

Cognitive Dissonance as a Potential Mediator of the Misinformation Effect

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ABSTRACT

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The current study was interested in examining the relationship between cognitive dissonance and susceptibility to misinformation. Participants were exposed to two emotional images; subsequently, they composed a counterattitudinal essay concerned with generating arguments in support of a tuition increase. Participants were either given a set of objective questions concerning the images or a set of misleading questions. All participants were then administered final questionnaires that contained both misleading and non-leading questions. This study hypothesized that participants in the dissonance-induced condition were likely to be more susceptible to the inclusion of misinformation during the final recall task. Findings indicated that participants in the dissonance-induced condition did not make more errors than those in the non-dissonance condition.

Cognitive Dissonance as a Potential Mediator of the Misinformation Effect

Overview

The misinformation effect is a phenomenon that occurs when one's memory of an event is distorted as a result of one's exposure to false post-event information (Loftus, 1980). The misinformation effect occurs when an individual experiences two competing and inconsistent cognitions: the memory of an event and the misinformation, which is often supplied by an external source. An explanation proposed here for the pervasiveness of misleading post-event information is derived from the theory of cognitive dissonance. When applied to the misinformation effect, this theory would suggest that in order to achieve consonant cognitions the individual is likely to reconstruct a memory that makes logical sense. The theoretical framework of cognitive dissonance may provide insight into the reason that eyewitnesses to crimes are extremely susceptible to integrating misinformation into their memories of an event. Police intervention following a crime often affects retrieval process due to suggestive questioning. Eyewitnesses tend to maintain strong beliefs in their testimonies, which is problematic when their accounts are inaccurate reports of a given incident. Eyewitness accounts are frequently distorted due to post-event influence from other witnesses or as a result of suggestive questioning during police intervention. This can be explained through the lens of cognitive dissonance; individuals may believe that they saw one thing, but exposure to conflicting post-event information might bring the original memory of the event into question. In order

to logically make sense of the event, it is possible that individuals achieve consonant cognitions by integrating the false post-event information into their memory of the event.

The current study is interested in examining the relationship between cognitive dissonance and susceptibility to misinformation. Participants were exposed to two emotional images, one emotionally negative and one emotionally positive in nature, for 30 s each. Subsequently, participants composed a counterattitudinal essay concerned with producing arguments in support of a yearly tuition increase. Those in the dissonance-induced condition were given the choice to write against the increase, while those in the non-dissonance condition were restricted to generating arguments in support of the increase. Following the essay task, participants were either given a set of objective questions concerning the images or they were given a set of questions that contained misleading information. On a final recall task, all participants were given a final set of questions concerning each image that contained a mix of misleading and non-leading questions. This study hypothesizes that the participants in the dissonance-induced condition are likely to be more susceptible to the inclusion of misinformation during the final recall task. In addition, it is anticipated that recall of negative emotional images will be less accurate than recall of positive emotional images. Previous studies that have been conducted on the misinformation effect report that memory distortion is greater for negative emotional events (e.g., Porter, Spencer, & Birt, 2003). Studies on cognitive dissonance suggest that participants experiencing dissonance are more prone to

make errors in recall on high load memory-tasks (Martinie, Olive, & Milland, 2010). This finding is relevant to the current study because the results imply that cognitive dissonance induction may contribute to deficits in memory.

Descriptions of these studies are provided below and illustrate the importance of studying the extent to which the misinformation effect and cognitive dissonance are interconnected.

The Misinformation Effect

Memory distortion is extremely prevalent in cases in which one has been exposed to reports that are inconsistent with one's own perception of the event, a lapse in accurate retrieval that is referred to as the misinformation effect (e.g., Roebbers & McConkey, 2003). For example, in June of 2002, 110 prisoners, including 11 men who had previously been on death row, were released from prison due to DNA evidence that had surfaced, proving them innocent (Eakin, Schreiber, & Sergeant-Marshall, 2003). They were initially sent to jail based on reports from eyewitnesses, who had improperly recalled details of the criminal incidents (Eakin et al., 2003). Eyewitnesses tend to be extremely susceptible to the misinformation effect because they are often supplied with erroneous post-event information by co-witnesses or in the form of suggestive police questioning (Porter, Spencer, & Birt, 2003). Suggestive questioning is often cited as a causal factor in false allegations and false memories of a crime. This is particularly problematic because police interviewers are not present during the event, yet they are often responsible for exposing witnesses to misleading post-event information (Porter, Yuille, & Lehman, 1999). The pliability of memory has become a widely

studied phenomenon because of the problematic social consequences of false or distorted recall in the legal sphere. The misinformation effect has been replicated across various conditions, yielding consistent results that have profound implications concerning the reliability of memory. Although memory distortion is extremely prevalent in eyewitness testimony, it is clear that misinformation affects the accuracy of memory for other, more basic events as well. This phenomenon occurs on a regular basis regardless of whether or not an event produces arousal, which calls into question the general validity of memory.

There is evidence that susceptibility to misinformation varies as a function of the time interval that elapses between encoding and recall, as well as the extent of exposure to false information. Loftus (1992) claims that individuals are more likely to misremember an event following exposure to post-event information if a longer length of time has elapsed between the initial event and recall. She attributes this increase in susceptibility to the discrepancy detection principle, which holds, “recollections are more likely to change if a person does not immediately detect discrepancies between post-event information and memory for the original event” (Loftus, 1992, p. 121). The longer the delay between the encoding process and recall, the more likely a person will fail to detect discrepancies between misinformation and the original memory of the event. However, studies indicate that the misinformation effect also occurs when little time has elapsed between the event, misinformation, and retrieval period. In one study, the experimental condition was exposed to slides of a man carrying a screwdriver. Immediately following the image, misinformed participants read a

narrative that stated that the man was carrying a wrench. In a control condition, the slides depicted a screwdriver and the narrative stated that the man was carrying a tool. Subsequently, participants in the two conditions were given a memory test, which contained detailed questions about the original image. Participants in the experimental condition gave inaccurate reports relative to the control condition, which performed significantly better on the memory test (Eakin & Screiber 2003). These findings are typical of misinformation studies, reiterating that there are multiple factors that are responsible for memory distortion. Although time plays a significant role in the extent to which one's memory is accurate, it is evident that exposure to misinformation is powerful enough to distort one's memory when there is little time between the encoding process, misleading information, and recall.

Several studies have demonstrated that social factors also have a significant effect on the accuracy of one's retrieval following exposure to false information (Itsukushima, Nishi, Maruyama, & Takahashi, 2006; Paterson, Kemp, & Forgas, 2009). In an experiment conducted by Itsukushima et al. (2006), researchers examined the extent to which social influence increases one's susceptibility to the misinformation effect. Participants were exposed to a series of 16 slides that depicted a woman's daily activities. Following the viewing of the original information, misled participants were either asked to listen to a tape recording of two people discussing the slides, or they were given a transcript of the conversation between the two confederates. The researchers found a significant difference between the two misled conditions and a control group that

was not exposed to misinformation. Interestingly, the researchers found that the transcript of the conversation produced a more robust effect than the audiotape, suggesting that text may have been more convincing because it appeared more official and thus more reliable. Paterson et al. (2009) conducted a study in which participants in one condition were instructed to discuss a video within a group that contained a confederate. The confederate was responsible for introducing inaccurate post-event information. Other conditions included no discussion, or discussion in groups that did not contain a confederate. The findings demonstrated that the confederate's introjections had a profound effect on retrieval. Many of the participants in the misled condition reported the inaccurate information that was supplied by the confederate upon recall, a phenomenon referred to as the social contagion of memory (Roediger, Meade, & Bergmen, 2001). Though it is clear that social biases contribute to memory distortion, the effect is often replicated in laboratory settings in which a person's memory of an event is not subject to social influence.

In the current study I am interested in determining whether or not the tendency to misremember is, in part, a manifestation of cognitive dissonance. Misremembering due to post-event information is related to dissonance because integrating false information into memory requires a person to reconcile two inconsistent representations of an event. However, the reason that the misinformation effect occurs is heavily disputed because both cognitive processes and social factors contribute to the occurrence of improper recall. Eakin et al. (2003) cites four possible explanations for the misinformation effect, including

retrieval blocking, response bias, demand factors, and source confusion. Retrieval blocking is the relationship between the amount of misleading post-event information and the extent of impairment of the original memory. Eakin et al. (2003) hold that the more that one has been primed to associate the misinformation and the original memory of the event, the more likely that one will access misinformation at the time of recall. Response bias occurs when individuals report false information at the time of retrieval due to the fact that they did not encode the original details; rather, they encoded the misinformation without being aware that they were misled. This factor is largely discredited because of studies that indicate that participants who are told to anticipate exposure to misleading post-event information are still somewhat susceptible to the effect (Lindsay, 1990). Social demands occur when an individual does accurately remember the original event but reports the misinformation in order to provide a response that is consistent with the information that the researcher has provided (Eakin et al. 2003). Source confusion occurs when participants recall both the original content and the misinformation but cannot differentiate between the two sources, rendering them susceptible to false recall (Eakin et al., 2003). All of these explanations fail to consider that the misinformation effect might be a result of two competing representations of an event that are logically incompatible. Loftus (1990) explains, “an automobile that was involved in an accident stopped at either a stop sign or a yield sign, but it did not stop at both...in such instances, the most economical procedure may be to dismiss one memory in favor of another” (49-50). In order to achieve a logical understanding of an event,

it is possible that one rejects the original memory in order to achieve cognitive consonance.

The current study is a partial replication of an experiment conducted by Porter, Spencer, and Birt (2003). The findings of this study suggest that one's memory of negatively emotionally toned events is acutely susceptible to the incorporation of major false details upon retrieval. In this study, participants were exposed to either neutral, highly positive, or highly negative emotional images selected from the International Affective Picture System (IAPS). Half of the participants in each condition were exposed to misinformation in the form of a questionnaire. For example, one of the images shows a man holding a woman up to knifepoint in the foreground of the photograph. Misled participants were given the following question: "on the grass in the background was an animal, was it a cat or a dog?" These participants often reported seeing an animal in the background of the photograph, despite the fact that the attack took place in an empty alleyway. Overall, the control conditions significantly outperformed the misled conditions regarding the number of accurate responses that they reported at the time of recall. A second study conducted by Porter and his colleagues followed a similar procedure, and replicated the finding that the incorporation of misleading information into recall occurs more frequently for participants who have been exposed to negative emotional imagery (Porter, Bellhouse, McDougall, Brinke, & Wilson, 2010). In addition, participants were asked to return either one week or one month following initial exposure to the images. The disparity in recall across the misled condition and the non-misled condition was persistent,

though recall was less accurate for all participants as more time elapsed. These findings are significant in light of eyewitness reports because they indicate that negative emotional arousal can cause an individual to be more susceptible to misleading or suggestive post-event information. This is precisely the situation likely to occur in criminal cases involving eyewitnesses.

Cognitive Dissonance

The theory of cognitive dissonance maintains that individuals experience psychological discomfort when they hold contradictory beliefs or attitudes, or when their beliefs or attitudes contradict their behaviors (Festinger, Riecken, & Schachter, 1956). One will attempt to relieve this dissonance, or discomfort, by adjusting one's cognitions such that they are no longer discrepant (Festinger et al.). Research into this phenomenon has revealed that the greater the discrepancy between two cognitions, the greater the likelihood that a person will seek to achieve consonant cognitions (Harmon-Jones & Mills, 1999). The finding that attitude changes occur as a result of dissonance manipulations has been replicated in laboratory settings through various testing procedures. For example, an experiment conducted by Festinger and Carlsmith (1959), required participants to engage in an extremely mundane task, which involved removing wooden spools from a tray and replacing them in their previous location. Following this task, participants were asked to remove square pegs from a tray, turn them clockwise, and return them to their original location. The tasks were extremely tedious and each was repeated for a full half an hour. The participants were separated into three groups following the tasks; a control group was asked to leave, and the

remaining two groups were offered financial compensation to explain to a confederate that the task was extremely interesting. One of the remaining groups was offered \$20.00 to explain to the skeptical confederate that the task was engaging, while the other group was offered \$1.00. Following the conversation with the confederate, the participants were asked to report how much they had been entertained by the task. The researchers found that participants who were offered \$1.00 reported significantly more interest in the mundane task than those who were offered \$20.00. Presumably, those who were offered a sizable financial incentive did not experience dissonance when asked to lie about their attitude toward the task because the lie was justifiable. In contrast, the researchers concluded that those who were only offered \$1.00 felt compelled to change their attitude toward the task in order to relieve the dissonance that they felt upon lying to the confederate.

Martinie, Olive, and Milland (2010) induced cognitive dissonance by employing a counterattitudinal essay manipulation. Fifty undergraduate students were instructed to compose an essay in support of a tuition increase, which the researchers previously determined was a topic that undergraduate students opposed. Half of the participants were assigned to a no-dissonance condition, in which they were forced to write in support of the increase. The other half of the participants were assigned to a dissonance-inducing condition, in which they were told that they should write in support of the increase, but they were given the choice to write against the increase. The counterattitudinal essay composition exercise is a variation of the induced-compliance paradigm. This paradigm

suggests that when there is no perceived choice in engaging in a behavior, cognitive dissonance does not occur because the behavior is externally justified (Harmon-Jones & Mills, 1999). The researchers found that the participants in the dissonance-inducing condition favored the increase significantly more than those in the no-dissonance condition. In addition to the counterattitudinal essay task, participants were simultaneously given a secondary reaction time task, in which they were asked to click on a computer mouse with their non-writing hand in response to an auditory cue. Interestingly, participants in the dissonance-inducing condition made significantly faster responses to the auditory signal than those in the no-dissonance condition. The researchers attribute this difference to the idea that inducing cognitive dissonance elicited arousal, which prompted a more rapid reaction from the participants in the dissonance condition.

The current study is interested in looking at whether or not performing a dissonance-inducing counterattitudinal essay task has an effect on recall accuracy. A previous study, conducted by Martinie et al. (2010), was similarly concerned with the potential impact of dissonance on short-term memory. The researchers conducted a partial replication of the previously mentioned experiment by supplementing a working memory task in place of the reaction time task. Eighty-eight undergraduate students were separated into no-dissonance and dissonance-inducing conditions to perform the counterattitudinal essay task concerning a tuition increase. The participants were simultaneously instructed to perform a memory load task, which required them to memorize various three to five digit numbers that were randomly generated using a computer program. The

participants were exposed to the first set of numbers 5 s after beginning to write the essay. At intervals of 20 to 30 s after exposure to the digits, participants were asked to recall the series of digits by typing them into the computer program. After recall, the participants received a new set of digits. Recall was considered correct if the participants were able to identify each of the digits, regardless of their order. This task was repeated throughout the 20-min essay composition exercise. The researchers found that there was no significant difference between the two conditions with respect to recall of the shorter string of three digit numbers. However, participants in the no-dissonance condition were significantly more accurate upon recall of the five digit sets of numbers than those in the dissonance-inducing condition. The recall of five-digit sets of numbers is considered high load on a memory-load task, whereas the recall of three-digit sets of numbers is considered low load. The findings of this study indicate that cognitive dissonance causes a depletion of working memory resources, which accounts for the discrepancy in recall accuracy across the two conditions.

The Present Study

The current study is concerned with conducting a partial replication of the research conducted by Porter et al. (2010). Participants were initially exposed to two images, one negative and one positive, that were selected from the series of images used in the study conducted by Porter et al.. All participants were then given a counterattitudinal essay prompt in which they were asked to argue in support of a yearly tuition increase, though half of the participants were given the choice to generate arguments against the increase. The non-dissonance inducing

condition was comprised of the participants who were forced to generate arguments in support of the increase, while the dissonance-induced condition included participants who were given the option to dissent. Following the essay-task, which simultaneously functioned as a distracter task, participants were given a series of questions about each emotional image that were either misleading or non-leading in nature. Following a second brief distracter task, all participants were given a final set of fifteen questions for each picture, some of which were misleading and some of which were non-leading. This study hypothesized that participants in the dissonance-induced condition would be significantly more susceptible to the misinformation effect than those in the non-dissonance inducing condition. In accordance with the research conducted by Porter et al. (2010), it was also expected that participants would experience less accurate recall for negative emotional scenes than for positive emotional scenes.

Method

Participants

One hundred and twenty undergraduate students from Union College volunteered to participate in this experiment in exchange for \$6 cash compensation or class credit. Forty-one participants were male and seventy-nine were female. Each participant was randomly assigned to one of the four experimental conditions. These conditions included: no-dissonance, no misinformation; no-dissonance, misinformation; dissonance-induced, no misinformation; or dissonance-induced, misinformation. Participants were tested in groups of 10 or fewer. Within each

session, participants were assigned to different between-subject conditions. There were 30 participants assigned to each between-subjects condition.

Materials

Self-esteem scale.

The current study used the Rosenberg (1965) Self-Esteem Scale, which is a 10 item Likert scale. Items are answered using a seven-point scale, where 1 corresponds to strong disagreement and 7 corresponds to strong agreement.

Images coded for positive and negative emotional valance.

Six of the ten emotional photographs that were selected from the International Affective Picture System in the study conducted by Porter et al. (2010). Of the six emotional images chosen for the current study, three negative and three positive, each had been assigned ratings of emotional valance in the International Affective Picture System manual. Each group of participants was only exposed to one negative image and one positive image, which required separating the six images into three pairings. The images were paired on the basis of their emotional valance ratings. One image in each set was negative and one was positive. In picture set one, image 9415 (“handicapped”) had an emotional valance rating of 4.91, while image 2340 (“man and kids”) had an emotional valance rating of 4.9. In picture set two, image 6136 (“attacker and victim”) had a rating of 6.94; the other image in the pair was 2345 (“beach”) and had a rating of 5.42. In picture set three, image 9433 (“bleeding man”) was rated 5.89, while image 4617 (“café”) was rated 5.19.

Counterattitudinal Essay Task.

The counterattitudinal essay manipulation used in the current study was adapted from a study conducted by Stalder and Baron (1998). The participants in the non-dissonance inducing condition received the following no-choice essay prompt:

In this study, you have been randomly assigned to generate arguments in favor of a moderate yearly tuition increase at Union College. Pilot studies have indicated that students are not always comfortable participating in this activity, but it is important for this research. We usually like to let people write on either side of the issue, but we do not have that option this time.

Participants in the dissonance-inducing condition received the following high-choice essay prompt:

In this study we would like to request that you generate arguments in favor of a moderate yearly tuition increase at Union College. Pilot studies have indicated that students are not always comfortable participating in this activity, so we do not want to force you—in fact, if you feel you must, you could generate arguments against the yearly increase, but given the major focus of this research, it will be less useful to us. So while we would like to stress that it is your choice regarding which side of the issue to write on, our primary need is for arguments in favor of the yearly increase.

Non-leading and misleading question sets.

The non-leading and misleading questions were identical to the question sets by Porter et al. (2010). There was one initial question set that corresponded to each emotional image. The non-misled condition received 10 non-leading questions that objectively inquired about the content of the image. In contrast, the misled condition received five questions that contained false post-event information as well as five non-leading questions. For example, one non-leading question in picture set 2 read, “what type of shirt was the attacker wearing in the photograph?” The corresponding question in the mislead condition was “there

was a sign on the door with the apartment number on it, did it say 104 or 135?”

The misled condition was led to believe that there was a number on the door though the door lacked an apartment number. In a subsequent recall task, non-misled and misled participants were given the same two sets of 15 questions that corresponded to each of the two images. Each of these question sets contained five misleading or suggestive questions and 10 objective questions.

Procedure

All participants were first asked to complete the Rosenberg (1965) self-esteem scale. Following completion of this task, participants were told that the purpose of the current study was to examine the manner in which emotional scenes are processed. Participants were exposed to one negative image for 30 s and one positive image for 30 s, the order that the images were shown varied across participants. Both images were flashed on a screen from an overhead projector. Each of the three sets of pictures was presented to one third of the participants in each of the four between-subjects conditions. The order of presentation of the positive and negative images was completely counterbalanced. Half of the participants in each between-subjects condition were exposed to the positive image first, with the remaining 60 participants receiving the negative image first. The counter-balancing scheme used in the current study is presented below:

Subject Set	Picture Set	Order
1	1	Pos-Neg
2	1	Neg-Pos
3	2	Pos-Neg
4	2	Neg-Pos
5	3	Pos-Neg
6	3	Neg-Pos

Following exposure to each image, participants were given 7 min to complete an essay in support of a yearly tuition increase, which functioned as the cognitive dissonance manipulation and a distracter task simultaneously. Following completion of the counterattitudinal essay task, participants were given a series of 10 questions concerning the content of the first image to which they were exposed, followed by a series of ten questions concerning the content of the second image. After completing the question sets, participants were given a brief distracter task. The task included a series of demographic questions and took approximately 3 min to complete. All participants were then administered the final question sets, each of which contained 10 non-leading questions and five misleading questions concerning the first image. This was followed by a second question set that contained ten non-leading questions and five misleading questions that corresponded to the second image. Following this task, participants were instructed to fill out a final brief questionnaire that contained a manipulation check. The manipulation check was a 10 item Likert scale asking participants the extent to which they support a yearly tuition increase at Union College, where 0 corresponded to strong disagreement and 10 corresponded to strong agreement.

Finally, participants were debriefed and given the opportunity to ask any questions they had about the study.

Results

A 2 (dissonance: dissonance-induced, non-dissonance induced) by 2 (misinformation: misled, non-misled) between-subjects ANOVA was performed on tuition increase preference scores and showed a significant main effect of dissonance, $F(1, 116)=8.21, p<.05$, but no main effect of misinformation $F(1, 116)=.01, p>.05$. The dissonance X misinformation interaction failed to reach significance, $F(1, 116)=.07, p>.05$. This statistical analysis functioned as a manipulation check to ensure that the counterattitudinal essay task elicited a change in attitude toward a yearly tuition increase.

An initial 2 (dissonance: dissonance-induced, no-dissonance) by 2 (misinformation: misled, non-misled) by 2 (valence: positive, negative) mixed factor ANOVA was conducted on recall accuracy scores for misleading questions in question set two revealed that the main effect of dissonance was not significant, $F(1,116)=1.08, p >.05$, nor did it interact with any other variable, (smallest $p=.26$). These results suggest that cognitive dissonance had no effect on the magnitude of the misinformation effect. Table 1 demonstrates that the dissonance manipulation failed to have a significant effect on recall accuracy scores for both positive and negative images.

Table 1

Mean number of errors on second recall task by misled and non-misled participants as a function of condition.

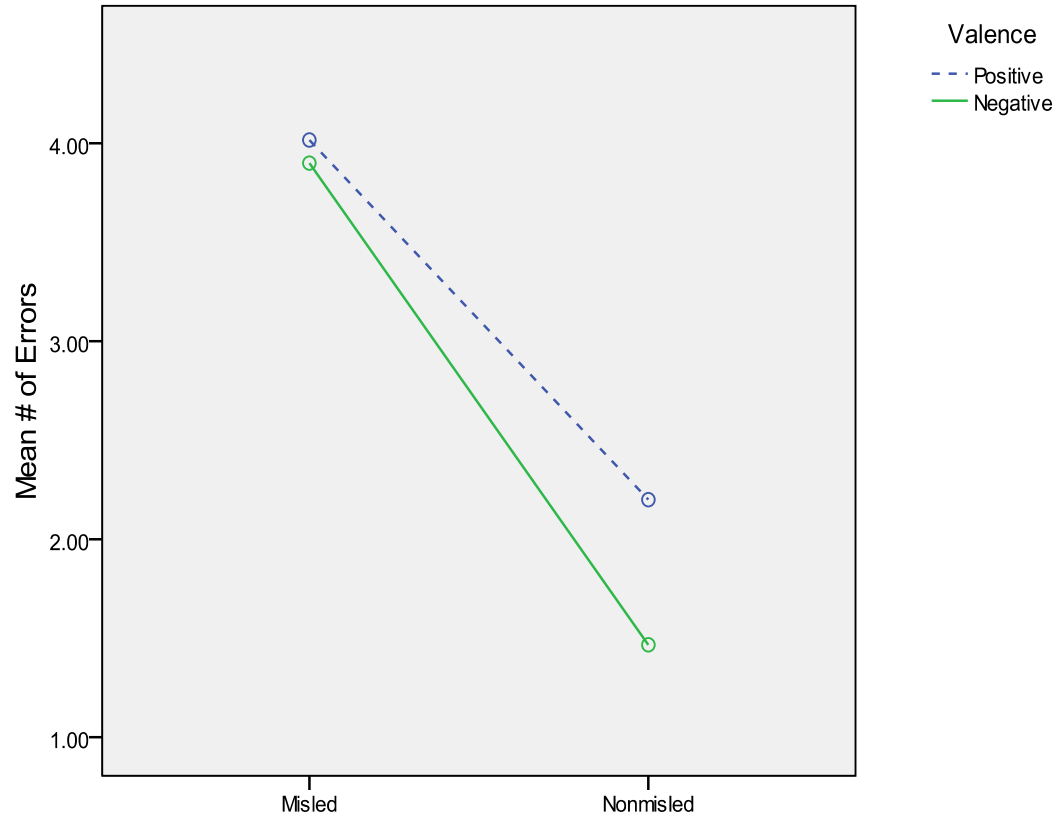
Valence	Condition	
	Dissonance-induced	Non-dissonance induced
Negative images	2.83 (1.65)	2.53 (1.77)
Positive images	3.13 (1.43)	3.10 (1.44)

Note. Parenthetical values are standard deviations.

Due to the fact that there were no significant effects of dissonance, it was ignored in the following analyses. A 2 (misinformation: misled, non-misled) by 2 (valence: positive, negative) mixed factor ANOVA was conducted on recall scores and revealed a significant main effect of valence, $F(1, 118)=10.93, p<.05$, and a significant main effect of misinformation, $F(1, 118)=1187.68, p<.05$. The valence X misinformation interaction also reached significance, $F(1,118)=5.75, p<.05$. This interaction can be seen in Figure 1.

Figure 1

Mean number of errors in recall for misled and non-misled participants as a function of valence

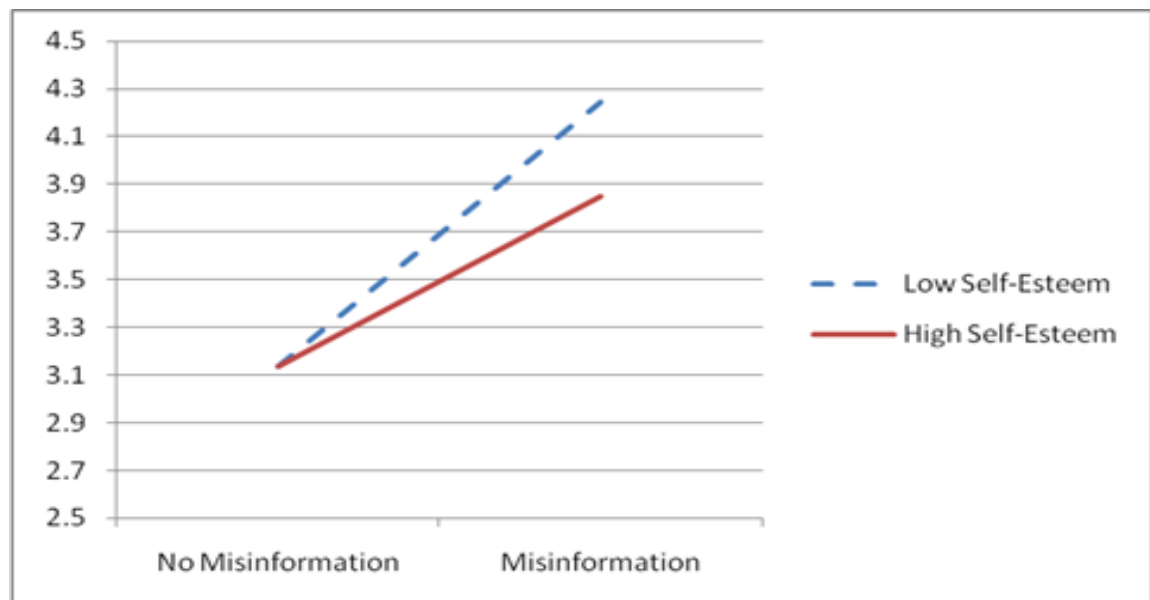


Since the interaction was significant, a paired-samples t-test was performed on the number of errors with respect to image valence in the non-misled condition and revealed that the positive images produced more errors than the negative images, $t(59)=4.17, p<.05$. A second paired-samples t-test was conducted on recall accuracy scores with respect to image valence in the misled condition and demonstrated that there was no significant difference in recall accuracy scores for negative and positive images, $t(59)=.62, p>.05$.

A multiple regression analysis was conducted on recall accuracy scores for misleading questions in the second positive question set. The regression analysis used standardized self-esteem scores and a dummy variable for misinformation condition (0 = no misinformation; 1 = misinformation) as predictor variables. The analysis revealed, in addition to the aforementioned main effect of misinformation, a marginally significant interaction between misinformation and self-esteem, $t(116) = -1.87$, $\beta = -.14$, $p = .06$. A probe of this interaction revealed that the main effect of misinformation was stronger among individuals with lower self-esteem; that is, low self-esteem was associated with greater susceptibility to misinformation, at least for positive images (see Figure 2). However, it is important to note that there was no parallel interaction for the accuracy scores in the second negative question set.

Figure 2

Number of Errors for Misleading Questions in Question Set 2 As A Function Of Self-Esteem and Condition



Discussion

The results of this study did not support the hypothesis that the induction of dissonance would affect the extent to which participants were susceptible to the misinformation effect. Findings indicated that participants experiencing cognitive dissonance did not have an increased susceptibility to the misinformation effect with respect to a control condition. Additionally, the findings demonstrated that non-misled and misled participants made fewer errors during the recall task concerning negative emotional images than that concerning positive emotional images. These results conflict with previous findings, a discrepancy that may be attributable to the varying complexity of content within each image (Porter et al. 2003, Porter et al. 2010). The images used in the current study were paired based on similarities in emotional valance, disregarding the content of each image. Upon analysis, however, the positive images that were selected for this study appear to contain more detail than the negative images. One reason that the varying complexity of the images was problematic was that participants were only exposed to each image for 30 s. As a result, participants had an extremely limited amount of time to absorb the details of relatively complex visual stimuli. Additionally, participants were not explicitly instructed to rehearse the details of the images, which implies that most participants did not actively attempt to remember the content to which they were briefly exposed. Loftus (1980) notes that short-term memory cannot hold more than six or seven representations at the same time. It was likely more difficult for participants to recall details of each image, especially those of the more complex positive images, given that they were

not informed that they would be given a short-term memory task. Without rehearsal, representations that enter short-term memory are extremely malleable and very difficult to accurately retrieve after a period of 30 s or longer (Peterson & Peterson 1959). These factors may account for the slight discrepancy between the amount of errors in recall for positive and negative images, given that the positive images were more complex with respect to content.

In the current study, participants were given the dissonance manipulation following exposure to the images. There was a 7 min period in which participants were unconcerned with the content of the images, entirely focused on completing the essay task. During this delay period, their mental representations of each image presumably became acutely unreliable and, in most cases, extremely susceptible to misinformation. Though there was no significant difference between the recall accuracy of the misled participants in the dissonance-induced condition and the non-dissonance induced condition, it is interesting to note that some errors in recall were relatively consistent across all conditions. This finding suggests that some of the common errors may have been a consequence of pragmatic implication. Loftus (1980) explains:

a pragmatic implication is simply a remark that leads the hearer to expect something neither explicitly stated nor necessarily logically implied in the sentence. For example, the sentence 'John pounded the nail' pragmatically implies that John was using a hammer. The sentence says nothing about a hammer (pg. 151).

With regard to the current study, there were several specific instances in which many participants, regardless of their respective conditions, were erroneous in their recall responses. For example, the picture "Handicapped" depicted a man, who was missing one leg, sitting in a wheelbarrow. A trend emerged which

revealed that participants inaccurately recalled that the man was sitting in a wheelchair, though it is clear that the device is a wheelbarrow. The fact that this error was particularly common suggests that participants may have failed to encode the original image well because a wheelbarrow is atypical in the context of medicine. Another image, titled “café,” depicted a waiter talking to a woman who was leaning against a car. He was holding an empty tray; however, he was holding it in the air such that it appeared as if he were carrying food or beverages. Many participants across various conditions erroneously assumed that he was holding a beverage on the tray because he was positioned in such a manner that it would be more logically viable for him to be carrying something. These trends show that an individual’s expectations or preconceived notions have potentially detrimental effects on memory, which is particularly problematic in eyewitness reports.

It is possible that this study produced null results with regard to the dissonance manipulation because false post-event information is so pervasive that priming participants with cognitive dissonance did not affect the extent to which they were susceptible to misinformation. Studies show that the misinformation effect manifests differently when participants are warned about exposure to misleading information; however, it is also evident that the effect remains relatively persistent in such cases, demonstrating the pervasive nature of misinformation. Echterhoff, Groll, and Hirst (2007) coined the phrase “tainted truth” to describe a phenomenon that occurs when participants are forewarned that they face potential exposure to misleading post-event information. Studies

have indicated that participants have improperly recalled details of an event despite the fact that they had previously been informed that a “co-witness” (a confederate) may provide misleading or false post-event information (Echterhoff et al. 2007). Echterhoff et al. (2007) argued that participants tended to unintentionally overcompensate when attempting to identify misleading details by assuming that the co-witness’ account was entirely erroneous. That is, when participants have been told not to trust a co-witnesses account of an event, they tended to believe both that the misleading information was false and that the correct information that the co-witness provided was also false. Essentially, participants in this condition continue to report false information upon recall due to the fact that they are entirely untrusting of any information provided by the co-witness. This is a strange inversion of the misinformation effect, suggesting that those who are aware that they might be exposed to misleading information are significantly more likely to misremember the event than those in a control condition. The misinformation effect is self-evidently powerful, which is clear through studies like these that have attempted to prevent the effect from occurring yet continuously fail to elicit accurate recall.

Memory distortion due to exposure to misinformation occurs frequently, which suggests that few, if any, are exempt from susceptibility to the misinformation effect under the right circumstances. The effect is extremely robust with respect to other manifestations of memory distortion, including susceptibility to implanted memories. Loftus (2004) illustrated the alarming extent to which memory is fallible by demonstrating that it is possible to convince

“suggestible” individuals that they have experienced an unusual fictitious event.

The results of her study showed that select individuals confused implanted memories with actual ones, a finding that implies that some memories are wholly unreliable (Loftus, 2004). The researcher conducted a study in which subjects were exposed to an advertisement that referenced meeting Bugs bunny at Disneyland, and “16% of those who had been exposed to the fake Bugs later said that they had personally met Bugs Bunny at Disneyland” (Loftus, 2004, 146). Loftus (2004) claims that certain subjects fabricated a detailed memory based on the mere suggestion that the event had, in fact, occurred. A second study conducted by Loftus (2004), demonstrated that it is possible to implant unpleasant memories, as well as pleasant ones, in suggestible individuals. Participants were led to believe that they had experienced having a nurse remove a skin sample from their finger before the age of six. This study utilized the most powerful mode of suggestion, which was requesting participants to actually visualize themselves in the fictional scenario. The findings were consistent with those of the previous study, in that approximately 16% of all participants were eager to claim that they remembered the experience. The rate of people who are susceptible to the misinformation effect is significantly higher than the rate of individuals who are suggestible enough to claim ownership over implanted memories, which implies that the misinformation effect is a typical yet extremely powerful form of memory distortion. In the current study, participants who were primed with dissonance were no more likely to misremember details of the images as the non-dissonance induced condition, which suggests that the

misinformation manipulation may have effectively overpowered the dissonance manipulation.

There are several ways in which the current study could be modified in order to offer a more comprehensive understanding of the relationship between emotions, self-esteem, cognitive dissonance, and memory impairment. For example, future research might further explore the relationship between emotion and memory distortion by controlling for discrepancies in the content of negative and positive emotional images. Perhaps the findings of the current study fail to replicate previous findings because the negative and positive images were significantly dissimilar with regard to detail, an issue that might be reconciled if the images were matched based on both complexity of content and emotional valance. The images used in the current study may have been inadequately matched with respect to content, a problem that could be resolved in future research by using inter-raters to compare the complexity of positive and negative images. It is also important to note that future research should address the potentially detrimental effect of low self-esteem on memory. A recent study indicated that susceptibility to the misinformation effect is negatively correlated with depression and fear of negative evaluation (Zhu et al., 2010). Conversely, further analysis revealed that there were interaction effects between particular personality traits and cognitive abilities that made certain individuals extremely susceptible to the misinformation effect. For example, participants who exhibited low fear of negative evaluation, high reward dependence, high self-directedness, low cognitive abilities, low harm avoidance, and high reward dependence, were

significantly more susceptible to the misinformation effect than those who exhibited other combinations of personality traits and cognitive abilities (Zhu et al., 2010). Although the difference was only marginally significant, the data that were collected in the current study revealed a trend that suggests that there might be a relationship between self-esteem and susceptibility to misinformation. In the current study, participants who reported higher self-esteem tended to make fewer errors during the recall task than those who reported lower self-esteem, a correlation that should be further pursued in future research concerning emotional disposition and memory.

Future research might also consider the misinformation effect in relation to the modified theories of cognitive dissonance that have surfaced in the recent past. Aronson (1999) argues that dissonance induction is significantly more effective “when an important element of the self-concept is threatened” (110). Other experiments have employed a counterattitudinal essay prompt. Stalder and Baron (1998) misled participants into thinking that their peers would read and rate their essays in which they had been asked to generate arguments in support of a yearly tuition increase. The researchers informed participants that it would be necessary for them to print their names at the end of their essays. This mildly deceptive tactic was thought to elicit feelings of personal responsibility from participants that would likely threaten their self-concepts. Future research might consider the model of cognitive dissonance proposed by Aronson (1999) in relation to memory distortion and the misinformation effect. In his modified version of the widely studied theoretical framework, Aronson (1999) suggests that

a cognitive dissonance manipulation is inadequate if it does not pose a threat to a person's sense of self. He holds that individuals will be unaffected by cognitive dissonance if they do not perceive that there are any aversive consequences for fostering conflicting beliefs, cognitions, or behaviors. It would be advantageous to study the misinformation effect in conjunction with this modified theoretical framework of dissonance that brings the self-concept into question, bringing up issues of self-esteem. It is true that there are many cognitive and social influences that have the potential to contaminate memories. However, it is important to continue studying the extent to which these individual factors are detrimental to memory. The study of the fallibility of memory is significant because memory can be tainted through various avenues and distorted to different degrees. Exploring the different factors that contribute to memory impairment is helpful in revealing ways in which the potentially dangerous consequences of the misinformation effect can be avoided.

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