which make it more difficult for them to distinguish 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).

Reduced capacity for reality monitoring also serves to increase vulnerability to forming false beliefs about events (Hyman & Billings, 1998). Psychiatric populations suffering from delusions, with or without the presence of hallucinations, are generally less accurate at identifying source of information, with the former exhibiting a higher propensity for reality monitoring errors as compared to the latter as well as to non-clinical controls (Bentall, Baker & Havers, 2011). Indeed, some research suggests that in some

cases, individuals with psychotic delusions may have brain pathology similar to that of confabulating organically brain damaged individuals (Johnson & Raye, 2000). Children are also vulnerable to forming false beliefs and memories, even for events that are highly implausible and surreal (Strange, Sutherland & Garry, 2006), or truly bizarre, ritualistic sexual abuse (e.g. *People v. Akiki*, 1993; *State v. Michaels*, (1994).

### **Limitations and Future Research**

An obvious limitation is that individuals are becoming increasingly aware of digital imaging technology in a broad sense. Moreover, the concept of false memory formation is no longer a completely novel phenomenon, and thus is increasingly presented in introductory psychology textbooks. These factors, in concert, suggest that the shelf-life of the “lost-in-the-shopping-mall” paradigm – as it has been employed in the literature to date – has been reached. Consultation with primary researchers in the false memory field (indeed, the pioneers of the “lost-in-the-shopping-mall” paradigm) has revealed that owing to increasing publicity (in general media, high school, and introductory psychology courses), they have found that more people are aware of this type of research. Researchers lose a fair percentage of participants who come to disbelieve the doctored photograph and/or become aware of the true nature of the research such that some have altogether abandoned this paradigm in search of alternative methodologies (Stephen Lindsay, Don Read; personal communications; March 2013).

Another limitation relates to the methodology, specifically referencing the procedure around debriefing. To review, at the conclusion of the third interview, participants are told that one of the events is false and are invited to guess which one it may be. A disadvantage of this approach is that revealing that one of the events is false



prevents an accurate assessment of whether or not the participant was aware of the true nature of the study. A possible alternative is to simply ask the participant what they thought the study was about initially, followed by the original method. Through this approach, a more valid determination of the presence of demand characteristics or compliance can be made. If participants fail to correctly identify the true nature of the study, but do correctly identify the false event, this would further illustrate the importance of even very tenuously-held beliefs and memories. This would inform therapeutic and legal practice in that specific queries may need to be made regarding a seemingly recovered or remembered account to ensure that it is not in fact a false memory.

Additionally, the fact that almost all participants guessed which photograph is false in both studies may reflect another limitation in the methodology. Again, it is notable that the patterns of imagery and memory generation in each condition in both studies are consistent with both theory and with existing literature, which suggests that individuals genuinely formed false memories, and that they provided verbal output and subjective ratings reflective of this. However, regarding the second study, it is possible that the doctored photograph looked more doctored as compared to the three photographs representing the true events. It may be the case that the photograph is least vivid compared to the others, and thus requires the most cognitive operations to process. In retrospect, conducting a pilot study or even asking individuals who are not depicted in the photographs (and who are unaware that any photographs have been doctored) to assess the degree to which the photographs look “real” would have allowed for the preliminary diagnosis of any flaws in the quality of the materials.

Another limitation of the study relates to the gender breakdown of the sample. The first study included only seven males, and the valid participants in the second were all female. Gender differences in autobiographical memory have in fact been observed (St. Jacques, Conway & Cabeza, 2011). Thus, the conclusions drawn from the data must include the necessary proviso that they may not be completely generalizable to males.

As outlined previously, addressing the possible methodological flaw in the second study may be to show a true photograph of the participant with their parent paired with an entirely separate photograph of a park with hot-air balloons. This eliminates any rejection based on perception of image doctoring, while retaining the theoretical integrity.

Another approach, reminiscent of Bransford & Johnson's (1972) study, may be to include narratives that describe components of an event, but that cannot be fully understood without an accompanying photograph. For example, the narrative could describe the basket in detail, the fear of peeking over the edge, the friendly man operating the fire – all without explicitly referring to a hot air balloon ride. Participants would be asked to try to remember the event initially, and would only be supplied with an accompanying photograph of a hot air balloon in a later session. This approach is also reminiscent of more recent research examining the role of photographs on making inferences from narratives, which suggests that photographs that are consistent with conclusions implied (but not explicitly stated) in narratives lead individuals to erroneously assert that the conclusions were presented in the narrative (Henkel, 2012).

Current research directions into examining the mechanisms by which false events come to be accepted as true include focusing on the formation of false beliefs. As outlined above, inducing false beliefs occurs much more rapidly than inducing false

memories, and carries similar implications. Other research employs the use of digitally altered video which has been demonstrated to impact both beliefs and memories (Nash, Wade & Lindsay, 2009), as well as elicit false confessions (Nash & Wade, 2009) and even false accusations (Wade, Green & Nash, 2010). Additional directions attempting to study the formation of false memories can include the “lost in the shopping mall” paradigm, albeit avoiding the hot air balloon ride target event. Alternatively, the paradigm can be further adapted such that it involves embedding a false event of variable plausibility into a true event of varying salience. A memorable true event will elicit familiarity and fluency of processing of the memory cue, such that the embedded false event may be accepted as being true by virtue of these activated processes.

As is apparent, the field of false memory formation is moving into another generation. The focus of the initial query was whether false memories could indeed be fabricated and to what extent. Subsequent foci included an exploration of which types of media constitute superior suggestive cues. At present, the focus is about fine-tuning our understanding of the underlying mechanisms by which the well-established media operate to induce false memories. As with any generational progression, new challenges arise that necessitate the revision, rethinking, and re-invention of the manner in which phenomena can be explored to further deepen the understanding of what drives the machinery.

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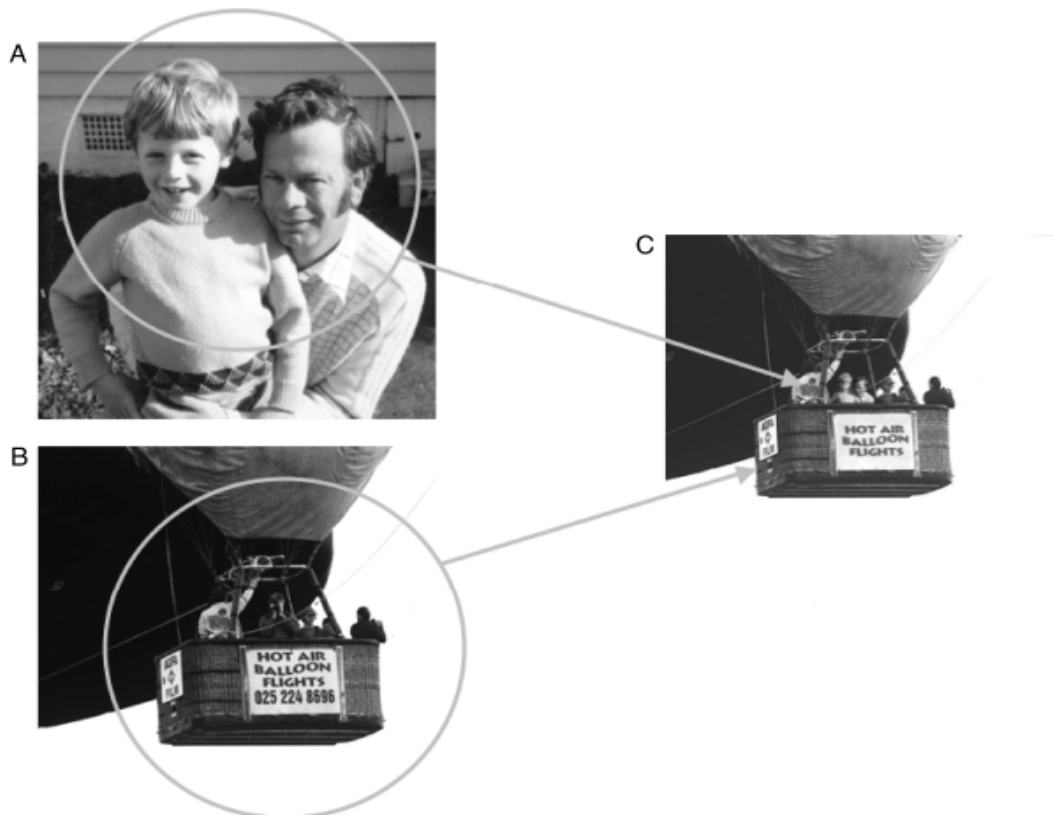
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Appendix A – Sample doctored event-specific/non-specific photograph

Sample family photograph and an example of how it was modified according to the doctored, event-specific photograph condition. The same hot-air balloon image was used for the doctored, non-event-specific condition.



Note. Photograph taken from Wade & Garry (2005)

## Appendix B – Recruitment message to be e-mailed to eligible participants



Hello,

You are being contacted because, based on your answers to the Psychology Participant Pool Screening Questions, you have met the criteria for the study entitled “Remembering Childhood Events”. This study is designed to assess the effectiveness of various techniques used in trying to assist in the recovery of childhood memories.

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

- You will be asked to provide consent for researchers to contact your parents to obtain photographs of you when you were a child.
- Upon receipt of information from your parents, you will then be asked to attend three (3) separate sessions over the course of approximately one (1) week. During these sessions, you will be asked to remember a variety of non-sensitive childhood events. If you are unable to remember any event, you will be provided guidance in attempting to recall them.
- All of your answers will be audio-taped in order to be able to assess the quality of your memories for each event. You will be asked to answer some questions regarding the quality of your memory for each of the events.

The first session will last 60 minutes; the second and third sessions will last approximately 30 minutes, with a total participation time requirement of 2 hours. You will be eligible to receive 3 participation credits if you attend all three sessions.

Please note that you will not be officially enrolled in the study until the information requested is obtained from your parents and you are scheduled into your respective sessions.

If you agree to this, please provide the following contact information for your parents:

E-mail: \_\_\_\_\_

Telephone: \_\_\_\_\_

Address: \_\_\_\_\_

Thank you for your cooperation. You will be contacted to set up an appointment once the necessary materials have been obtained from your parents.

## Appendix C – Letter of Information for Parents

**LETTER OF INFORMATION FOR PARENTS**

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 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. Please provide photographs from a variety of different events. I would appreciate if you would provide as many photographs and corresponding descriptions as possible (minimum of 5), whether or not they fit the categories provided. We would appreciate if you are able to provide photographs that your child has not seen.

**Categories:**

- Birthday parties
- Family gatherings (barbecues, birthdays, trips)
- Family weddings
- Trips to amusement parks

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.

Additionally, we would like you to indicate which of the following events your child has experienced prior to the age of 6. Please place a checkmark beside each event that your child has experienced:

- Getting lost in a shopping mall
- Spending the night in a hospital due to an ear infection
- Taking a hot-air balloon ride

- Losing a favorite toy
- Choking on a small object.

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. As is sometimes necessary in psychological research, a mild form of deception will be employed in this study. However, all procedures to be employed have been approved by the University of Windsor Research Ethics Board and present no risk of discomfort to the participants. The photographs provided will be copied so that the originals are not damaged. They may be used, in whole or in part, and along with other pictures, to aid the participant in remembering various autobiographical events. This study will help inform the current state of knowledge regarding memory recovery techniques, which play an important role in therapeutic and legal settings.

Upon the completion of their participation in the study, both you and 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 will be returned to your child upon completion of the study.

Please return the form to us using the pre-addressed envelope enclosed. Or, if you have digitalized photographs, you may email your response to [hessen@uwindsor.ca](mailto:hessen@uwindsor.ca). Please include your child's name and the student number indicated on the form should you choose to email your response.

Thank you for your assistance.

Sincerely,

---

Joanna Hessen-Kayfitz  
Psychology Department  
University of Windsor



## Appendix D – General Consent Form

**CONSENT TO PARTICIPATE IN RESEARCH**

Title of Study: **Remembering Childhood Events**

You are asked to participate in a research study conducted by Joanna Hessen, M.A. (PhD student) from the Department of Psychology at the University of Windsor.

If you have any questions or concerns about the research, please feel to contact Joanna Hessen-Kayfitz (Principal Investigator) at [hessen@uwindsor.ca](mailto: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 will be asked to provide consent for researchers to contact your parents to obtain photographs of you when you were a child.
- Upon receipt of information from your parents, if invited to take part you will then be asked to attend three (3) separate sessions over the course of one (1) week. During these sessions, you will be asked to remember a variety of non-sensitive childhood events. If you are unable to remember any event, you will be provided guidance in attempting to recall them.
- Your answers to the first and third sessions will be audio-taped to assess the quality of your memories for each event. You will be asked to answer some questions regarding the quality of your memory for each of the events.
- The first session will last 60 minutes; the second and third sessions will last approximately 30 minutes, with a total participation time requirement of no more than 2 hours. The three interviews will take place over the period of one week. The first and third interviews will be digitally audiorecorded.

**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 will be 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.

#### COMPENSATION FOR PARTICIPATION

You will receive 3 bonus points towards the Psychology Participant Pool, assuming you are registered in the Pool and are enrolled in an eligible course.

#### CONFIDENTIALITY

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

Your name will only be retained for the purpose of contacting your parents, to remind you of your interview session times, for assigning credits, for connecting your data across sessions, and for contacting you regarding the results of the draw. Data will be given an identification code. After the study is over, any personally identifying information will be destroyed.

The interview sessions will be taped and transcribed for the purpose of studying your memory for each event. Once transcribed, the audio files will be destroyed.

#### 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. If you are uncooperative during this study, your participation may be terminated.

#### FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS

Research findings will be made available to all interested parties upon completion, on the Research Ethics Board web site ([www.uwindsor.ca/REB](http://www.uwindsor.ca/REB)) approximately in April, 2012. Please provide your e-mail if you would like to receive a notification when the results become available for you to view.

#### SUBSEQUENT USE OF DATA

This final data will be retained for potential future analyses.

#### 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. 3948; e-mail: [ethics@uwindsor.ca](mailto:ethics@uwindsor.ca)

## SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study **Remembering Childhood Events** 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 E – Audio-taping Consent Form

**CONSENT FOR AUDIOTAPING**

Research Subject Name:

Title of the Project: **Remembering Childhood Events**

I consent to the audio-taping of interviews, procedures, or treatment.

I understand these are voluntary procedures and that I am free to withdraw at any time by requesting that the taping be stopped. I also understand that my name or will not be revealed to anyone and that taping will be kept confidential. Tapes are filed by number only and store in a locked cabinet.

I understand that confidentiality will be respected and the viewing of materials will be for professional use only.

\_\_\_\_\_

(Research Subject)

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

(Date)

## SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

\_\_\_\_\_  
 Signature of Investigator

\_\_\_\_\_  
 Date

## Appendix F – Participant Debriefing



The study you have just taken part in has been designed to look at the effects of varying different types of details contained in photographs on the likelihood that an event will be remembered.

Everybody in the study was asked to provide consent to contact their parents so that they could provide the researcher with childhood photographs of the participant. For each participant, a personalized booklet was made, containing the photographs that were provided by parents. Obviously, each participant had different photographs in their booklet. However, the third photograph, which depicted a hot-air balloon ride, was the same for all participants. This was not a true event, and the photograph depicting this event was doctored using photograph imaging software. Because your parents had indicated on the form that you had in fact gone on a hot-air balloon ride, you were disqualified from participating, as this would have confounded the results of the study.

Research has shown that individuals can be made to remember events that never actually happened to them. Many studies have used narratives as the suggestive medium, where the participants were provided a story that was allegedly obtained from a member. This story contained a false event, and participants developed varying degrees of memory for this event. More recent studies have used doctored photographs as the suggestive medium, where, much like this study, researchers doctor a photograph that was obtained by participants' parents to make it look as though the participant is engaging in an event that they never actually experienced. These studies as a whole are designed to examine how individuals come to remember events that never actually happened to them. This particular study varied the types of details that were contained in photographs; each participant had an equal opportunity to be assigned to one of four conditions that contained different types of details.

This line of research has important implications in areas where photographs and other suggestive tools are used to assist in the recovery of long-forgotten memories, such as in therapy, law enforcement, and judicial settings.

Thank you for taking part. We would really appreciate if you would refrain from discussing this study with anyone. We plan to collect data over an extended period of time, and it would be a problem if people coming to the study were aware of what we are studying.

As a standard precaution, if this study has resulted in any distress or discomfort on your part, please inform the study administrator at the current time. You may also contact Dr. Scoboria at any time, now or hereafter (see below), or contact the Student Counselling Center at 253-3000 ext. 4616.

If you have any further questions about this study, please contact Joanna Hessen-Kayfitz, the principal investigator, at [hessen@uwindsor.ca](mailto:hessen@uwindsor.ca), or Dr. Alan Scoboria, the faculty supervisor, at [scoboria@uwindsor.ca](mailto:scoboria@uwindsor.ca), or at 253-3000 ext. 4090.

## Appendix G – Debriefing letter for parents



Dear Sir or Madam,

The purpose of this letter is to provide you with information regarding the research study your son or daughter participated in recently, and for which you provided photographs.

The study your child has taken part in has been designed to look at the effects of varying different types of details contained in photographs on the likelihood that an event will be remembered.

Everybody in the study was asked to provide consent to contact their parents so that they could provide the researcher with childhood photographs of the participant. For each participant, a personalized booklet was made, containing the photographs that were provided by parents. Obviously, each participant had different photographs in their booklet. However, the third photograph, which depicted a hot-air balloon ride, was the same for all participants. This was not a true event, and the photograph depicting this event was doctored using photograph imaging software.

Research has shown that individuals can be made to remember events that never actually happened to them. Many studies have used narratives as the suggestive medium, where the participants were provided a story that was allegedly obtained from a member. This story contained a false event, and participants developed varying degrees of memory for this event. More recent studies have used doctored photographs as the suggestive medium, where, much like this study, researchers doctor a photograph that was obtained by participants' parents to make it look as though the participant is engaging in an event that they never actually experienced. These studies as a whole are designed to examine how individuals come to remember events that never actually happened to them. This particular study varied the types of details that were contained in photographs; each participant had an equal opportunity to be assigned to one of four conditions that contained different types of details.

This line of research has important implications in areas where photographs and other suggestive tools are used to assist in the recovery of long-forgotten memories, such as in therapy, law enforcement, and judicial settings.

Thank you for taking part. We would really appreciate if you would refrain from discussing this study with anyone. We plan to collect data over an extended period of

time, and it would be a problem if people coming to the study were aware of what we are studying.

If you have any further questions about this study, please contact Joanna Hessen-Kayfitz, the principal investigator, at [hessen@uwindsor.ca](mailto:hessen@uwindsor.ca), or Dr. Alan Scoboria, the faculty supervisor, at [scoboria@uwindsor.ca](mailto:scoboria@uwindsor.ca), or at 253-3000 ext. 4090.

## Appendix H – Consent for use of data post-debriefing



Research Subject Name:

Title of the Project: **Remembering Childhood Events**

Now that I am fully informed about the true nature and intent of this study, I consent to the subsequent use of the data obtained from the above-listed study.

I understand this is voluntary and that I am free to withdraw my data at any time. I also understand that my name or will not be revealed to anyone and that all information obtained will be kept confidential. Data are filed by number only and store in a locked cabinet.

I understand that confidentiality will be respected and the viewing of materials will be for professional use only.

\_\_\_\_\_  
(Research Subject)

\_\_\_\_\_  
Date

## SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

\_\_\_\_\_  
Signature of Investigator

\_\_\_\_\_  
Date



## Appendix I - 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 J – 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 K – Demographic Questions

1. What is your gender?
2. What is your date of birth
3. Do you live with your parents
4. How long have you lived in Windsor

## VITA AUCTORIS

NAME: Joanna K. Hessen-Kayfitz

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EDUCATION: Kelvin High School, Winnipeg, Manitoba  
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