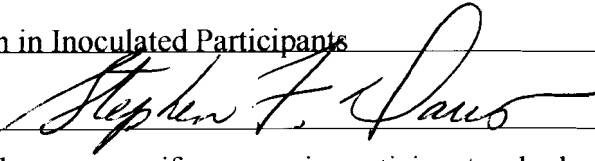


AN ABSTRACT OF THE THESIS OF

Brandy G. Smith for the Master of Science
in Psychology presented on July 30, 1999

Title: Memory Distortion in Inoculated Participants

Abstract approved:



This study investigated the accuracy of memory in participants who had been warned they might be presented with misleading information. Participants were 76 college students from a medium-sized midwestern university. All participants were shown a 12-minute defensive driving video. Three groups of participants were then given either a video, written, or video and written version of the inoculation procedure. The fourth group received no inoculation. All participants were given one of two versions of a postevent questionnaire. One version contained 10 accurate questions and 10 misleading questions relating to the defensive driving video. The second version contained 20 accurate questions. One week later participants were given a 40-item forced choice questionnaire. This questionnaire contained 10 critical items that provided a choice between the accurate information contained in the video and the misleading information contained in the postevent questionnaire. Ten confirming items provided a choice between accurate information contained in the postevent questionnaire and video and information not contained in either the video or the postevent questionnaire. The 20 neutral items provided a choice between accurate information contained in the video but not contained in the postevent questionnaire and information not included in the video or postevent questionnaire. After completing the forced choice questionnaire participants were given a manipulation check to assess the amount of information they retained from the inoculation procedure. Results indicated that participants who were misled and received an inoculation procedure exhibited the greatest memory distortion. The results could indicate a need for a longer inoculation procedure. Future research should examine

postevent processing in relation to developing a procedure to reduce or prevent memory distortion.

MEMORY DISTORTION IN INOCULATED PARTICIPANTS

A Thesis

Presented to

the Division of Psychology and Special Education

EMPORIA STATE UNIVERSITY

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of the Requirements for the degree

Master of Science

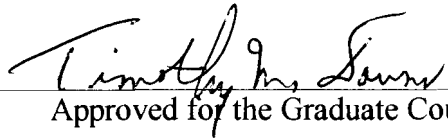
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Approved for the Division of
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Approved for the Graduate Council

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As I finish my thesis, I find myself looking at the last two years of my life and all of those events and people that were with me along the way. First, I would like to thank my family, Karen, Dustin, Derek, and Anthony. Mom, you always said I could do whatever I wanted in life. Without all of your continued support and love I never would have made it.

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CHAPTER 1

INTRODUCTION

Memory is often imperfect and can be influenced by many factors. A major influence on memory is the amount and type of information presented after the occurrence of an event. For example, a person may witness an event and later be presented with information about the occurrence by the media and police officers. If newly presented information is incorrect, people may inadvertently incorporate this information into their memories, leading to memory distortion. A witness may later give a false account of an event (Loftus, 1979).

During the last two decades the number of repressed memories that have surfaced during therapy or some other aspect of the person's life has increased greatly (Loftus, 1997). Consequently, memory distortion research has escalated. In addition, eyewitness testimony research has escalated due to increased interest in the victims of crimes, especially sexual abuse victims (Kapardis, 1997). There are several important areas and factors to consider when considering memory distortion and eyewitness testimony.

Historically, memory distortion research has focused on several different areas (Gary & Loftus, 1994). One type of research demonstrates the memorial presence of items such as a weapon or broken glass that were not actually present during some event. Another type of research manipulates details about an object that was present in an event. For example, in a classic study by Loftus (1978), the participants viewed a simulated accident involving a car that ran a stop sign. When the experimenter manipulated the information about the stop sign by referring to it as a yield sign, the participants' recall of seeing a yield sign increased significantly. A third type of memory distortion research creates a false memory, such as convincing a boy that he had been lost in a shopping mall at a young age, when he actually never experienced this event (Loftus, 1993).

Researchers have examined eyewitness testimony to study memory distortion and

the influence of false information. Much of this research has focused on the presentation of new information after an event (Loftus, 1978). Often this research includes the presentation of a video that is meant to simulate an eyewitness event. After the presentation of the video, participants are given a narrative that is meant to mislead them. They are then questioned concerning the events actually contained in the video. Using this format, participants have recalled a wide variety of information that was not actually contained in the video (Belli, 1988).

Although many researchers have expended considerable effort to delineate the factors involved in eyewitness testimony and memory distortion, few studies have focused on the effects of warning participants that they may be misled by information presented after they view a simulated event. Because of conflicting results, researchers are unsure if warning participants that they may be misled will impact subsequent memory distortion.

Factors Influencing Eyewitness Testimony and Memory Distortion

Different factors influence eyewitness testimony and distort memory. Age is one key factor; participants over the age of 60 have poorer recall than participants in their 20s (Haberlandt, 1998). In contrast, Ceci, Ross, and Toglia (1987) found that children between the ages of 3 and 4 are especially susceptible to misleading information. However, their vulnerability to postevent information is reduced if the information is provided by another child instead of an adult. These results suggest that children's susceptibility may arise partially due to a desire to please an adult. Race is another possible influence on recall. Interestingly, if the race of the witness and the suspect is not the same, the recall is more likely to be distorted (Kapardis, 1997). Alcohol consumption is another factor that could have an effect on recall. For example, witnesses are less likely to accurately recall an event if they have been drinking (Kapardis, 1997).

Types of Eyewitness and Memory Distortion Research

The plethora of research studies on eyewitness testimony have evaluated children

and adults in just about every socioeconomic category and racial background (Kapardis, 1997). Despite the research in this area, only a few main types of memory distortion techniques are routinely used in eyewitness simulation procedures to study distortion.

First, studies have focused on the effects of leading questions on eyewitness testimony and memory distortion (Loftus & Palmer, 1974). Under such conditions people recall an event in a different way than it actually occurred. For example, Loftus and Palmer (1974) found that changing a single word in a question could affect a participant's answer. One participant may be asked, "About how fast were the cars going when they hit each other?" Another participant may be asked, "About how fast were the cars going when they smashed into each other?" The words hit and smashed imply how fast the cars were moving. Loftus and Palmer found that the phrasing of the question controlled considerable variance in the participants' answers. When the word smashed was used, participants estimated the speed of the vehicles to be higher than when the word hit was used.

This research has practical implications. Police officers attempt to collect information from witnesses following a crime. These officers are expected to learn appropriate questioning techniques before they assume their duties (Kapardis, 1997). This assumption may not be accurate, at least not in previous decades. Prior to the development of eyewitness testimony and memory distortion research, law enforcement officials often gave witnesses a choice between two options, rather than asking open-ended questions. This approach led many witnesses to feel their answer had to be one of those two choices. Because of Kapardis' (1997) research and litigation in this area, police officers are now trained how to question potential eyewitnesses more effectively.

The second type of memory distortion research involves suggesting the presence of items that were not present during some event. This research focuses on several key factors including the acquisition of the original experience. During any event we must decide what we are going to attend to. Naturally this information will be most accurately recalled

(Loftus, 1975). This research also focuses on the form of representation of the memory. More pertinent to the current research are findings that information occurring after the event may alter retrieval of the initial information. New information may alter the recall of potentially relevant and irrelevant objects. For example, people may recall a barn when there really was not a barn present (Loftus, 1975). Similarly, Gary and Loftus (1974) found that participants who viewed a video of multiple car wrecks often reported seeing broken glass when no broken glass was present. This effect was exacerbated when the researcher asked the participant how fast the cars in the video were going when they smashed into each other, rather than when the cars hit each other. This research supported previous research on the influence of leading questions and their influence on eyewitness testimony.

The third type of research conducted in this area focuses on manipulating some aspect of an object that is present during an event (Loftus, 1979). The manipulated object may vary from a stop sign/yield sign to the color of a car being driven in the simulated event (Loftus, Donders, Hoffman, & Schooler, 1989). For example, participants view a video that shows a red car swerving across the center line and causing an accident. During recall, participants are asked if the green car caused an accident by swerving across the center line. Often eyewitnesses will be unsure of the specific details of an event, and may have imagined or tried to replay the event. When people imagine an event and are later questioned about the event it is often difficult for the person to discern the source of the memory. This means people are often unable to discriminate if the source of the memory was external or internal (Johnson, 1988). Also, any type of suggestion could directly influence the information they report. Especially important are results that indicate when a person's representation of an event is intact when new information is introduced, the representation is updated and modified to include the new information. If the new information conflicts with the representation, the person may either change the representation or disregard the new information (Loftus, 1979). Some influencing factors

are the age of the original representation, and the credibility of the sources of the new information. Changes in the accuracy and content of memory can have profound consequences. This manipulation renders people unable to distinguish between experiences, inferences, and complete imagination (Bowman & Zaragoza, 1989; Loftus, 1979); law enforcement officials and therapists should be carefully trained in effective and appropriate questioning techniques.

The fourth type of memory distortion research involves creating an entirely false memory (Loftus, 1997a). Combining actual memories of an event and false suggestions made by others often leads to the creation of false memories. This research often involves implanting a memory about being lost in a shopping mall as a small child. Participants often recall detailed memories of the event that were sometimes emotional. Participants remembered crying and finally being assisted by an elderly woman. It often took a significant amount of time to convince the participants that they had not actually been lost. Loftus (1997a) found that if an event is corroborated by another person, a false memory is more likely to be constructed. For example, if a parent agrees that the person was lost as a child, the person may be more likely to construct that memory. Also, people may be more likely to remember an event that did not take place if they are told to imagine the event. During this procedure clients are told to relax and just imagine what it would be like to experience an event. This event could be emotional like being molested. Clients are then asked questions about the time of day, the people present, and what specifically is going on. The clients are told not to worry about the truth of their imaginations. According to Johnson, Raye, Wang, and Taylor (1979), people often confuse thoughts with imaginations of events. Therefore, this procedure may lead clients to incorporate this information into their memories. Whether a person is a witness to a crime, in therapy, or in an experiment, there is tremendous pressure to remember. Factors such as being told to imagine the event

and corroboration from another person may lead people to construct false memories (Loftus, 1997b).

In another study conducted by Loftus (1997b), participants remembered the first day of life or of kindergarten. This research indicated that people experience complex and vivid memories via a procedure that prompts them to expect that they have unconscious hidden memories and that certain procedures, similar to hypnosis, will help them remember those memories. People often believe they can be taken back to their childhood or infancy period. Some participants recalled vivid details of their cribs, mobiles, and people who were around them.

The fifth type of research conducted on memory distortion and eyewitness testimony focuses on the effect of presenting new information after participants had witnessed an event (Chandler, 1991; Loftus, Miller, & Burns, 1978). This research usually involves several steps. First, participants view a video that is meant to closely resemble witnessing an event, such as a theft or nonviolent car accident. Second, the participants read a short account or answer questions that are meant to mislead them. The story and the questions contain information not actually shown in the video. Finally, the participant's knowledge is tested for the actual details contained in the video. Numerous studies have reported that a variety of the false information was recalled by participants. For example, Loftus, Miller, and Burns (1978) found that presenting misleading information led to a decline in the accuracy of recall of both relevant and irrelevant objects from the video presentation. For example, the researchers may show the participants a parked car that was involved in an accident. During the recall test the researchers may lead the participants to believe that the car was actually in motion and caused the accident. Individuals are less likely to be accurate in their responses if the researcher presents the information right before the final recognition test that is used when the participant's recall of the actual event decreased due to the misleading information in the recall test. Loftus et al. (1978) also

determined that misleading information influences participants' confidence in their answers. Specifically, when misinformation is introduced just prior to the final test, participants are less confident of the accuracy of their answers.

One of the primary questions examined by Lindsay (1990) was whether suggestions impair participants' ability to remember event details or if participants actually believe they saw the suggested details. The results indicated that although participants identified the source of their memories of suggested details, the misleading suggestions impaired their ability to report accurate event details. This result could mean that the old representation of the event is replaced by the new information. In contrast, Zaragoza and Lane (1994) found that participants came to believe they actually remembered seeing suggested items. Participants could describe the objects and the surroundings in great detail. Moreover, a majority of the participants claimed to be definitely sure they remembered seeing the suggested item.

Additional research has found that the introduction of misinformation influences accuracy of recall of word recognition, list recall, and even color blend retrieval (Belli, 1988; Zaragoza, McCloskey, & Jamis, 1987). For example, Belli (1988) showed over 300 participants a slide with an object and then a slide with a color wheel to choose the color that most closely resembled the color of the object. After the slide presentation some participants were asked misleading questions using the wrong color for the object. After answering the questions related to the slides, participants were asked again to match the color of the objects with the color wheel. Participants who were given misinformation tended to select inaccurate hues that corresponded to the color mentioned in the misleading questions.

Despite the robustness of the memory distortion effect, little research has focused on ways to reduce the influence of misleading information. The research that has been conducted in this area has focused on warning participants that they may be presented with

inaccurate or misleading information. The theoretical assumption of this research is that if the participants are warned that misleading information may be presented, they will work to reduce possible distortion. This prediction is not always supported. For example, Greene, Flynn, and Loftus (1982) reported that warning the participants was only marginally successful in inoculating them against the effects of misleading information. These researchers examined previous studies conducted on persuasion and opinion change to find possible methods of inducing resistance to misleading postevent information. An important finding was that people are less likely to change their beliefs when they are informed of the persuasive intent of a message. Greene et al. (1982) report that they reduced belief change when they derogated the source's expertise or credibility. This research also attempted to determine the possible reasons why warning participants could influence performance. Greene et al. believed that the warning might cause participants to process the initial event more deeply as they were viewing it and rehearse it over and over in order to recall the information accurately. The research did not confirm this prediction. Greene et al. also believed that a warning might cause participants to evaluate the postevent information more carefully and thereby reduce the effects of misinformation. In support of this contention, participants took longer to read the postevent information when they were warned that they might be presented with misleading or inaccurate information. These participants had higher accuracy scores and were more resistant to postevent suggestions. Greene et al. also reasoned that warning participants could lead to more careful test taking. This reason was not supported by the results.

Zaragoza and Lane (1994) also found that warning the participants was unsuccessful in reducing the effects of misleading information. In their study the focus was to determine whether the tendency for participants to feel pressure to please the examiner was playing a role in the misattribution effects that researchers had observed previously. Belli (1989) defines source misattribution error as a situation in which a memory derived

from one source is misattributed to another source. Zaragoza and Lane (1994) did not warn one group that some of the test items were misleading, whereas they gave a second group instructions that specifically stated that the questions contained inaccuracies. The results indicated that the presence or absence of a warning had no influence on the participants' performance accuracy.

On the other hand, Saywitz and Moan-Hardie (1994) were successful in reducing the amount of false information recall in children. They used an extensive training program that emphasized the importance of accurate memory rather than pleasing the interviewer. This program also emphasized the negative consequences of errors.

After showing participants a defensive driving video, Winkelspecht and Mowrer (1999) utilized several different ways of warning participants they may be misled including a video tape, written text, and a video and written text combination. Winkelspecht and Mowrer found that the inoculation procedure actually promoted memory distortion and led to lower accuracy scores on a postevent questionnaire.

Because eyewitness testimony plays such a large role in the judicial system, it is important to discern what factors, such as warnings, may facilitate resistance to postevent information and therefore increase the reliability of an eyewitness account (Greene et al., 1982). This information also may encourage therapists to discuss memory and how easily it can be manipulated with their clients.

Rationale for the Present Study

The main factor investigated in the present study was whether the knowledge that participants may be presented with misleading or inaccurate information has an influence on the accuracy of their information recall. The present study replicated Winkelspecht and Mowrer (1999) and utilized many of the materials developed for that research including the defensive-driving video, inoculation procedures, and questionnaires. The present study attempted to provide a clearer indication of the influence of warning participants that they

may be presented with misleading information.

Hypotheses

The present study investigated the following hypotheses:

Hypothesis 1: Participants who were not misled and received the inoculation procedure would be more accurate on the critical items than participants in the same condition who were misled.

Hypothesis 2: Participants who were misled and did not receive the inoculation procedure would be more accurate on the critical items than participants who received the inoculation procedure and were misled.

CHAPTER II

METHOD

Participants

Participants were 76 college students from a medium-sized midwestern university. Participation was voluntary and some participants received two research points to fulfill the requirements of the Introduction to Psychology and Developmental Psychology courses.

Design

This study had a 4 (Format: no inoculation, video, written, video/written) X 2 (Information: misleading, not misleading) X 3 (Question: critical, confirming, neutral) split-plot design. Format and information served as the between-subjects factors, whereas question served as the within-subjects factor. Participants were randomly assigned to one of the treatment conditions: no inoculation-misled, no inoculation-not misled, video-misled, video-not misled, written-misled, written-not misled, video/written-misled, video/written-not misled. The dependent variable was the percentage of accurate scores for each type of question on the final recognition test (see Appendix E).

Materials

Video. The 12-min defensive driving video was adopted from previous research conducted by Winkelspecht and Mowrer (1999). This video depicts various traffic scenes, including minor collisions and near-collisions. There are no injuries depicted.

Inoculation materials. One-quarter of the participants received the written inoculation procedure (see Appendix A) concerning the fallibility of memory and a warning that they may be misled. This procedure included information about a study that created false memories and stressed the importance of accurate recall (see Appendix A). The rest of the participants received a written and video filler activity on iconic memory (see Appendix B). Both the video and written procedures were identical in wording and took approximately the same amount of time to administer.

Postevent defensive driving questionnaire. Depending on the group they were randomly assigned to, participants were given one of two different questionnaires pertaining to the defensive driving video (see Appendix C). One version contained 10 questions that were misleading (matched with the 10 accurate questions on the other questionnaire; see Appendix D). For example, a misleading question was “When Betty and her children were on their way home from the shopping center, did the children on the skateboard fall when Betty slammed on the brakes.” In the video the child was riding a bicycle. The not misled groups received 20 accurate questions. All questions were chosen by Winkelspecht and Mowrer (1999) to match, as closely as possible, the types of questions utilized in previous studies (Greene et al., 1982; Saywitz and Moan-Hardie, 1994; Zaragoza & Lane, 1994).

Recognition test. Participants were given a 40-item forced-choice recognition test developed by Winkelspecht and Mowrer (1999) (see Appendix E). Ten items provided a choice between accurate information (information contained in the video) and misleading information contained in the postevent questionnaire (critical items). For example, the critical question relating to the example given previously was “What was the child riding when Betty almost hit him?” The two choices were “a) bicycle” and “b) skateboard.” Ten items provided a choice between accurate information included in the video and questionnaire and information not contained in the video or questionnaire (confirming items). An example of a confirming question is “What color was the jacket of the child that Betty almost hit?” The choices are “a) blue” (in the video and mentioned on the postevent questionnaire) and “b) red” (not in the video or on the postevent questionnaire). The other 20 items required a choice between accurate information from the video (but not mentioned in the postevent questionnaire) and other information not included in the questionnaire or the video (neutral items). An example of a neutral question is “Why was Ben’s passenger resting her head on his shoulder?” The choices are “a) she was sick” (not mentioned in the

video or on the postevent questionnaire) and “b) she was sleepy” (mentioned in the video but not on the postevent questionnaire).

Manipulation check. Participants were given a 10-item multiple choice manipulation check (see Appendix F). This manipulation check was developed from information contained in the inoculation procedure. It was designed to ascertain whether participants remembered the information in the inoculation procedure. A sample question is “Researchers have established it is possible to create false memories of ____.” The choices are “a) parts or details of an event.” “b) an entire event.” “c) both a and b.” or “d) neither a nor b.”

Procedure

All participants met in the same room and were given an informed consent document to sign. The informed consent document was also explained aloud to the group. After signing the informed consent document all participants were required to draw a number from a container in order to designate the research condition they were to attend. All participants then viewed the 12-min defensive-driving video. After the video was finished, the four White men (ages 23, 24, 25, and 27), and two White women (ages 23, and 24), trained researchers who were blind to the study’s purpose took their groups to separate rooms to finish the project.

Immediately after the video three groups were given the written and/or video inoculation procedure. One group received the videotaped lecture, one the written text (see Appendix A), and the third group received both the videotaped lecture and the written text. As a control, participants receiving only the written text also viewed the irrelevant videotape on iconic memory. The fourth group of participants did not receive any type of inoculation but received both the irrelevant videotape and written text on iconic memory. Then all groups were given a 20-item open-ended questionnaire about the defensive driving video. Approximately half of the participants received the questionnaire that included 10

misleading questions. For all other participants the questions contained accurate information contained in the video. One week later all participants were administered the 40-question recognition test. Finally, all participants were given the 10-item manipulation check developed from information contained in the inoculation procedure.

CHAPTER 3

RESULTS

A 4 X 2 X 3 split-plot factorial analysis of variance (ANOVA) was conducted on the percent of accuracy scores for each type of question. An alpha level of .05 was used to determine significance in all instances. Format (no inoculation, video, written, video/written) and information (misleading, not misleading) served as the between-subject factors, whereas question (critical, confirming, neutral) served as the within-subject factor.

This analysis yielded significance for the Question main effect, $F(2, 136) = 29.53, p < .001$, Information by Question interaction, $F(2, 136) = 4.93, p < .01$, and Format by Information by Question interaction, $F(6, 136) = 2.94, p = .01$. See Table 1 for the complete ANOVA summary table. Eta squared indicated that these factors accounted for 43.41%, 7.17%, and 12.98% of the variance, respectively.

The Newman-Keuls procedure was used to probe the significant three-way interaction. See Table 2 for the mean accuracy rates. The results of these analyses indicated that the locus of the three-factor interaction involved the critical questions. Participants who were tested under the video inoculation condition ($M=.93$) and were not misled were more accurate ($M=.81$) than participants in the same condition who were misled. Similarly, participants who were tested under the written inoculation condition and not misled were more accurate than participants in the same condition who were misled. Participants who were given both the video and written inoculation procedure and were not misled were more accurate than those participants in the same condition who were misled. As expected, participants who were not given any version of the inoculation procedure and were misled were more accurate than participants who received the inoculation procedure and were misled. There were no significant differences between any groups in regards to the confirming and neutral items.

Table 1

Complete Analysis of Variance Summary

Source	SS	df	MS	F
Format (A)	.04	3	.01	.75
Information (B)	.03	1	.03	1.81
A X B	.05	3	.02	.95
Error	1.17	68		
Within				
Question (C)	.42	2	.21	29.53***
AC	.08	6	.01	1.87
BC	.07	2	.03	4.93**
ABC	.13	6	.02	2.94*
Error	.96	136	.01	

* $p < .05$

** $p < .01$

*** $p < .001$

Table 2

Means and Standard Deviations on Accuracy Rates for Each Condition

	Critical		Confirming		Neutral	
	Misled	Not	Misled	Not	Misled	Not
	<u>M</u> (<u>SD</u>)	<u>M</u> (<u>SD</u>)	<u>M</u> (<u>SD</u>)	<u>M</u> (<u>SD</u>)	<u>M</u> (<u>SD</u>)	<u>M</u> (<u>SD</u>)
Video	.81 (.14)	.93 (.12)	.97 (.05)	.93 (.12)	.86 (.08)	.88 (.13)
Written	.74 (.07)	.84 (.13)	.99 (.03)	.95 (.09)	.90 (.08)	.86 (.13)
Video/ Written	.75 (.18)	.91 (.10)	.92 (.09)	.93 (.09)	.83 (.10)	.86 (.06)
No Inoculation	.89 (.13)	.84 (.18)	.93 (.09)	.98 (.04)	.87 (.07)	.86 (.07)

CHAPTER 4

DISCUSSION

Memory distortion is an area that has been widely researched. Despite the extensive research on memory distortion little research has focused on how to reduce or attenuate the effects of misleading information. Previous studies (Greene et al., 1982; Saywitz & Moan-Hardie, 1994; Winkelspecht & Mowrer, 1999; Zaragoza & Lane, 1994) have attempted to reduce the amount of false information recall by warning participants that misleading information may be presented have produced conflicting results.

As predicted in Hypothesis 1, participants who were not misled and received the inoculation procedure were more accurate than participants in the same condition who were misled. In regards to Hypothesis 2 (as in the Winkelspecht and Mowrer (1999) study), the present data indicates that the inoculation procedure promoted instead of prevented memory distortion. Several explanations for this result are possible. One explanation involves the wording used in the inoculation procedure. Another possibility is that the inoculation procedure was not long enough. Therefore, participants may not have fully understood the implications of the inoculation procedure or did not pay attention to such a short video and/or written text. The implications of these explanations are discussed below.

The warning utilized by Zaragoza and Lane (1994) specifically stated that the participants would be presented with misleading information. The present study used a less blatant warning. For example, the final paragraph of the inoculation states "In a few minutes you will be given a questionnaire about the video you just viewed. Some of these questions may be misleading. It is possible that you may assume that the questions were written by somebody who knows the facts about the video, and therefore accept the misleading information as facts. Keep in mind that if there are misleading questions, they may be only guesses, and it is very important that you accurately report your memory of the event." The ambiguity of the words "may" and "if" might have made the misled

participants unsure if they were presented with misleading information and consequently might have caused those participants who were misled to become more susceptible to the inaccurate information (Winkelspecht & Mowrer, 1999). According to Loftus and Palmer (1974), changing a single word in a question can greatly influence participants' answers. For example, some of their participants were asked, "About how fast were the cars going when they hit each other?" Another set of participants were asked, "About how fast were the cars going when they smashed into each other?" Loftus & Palmer (1974) found that the words hit and smashed accounted for a large portion of the variance in participants' answers. Therefore, participants might answer differently if they are told they will be presented with misleading information, rather than they may be presented with misleading information.

As indicated by Zaragoza and Lane (1994), answering a misleading question leads participants to replay the initial event. According to Loftus (1975), information occurring after an event may alter the retrieval of the initial information. In the present study participants might have replayed misleading information presented in the post-event questionnaire. Moreover, Loftus (1979), found that if new information conflicts with the representation participants have of an event, as in the case of the present study, they might change the representation of the event or discard the new information. Therefore, it is possible participants might have incorporated the information presented in the post-event questionnaire into their representation of the original events. In the Zaragoza and Lane (1994) study, participants knew that they would be presented with misleading information, therefore they may have been more confident about which details of the event were misleading. In the present study the inoculation procedure, which contained more ambiguous terminology than the Zaragoza and Lane (1994) study, may have led to confusion among the participants. The result might have been a more continuous replaying of the original event making them more susceptible to incorporating the misleading

information into their representation of the event. Consequently, those participants in the present study who were not inoculated or exposed to the ambiguity might have been less likely to replay the event and incorporate the misleading information. Therefore, the not misled and inoculated participants should also engage in increased rehearsal. On the other hand, they should not show a decrease in performance because they were not exposed to the misleading information. These results are in agreement with the data reported by Winkelspecht and Mowrer (1999).

The length of the inoculation procedure could be another reason the present inoculation was not as successful as the one used by Saywitz and Moan-Hardie (1994) study. In the present study the video inoculation procedure was approximately 3 ½ minutes long and the written text consisted of a page and a half. The Saywitz and Moan-Hardie inoculation procedure was an extensive program that emphasized the importance of accurate memory, not pleasing the interviewer, and the negative consequences of errors. It should be noted that the Saywitz and Moan-Hardie study was conducted with children, not adults as in the current study.

In an attempt to understand further the reasons the inoculation procedure failed to prevent memory distortion in the present study, a manipulation check was employed. This manipulation check was conducted after the final questionnaire and seems to indicate participants did not remember the information provided in the inoculation procedure. This could be due to many factors including the length of the inoculation procedure and/or the lack of involvement of the participant.

The exact reason the inoculation procedure increased the memory distortion effect is unclear. The results indicate that postevent processing and the length of the inoculation procedure may have been important factors. Future research should focus on developing a more extensive training procedure for adults possibly similar to the one used with children by Saywitz and Moan-Hardie (1994). Developing a procedure that can prevent or attenuate

the affects of memory distortion is critical due to the practical implications of reporting inaccurate information as fact.

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APPENDIX A

INOCULATION PROCEDURE

You have just watched a video, and in a few moments you will be asked some questions about that video. Before that, I would like to give you some information about memory.

A memory is not a perfect representation of an event. New information obtained after the event may alter the way that event is remembered. If the new information is incorrect, the memory may become distorted.

Scientists have engaged in an extensive study of memory distortion for the past two decades. Initially, research was designed to test the effect of misleading questions on eyewitness testimony. In one early study, subjects saw a series of slides, one of which depicted a red Datsun at a stop sign. They were asked questions about the slides, which included the misleading question, “Did another car pass the red Datsun while it was at the yield sign?” After exposure to the misleading questions, the subjects were shown two slides, one of the car at a stop sign, and one of the car at a yield sign. They were asked which slide they had actually seen. Over half of the misled subjects incorrectly reported seeing the car at a yield sign.

Having established that it is possible to create false memories about details of an event, researchers turned to creating false memories of an entire event. One study involved a mother and her two sons. The older son told his 14 year old brother a fictitious story about the younger brother being lost in a shopping mall when he was five years old. The younger boy was easily convinced that the story was true.

There may be times in your life when it is necessary to try to recall an incident from the past. You may witness a crime and be asked to testify about your memory of the crime, or you may enter therapy and find it is desirable to recall events from your past. It is possible that you will be exposed to suggestions. These suggestions are not necessarily

meant to mislead you, they may be only guesses on the part of the interviewer, but they may mislead you and cause your memory of the event to be distorted. Sometimes people will accept the misleading information as fact, if they believe that the information was given to them by an expert, such as a police officer, a lawyer, or a therapist. Keep in mind that although you may perceive such a person as an expert, he or she may not necessarily know all the facts about what you witnessed or experienced. In cases such as eyewitness testimony or a therapy situation, it is very important that you accurately report the details of an event. If you were to testify in court based on a distorted memory, you might cause the wrong person to be punished.

In a few minutes you will be given a questionnaire about the video you just viewed. Some of these questions may be misleading. It is possible that you may assume that the questions were written by somebody that knows the facts about the video, and therefore accept the misleading information as facts. Keep in mind that if there are misleading questions, they may only be guesses, and it is very important that you accurately report your memory of the event.

APPENDIX B

FILLER ACTIVITY

It is generally accepted that we have a very short-term iconic store function of memory and that this iconic store decays rapidly. During a brief stimulus and for a short period of time afterward, a great deal of information is available to the person affected by the stimulus. How much information is available in this iconic store?

Research in this area has been developing for many years. Informal experiments conducted in 1859 indicated that up to about seven marbles tossed on the floor could be comprehended without difficulty. Later, more formal experiments would agree with this limit. Others would question it, suggesting that more would be seen, but there was a limit to what could be reported.

Experimentation became more sophisticated with the use of the tachistoscope, which mechanized the presentation of the stimulus, generally in the form of varying numbers of dots projected onto a screen.

One problem in determining how much information is available is that subjects are asked to report more than is possible due to the limitation of the span of apprehension, thus it is necessary to devise a way to estimate the iconic store. A partial-report task using four or fewer letters is within the span of apprehension for most people. Asking subjects to report a specific part of what they have seen enables one to estimate how much has actually been seen.

A partial-report task used by Sperling required subjects to report specific information indicated by a tone. Each subject was presented with a stimulus. After the stimulus was removed, a high or low tone was sounded, indicating that the subject should report what appeared on either the top (high tone) or bottom (low tone) row. Subjects reported twice as much information as the same subjects reported in a whole-report test in an earlier experiment in the same series.

Chow endeavored to explain how the information is stored, and then how it is recalled. Sperling suggested that we choose what to store, and as a result of that choice, what to forget. Then, when prompted with a cue, we identify what has been stored. This select-then-identify process is the generally accepted view of the iconic store. Other researchers have proposed an opposite, identify-then-select view. This suggests that all letters in a brief stimulus display are identified and represented in abstract form in a character buffer. This model suggests that the decay of memory of the stimulus was due to difficulty in locating the letters in the character buffer at longer periods of time following the stimulus.

To address this issue, Chow devised an experiment involving matrix (whole-report) and array (partial-report) conditions. This experiment studied the types of errors made in each task, as well as the effect of instructions to guess or not guess if a letter could not be recalled. This information provided additional support for the iconic store model. In this study, the partial-report was superior to the whole-report.

APPENDIX C
QUESTIONNAIRE WITHOUT MISLEADING QUESTIONS

1. In the scene where the woman's car is halted at the entrance to the expressway, was the green car of the man behind her damaged when the driver behind him hit his car with her vehicle?
2. When Jane caused the accident by halting at the entrance to the expressway, did she stop to see if there was any damage, or did she go on?
3. When the woman was distracted because she was changing cassettes, did she cause an accident?
4. Did the driver on the expressway who failed to obey a "merging traffic" road sign cause an accident?
5. When Ben and his passenger were returning home from a trip to the country, was his passenger injured their car went into the shoulder of the road?
6. When Ben became very tired at the wheel, did his passenger alert him, or was he startled by the headlights of an oncoming vehicle?
7. Was Ben's passenger a factor that led to his loss of control of his car?
8. Did the weight of Ben's car cause his headlights to aim too high, thus causing it to appear that he was using his bright beams?

9. When Neal was driving under bad road conditions, and he was distracted because he was holding a map, did he knock over the construction barrier?
10. While Neal was distracted, he passed a parked yellow car. Did the yellow car cause an accident?
11. Was Neal, who was anxious to reach his destination, driving safely for the road conditions and the conditions of his vehicle?
12. Were Neal's nearly bald tires a factor that contributed to his accident?
13. When Betty and her children were on their way home from the shopping center, did the child on the bicycle fall when Betty slammed on the brakes?
14. Why were Betty and her daughter Jennifer, who was in the front passenger seat, not wearing seat belts on their trip home from the shopping center?
15. When Betty had her children in the car, was she paying more attention to the children or the road?
16. Did the blue jacket of the child playing in the road catch the attention of Betty or her children?
17. When Phil, in his car, found his exit and cut across to exit from the center lane, was he responsible for causing an accident?

18. Was Beth, who was rushing to get to a job interview, weaving across the white line, trying to pass the rental truck?
19. Was the rental truck driver's inappropriate driving in the left lane one of the factors that nearly caused a collision in the final scene?
20. Did Beth, by waiting too long to change lanes, contribute one of the factors that led to a near-collision?

APPENDIX D

QUESTIONNAIRE WITH MISLEADING QUESTIONS

1. In the scene where the woman's car is halted at the entrance to expressway, was the red car of the man behind her damaged when the driver behind him hit his car with her vehicle?
2. When Kathy caused the accident by halting at the entrance to the expressway, did she stop to see if there was any damage, or did she go on?
3. When the woman was distracted because she was changing cassettes, did she cause an accident?
4. Did the driver on the expressway who failed to obey a "merging traffic" road sign cause an accident?
5. When Ben and his passenger were returning home from a trip to the country, was his passenger injured when their car went nose-first into the ditch?
6. When Ben fell asleep at the wheel, did his passenger alert him, or was he startled by the headlights of an oncoming vehicle?
7. Was Ben's passenger a factor that led to his loss of control of his car?
8. Did the weight of Ben's car cause his headlights to aim too high, thus causing it to appear that he was using his high beams?

9. When Neal was driving under bad road conditions, and he was distracted because he was holding a cup of coffee, did he knock over the construction barricade?
10. While Neal was distracted, he passed a speeding yellow car. Did the yellow car cause an accident?
11. Was Neal, who was anxious to reach his destination, driving safely for the road conditions and the condition of his vehicle?
12. Were Neal's nearly bald tires a factor that contributed to his accident?
13. When Betty and her children were on their way home from the shopping center, did the children on the skateboard fall when Betty slammed on the breaks?
14. Why were Betty and her son Billy, who was in the front passenger seat, not wearing seat belts on their trip home from the shopping center?
15. When Betty had her children in the car, was she paying more attention to the children or to the road?
16. Did the blue jacket of the child playing in the road catch the attention of Betty or her children?
17. When Ken, in his rental truck, found his exit and cut across to exit from the center lane, was he responsible for causing an accident?

18. Was Beth, who was rushing to get to the hospital, weaving across the white line, trying to pass the rental truck?

19. Was the rental truck driver's inappropriate slow driving in the left lane one of the factors that nearly caused a collision in the final scene?

20. Did Beth, by waiting too long to change lanes, contribute one of the factors that led to a near collision?

APPENDIX E
RECOGNITION TEST

1. Bob Kaplan's car was hit from behind while he was halted, behind another car, at the expressway entrance. What distracted the driver behind him who hit his car with her vehicle?
 - a) reaching for a purse
 - b) changing a cassette
2. What type of vehicle hit Bob Kaplan from behind?
 - a) pickup truck
 - b) car
3. What type of sign did the driver on the expressway fail to honor?
 - a) merging traffic sign
 - b) yield sign
4. What was the reason why the young woman, first in line at the expressway entrance, was so cautious about entering the expressway?
 - a) her car was large
 - b) her car was expensive
5. What was Bob Kaplan, the man who was hit from behind at the expressway entrance, wearing?
 - a) business suit
 - b) leather jacket and slacks
6. What was the gender of the driver whose failure to honor a road sign kept Jane from getting on the expressway?
 - a) male
 - b) female

7. What color was Bob Kaplan's car?
 - a) green
 - b) red
8. Who caused the accident by halting at the entrance to the expressway?
 - a) Jane
 - b) Kathy
9. Ben and his passenger were returning home from a trip to the country. What restricted Ben's use of the steering wheel?
 - a) his passenger
 - b) his seat belt
10. What type of vehicle was Ben driving?
 - a) station wagon
 - b) Winnebago
11. Who was Ben's passenger?
 - a) daughter
 - b) wife
12. Why was Ben's passenger resting her head on his shoulder?
 - a) she was sick
 - b) she was sleepy
13. Where did Ben's car go when he lost control because he was startled by the headlights of an oncoming vehicle?
 - a) into a ditch
 - b) onto the shoulder of the road

14. Just before Ben was startled by the headlights of an oncoming vehicle, how alert was he?

- a) very tired
- b) asleep at the wheel

15. What was the time of day when Ben and his passenger were returning from the country?

- a) dusk
- b) dark

16. What was wrong with Ben's headlights?

- a) aimed too high
- b) bright beams were on

17. Neal was driving in bad weather conditions. What factors contributed to his accident?

- a) bald tires
- b) no headlights

18. Neal, normally a good driver, did not slow down while driving in bad weather conditions. Why not?

- a) he was anxious to reach his destination
- b) he was keeping up with other traffic on the road

19. What type of vehicle was Neal driving?

- a) pickup truck
- b) small car

20. What was Neal holding that distracted him?
- a) cup of coffee
 - b) map
21. What was the status of the yellow car that Neal passed?
- a) speeding
 - b) parked
22. What type of weather was causing difficulty for Neal?
- a) snow
 - b) rain
23. What type of barrier did Neal hit?
- a) guardrail
 - b) construction barricade
24. What caused Neal's visibility to be limited?
- a) bad wiper blades
 - b) freezing rain
25. Betty and her children were on the way home from the shopping center. What was the posted speed limit on the road they were on?
- a) 35 mph
 - b) 25 mph
26. What was the boy in Betty's back seat doing to annoy the girl next to him?
- a) pulling her hair
 - b) tugging at her cap
27. What color was the jacket of the child that Betty almost hit?
- a) blue
 - b) red

28. In what type of area was Betty driving?
- a) isolated country road
 - b) suburban area
29. Which was one of Betty's danger factors?
- a) attention to the road
 - b) bare tires
30. What was the child riding when Betty almost hit him?
- a) bicycle
 - b) skateboard
31. Who was in the front passenger seat with Betty?
- a) Jennifer
 - b) Billy
32. How many children were in Betty's back seat?
- a) three
 - b) two
33. Phil was one of several drivers on the expressway in the final scene. At what exit did he leave the expressway?
- a) 37
 - b) 40
34. John who was driving behind Phil, contributed two factors to the near-collision. Which of the following was one of the factors?
- a) improper lane change
 - b) following too close
35. What was Beth doing that contributed a factor to the near-collision?
- a) failing to use her turn signal
 - b) waiting too long to change lanes

36. What was the company name on the rental truck?

- a) Ryder
- b) U-Haul

37. One of the vehicles was inappropriately using the left hand lane by driving slowly.

Which vehicle was it?

- a) motorcycle
- b) rental truck

38. Who caused the near-collision by cutting across from the center lane to exit the expressway?

- a) Phil
- b) Ken

39. To what destination was Beth rushing?

- a) job interview
- b) hospital

40. What was distracting John?

- a) sports car
- b) Beth

APPENDIX F

MANIPULATION CHECK

1. Memory is
 - a. perfect representation of an event.
 - b. influenced by new information.
 - c. permanent and unchanging.
 - d. an uncharted area of the human mind.
2. Early research on memory
 - a. led to new policies when questioning witnesses.
 - b. focused on the effects of misleading questions.
 - c. produced unclear results.
 - d. involved presenting word lists to participants.
3. When participants viewed a car at a stop sign but were later questioned about seeing a car at a yield sign, what percentage falsely recalled seeing the car at a yield sign?
 - a. 10%
 - b. 30%
 - c. 50%
 - d. over 50%
4. Researchers have established it is possible to create false memories of
 - a. parts or details of an event.
 - b. an entire event.
 - c. both a and b.
 - d. neither a nor b.
5. Memory researchers have used a fictitious story about
 - a. being lost in a mall.
 - b. being left at a gas station.
 - c. falling out of a moving vehicle.
 - d. running away from home.
6. If you are presented with information from an expert you should
 - a. automatically accept the information as the truth.
 - b. disregard the information.
 - c. realize the person may not know all the facts.
 - d. ignore the information unless several people tell you the same thing.
7. If you are an eyewitness to an event it is important that you
 - a. report only what you saw.
 - b. listen to the information presented by those around you.
 - c. watch television to learn more about what happened.
 - d. none of the above.

8. Which of the following statements is **not** true?
- a. Misleading information is often only a guess about what really happened.
 - b. During an investigation you may be presented with new information.
 - c. Suggestions may lead to memory distortion.
 - d. Information presented by experts should be accepted as fact.
9. Researchers have conducted memory distortion studies for the past
- a. 2 years.
 - b. 5 years.
 - c. decade.
 - d. 2 decades.
10. Suggestions are most often
- a. meant to mislead you.
 - b. guesses about what really happened.
 - c. designed to distort your memory.
 - d. made by people who witnessed the event.

I, Brandy Smith, hereby submit this thesis to Emporia State University as partial fulfillment of the requirements for an advanced degree. I agree that the Library of the University may make it available to use in accordance with its regulations governing materials of this type. I further agree that quoting, photocopying, or other reproduction of this document is allowed for private study, scholarship (including teaching) and research purposes of a nonprofit nature. No copying which involves potential financial gain will be allowed without written permission of the author.

Brandy Smith
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10/1/99
Date

Memory Distortion in Inoculated
Participants

Title of Thesis

Lucy Cooper
Signature of Graduate Office Staff

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