

Running head: EMOTIONALITY, GENDER ON MEMORY DISTORTION

Emotionality and Gender of a Third Party Reporter on Memory Distortion

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A thesis submitted in partial fulfillment of the requirements for graduation with Honors  
in Psychology.

*Certificate of Approval*

This is to certify that the accompanying thesis by Katrina Kerrigan, Ana Rodriguez, and Madison Seltzer has been accepted in partial fulfillment of the requirements for graduation with Honors in Psychology.

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## Abstract

Human memory is largely considered a reliable source for retrieving information. At the same time, memory researchers continue to demonstrate the fallibility of memory. The misinformation effect is one such weakness in which post-event misinformation distorts an original memory for an event. There is a gap in the literature regarding how certain aspects of the post-event misinformation may modulate the misinformation effect. In the present study, we investigated how the gender and emotionality of a misinformant affects the misinformation effect. Participants watched a short video of a crime, followed by one of four testimonies in which a witness recounted both consistent and misleading information. The testimony was manipulated across both gender (male/female) and emotionality (emotional/neutral). Participants were tested on their memory for the original event with questions about facts that were reinforced, distorted, or not mentioned by the testimony. The misinformation effect was achieved in the present study. Although no main effects of testimony gender nor emotionality were found, a non-significant interaction trend was observed between testimony gender and emotionality. Participants' memory accuracy for distorted information was lower for emotional female testimonies compared to neutral female testimonies but higher for emotional male testimonies compared to neutral male testimonies. Analyses revealed a main effect of participant gender in which male participants were more susceptible to the misinformation effect than female participants. Research on the present topic will shed light on the ways in which we remember information acquired through third-party sources.

*Keywords:* memory, gender, emotionality, misinformation effect

### Emotionality and Gender of a Third Party Reporter on Memory Distortion

Memory is considered a trusted and reliable source and yet it continues to be proven fallible. The misinformation effect, in which a memory is distorted after exposure to misleading information, is a well-established phenomenon (Laney & Loftus, 2013). Research suggests that a variety of factors influence the individual's susceptibility to memory distortion, including emotion and gender. Given the real-world applications of the misinformation effect, researchers must investigate the vulnerabilities of memory to avoid the consequences of false recollection.

Research shows that memories for emotional events are more susceptible to distortion than memories for neutral events (Lamiell, 2010; Porter, Spencer, & Birt, 2003). Additionally, memory differences between genders are supported; numerous studies suggest that females generally have a stronger memory than males, especially for prosocial topics (Horgan, McGrath, & Long, 2009; Horgan, Stein, Southworth, & Swarbrick, 2012). We found a gap in the literature regarding the effects of post-event testimonies on memory distortion. Researchers focus on the misinformation effect in emotional events rather than in emotional third-party reports. We sought to close the gap in the literature by manipulating the emotionality of post-event testimonies rather than the emotionality of an event itself.

The researchers in the present study investigated the roles of gender and emotionality of a post-event report on an observer's memory for the event. Research on this topic is important given that third party accounts are a primary source of information. Individuals rarely witness important events firsthand. Rather, they gather information from media and third-party sources. This research could shed light on how newscasts and

viral videos may distort the public's memories of current events and news. Additionally, the present research could inform juries on their susceptibility to distortion through eyewitness testimonies. By educating jurors on the fallibility of their own memory, the juries and judges may achieve stronger objectivity in reaching a verdict.

### **Early Memory Research**

The general fallibility of memory has been recognized for centuries; however, it was not until the late 1800s that psychologists discovered a way to investigate specific properties of memory. Memory was first explored experimentally by German psychologist Hermann Ebbinghaus in 1885 (Benjamin, 2007). Ebbinghaus studied how memories are formed through associations using a strong experimental design. He struggled to find participants, so he formed nonsense syllables to control for preexisting cognitive associations and tested himself on recitation and recall. He found that recall greatly improved through recitation and later established the learning and forgetting curves (Benjamin, 2007; Ebbinghaus, 1913). Ebbinghaus' contributions paved the way for a psychology of memory which resulted in a progressive understanding of human memory.

While Ebbinghaus focused on associations in memory, Frederic Bartlett expanded the body of research by examining the constructive components of memory. Bartlett (1932) found that cultural and social factors greatly influence memory. In the early 1930s, he conducted a study where participants were read a long, foreign folk tale (Bartlett, 1932). In retelling the stories, Bartlett found that participants often reconstructed aspects of the story to make more sense of it. He concluded that human memory interacts with subjective experience to better make sense of a situation (Bartlett,

1932). Bartlett was crucial in uncovering the fallibility of memory, as he pointed to the mind's tendency to manipulate facts. Numerous revelations arose from this finding, including that memory for eye-witnessed events should not be readily accepted as fact. With a legal system that largely relies on witness accounts, the vulnerability of memory becomes a crucial area of study to effectively promote justice. By the time Bartlett discovered the reconstructive component of memory, several psychologists were already invested in studying psychology within the courtroom. Bartlett provided a strong framework with which to apply previous and future research.

In 1893, James Mckeen Cattell conducted the first study in what would later be known as forensic psychology (Bartol & Bartol, 1999). He asked students a series of questions and asked them to rate their confidence in each answer. Cattell found that confidence did not indicate correctness. Some students were confident across all answers while others were uncertain, though neither case was a predictor of accuracy (Cattell, 1893). The findings implied the legal system wrongfully relies on witness testimony. Cattell called for further research on the reliability of eyewitness accounts. Albert von Schrenck-Notzing later testified in 1896 that eyewitness accounts can be influenced by media reports preceding the trial (Blackburn, 1996). Von Schrenck-Notzing's declaration foreshadowed the constructive approach to memory and directed a spotlight towards the suggestibility of witness testimony that Bartlett would later investigate.

Hugo Munsterberg began his studies on forensic psychology in 1906, as a result of a controversial murder trial (Benjamin, 2007). A man who was thought to be mentally disabled had confessed to the crime and later retracted his confession. Munsterberg thought the confession was obtained through deceptive interrogation and began

researching false confessions. The court proceeded with the execution of the perpetrator, which Munsterberg interpreted as an attack on the field of psychology. Munsterberg remained determined to find a place for psychology in the courtroom and published works on crime prevention, lie detection, false confessions, and the decision processes of jurors. Munsterberg recognized that human memory is subject to influence by other factors and expanded the literature on memory to include questions of omission and commission. In 1908, he published the first book on applied psychology, *On The Witness Stand*, which presented a collection of his studies on the psychology of law. In his lifetime, the courts gave little attention to the human error of memory, but his contributions progressed the field to establish a forensic psychology that would eventually make its way into the courtroom (Benjamin, 2007). These psychologists paved the way for Elizabeth Loftus' important work on memory distortion, which serves as the basis for the present study.

### **Modern Memory Distortion**

Modern research on memory distortion was pioneered by Elizabeth Loftus in the mid 1970s. She first focused on the malleability of memory, especially when faced with leading questions. She focused on the real-world applications of the misinformation effect, particularly in courtroom and testimony settings. Early studies on the malleability of memory focused on the effect of leading questions on event recollection (Laney & Loftus, 2013). In a study in which participants viewed a film of a car accident and then answered questions about the events they witnessed, questions which used definite articles (i.e., "Did you see the broken headlight?") produced more false recognition and more confidence in participants' recognition than questions which used indefinite articles

(i.e., “Did you see a broken headlight?”) (Loftus & Zanni, 1975). In another study, participants were shown a video of a classroom disruption and were later asked to rate the video on a number of scales. The researchers found that participants rated the event as noisier and more violent if they were asked questions with active phrasing rather than questions with passive phrasing (Loftus, Altman, & Geballe, 1975).

Later, misinformation researchers shifted their focus from the effect of leading questions to the potential for new information to transform a memory in more complex and dramatic ways. Loftus, Miller, and Burns (1978) conducted a study in which participants saw a series of slides depicting a car accident and then were exposed to either consistent, misleading, or irrelevant information about the event. Participants were fed misleading information in the form of leading questions. For example, participants were asked a question about a yield sign after seeing a stop sign in the original slides. Misleading information decreased the number of accurate responses on both yes/no and forced-choice recognition questions: participants often recalled seeing a yield sign instead of a stop sign. For the first time, researchers recognized that post-event misleading information can alter a participant’s initial memory for an event.

In the 1990s, much of the research on false memory was fueled and divided by two separate groups of researchers. A new field of trauma studies existed in opposition to the field of eyewitness memory and false memory research. The new field of trauma studies was created specifically in response to the prevalence of victimization of women and children. Trauma study researchers argued that the experience of trauma has the power to alter memory and that trauma causes memories to become inaccessible from their owners (repression), but can later be recovered as full, accurate memories with the

help of a therapist. False memory researchers argued against this theory, noting that therapists may serve in effect as a misinformant as in Loftus' studies. Guided by their research, these psychologists saw memory as malleable, especially in the face of the techniques usually used to recover traumatic memories. This divide between memory researchers fueled a huge amount of research on the misinformation effect (Laney & Loftus, 2013).

Since these early misinformation studies, false memory research has largely operated under the same methodological paradigm (Loftus, 1979). First, participants view an event, either in video or image form. Next, they are either asked a series of questions or otherwise presented with new information, some of which is inconsistent with the original event. Lastly, their memory is tested with a series of either true/false or forced-answer questions. This paradigm provides the methodological base for the current study. We predict that the misinformation effect will be modulated by characteristics of the misinformation - in particular, by the degree of emotion and by the gender of the misinformant.

### **Emotion**

Most research on the relationship between emotion and memory focuses on how the emotionality of an event impacts the observer's memory for the event (Porter et al., 2003; Waring and Kensinger, 2009; Lamiell, 2010; Lawson & Strange, 2013; Van Damme & Smets, 2013; Hoscheidt, LaBar, Ryan, Jacobs, & Nadel, 2014). The researchers in the present study sought to examine the influence of an emotional expression of facts by an eyewitness on another person's memory for the same event. People often receive information from emotional sources, such as nuanced news reports

and eyewitness testimonies. The influence of emotion on memory is not a new topic of interest. In 1901, William Stern found that the emotionality of an event can reduce the accuracy of a witness' memory (Lamiell, 2010). For example, in one experiment, participants were asked to recall information about an angry dispute involving a weapon. Inaccuracy in recall was highest for information regarding the most intense part of the dispute. Lawson and Strange (2013) further supported Stern's findings. They studied whether memories are more susceptible to distortion after viewing or reading standard versus exaggerated reports and found that exaggerated reports led to greater memory distortion.

Various researchers have focused on different elements of emotion and memory. For example, Bock and Klinger (1986) found that through simple word recall, emotional words were often more accurately remembered than neutral words. Other research suggests that negative emotion in the event increases an individual's susceptibility to the misinformation effect. Porter et al. (2003) found that negative emotion in an event (i.e., sadness due to a picture of a fatal accident) increased susceptibility to misinformation compared to neutral and positive emotions in an event. Porter et al. (2003) conducted a study in which participants viewed negative and positive images (the images came from a study that previously rated the positivity/negativity of each image) and later answered questions containing false information about the images. The researchers found that participants remembered the misinformation for the negative images twice as much as for the positive images.

However, contrary to Porter et al.'s (2003) findings, Hoscheidt et al. (2014) found that when stress and arousal were elicited by a negative event, participants showed

greater resistance to memory distortion. Researchers addressed this inconsistency by studying the specific details remembered/distorted for emotional versus neutral events. Waring and Kensinger (2009) found a central-peripheral information trade off when it comes to memory: negative arousing information leads to better memory for central details but worsened memory for peripheral details. Central information refers to details that are at the forefront of the media, such as the main object in an image or painting. In contrast, peripheral information refers to more subtle details in the background. They suggested negative events may cause an individual to narrow their memory so as to focus and remember only central details versus peripheral details. Van Damme and Smets (2013) sought to expand on these findings to see how valence and arousal of photographs affect memory for implanted false information. The participants experienced the central-peripheral information trade-off for negative, arousing pictures, supporting Waring and Kensinger's theory that different types of information may be more susceptible to memory distortion. It is difficult to summarize the findings on memory recall for central versus peripheral details because the definition of central and peripheral changes across mediums. In an image, the focus of the picture is often the central detail, whereas the central detail of a video usually includes visual information as well as contextual information.

Although there is variability in the findings regarding the effects of emotion on memory, most of the literature supports the theory that negative emotionality in an event leads to greater memory distortion, especially for peripheral information. In a critical literature review on emotion and memory, Christianson (1992) concluded that information associated with negative emotional events is less accurately retained in the

short term memory. This finding is most pertinent to the present study as the researchers sought to examine the accuracy of memory for information given in a negative emotional testimony.

Apart from the emotionality of the event itself, there is also the question of how emotion displayed by a third-party reporter affects the misinformation effect. There is a large gap in the literature regarding the influence of a third-party emotional testimony on a viewer's recollection of a witnessed event. The above literature suggests that emotion on the part of the original observer diverts attention away from details in memory recall; we predict that an emotional testimony via an empathy process will likewise divert the viewer's attention away from details of the event, increasing their susceptibility to the misinformation.

The above research suggests that emotion can interfere with attention, leaving the memory less precise and thus more susceptible to distortion. A further consideration is that because the emotion in the present study stems from the misinformant, the testimony acts as a persuasive appeal. To understand the implications of this, it is important to look at the persuasive power of emotion. Dillard and Nabi (2006) investigated models of emotional persuasion by looking at cancer research advertisements. They proposed that for an emotional response to be persuasive, the emotion must be seen as both logically caused and relevant to the message. In other words, an emotional appeal is most persuasive when the emotion has a logical and relevant origin. In the present study, the emotion of the testimony stems from logic, which is clear to the participants. Because of this, the emotional testimonies are likely to be very persuasive. Based on the distracting nature of emotional information in general and also on the persuasive power of logical

emotional appeals, we expect misleading emotional testimonies to negatively influence memory recall for an original event.

### **Gender**

Research suggests gender differences in memory do not stem from gender differences in memory capacity but rather on the type of information to be recalled (Hamami, Serbun, & Gutchess, 2011; Powers, Andriks, & Loftus, 1979). Powers et al. (1979) reported that sex differences in recall occur with respect to the nature of the information. They found that an individual's stronger investment/interest in a subject led to more accurate recall. These findings support the self-referencing theory, which suggests individuals better remember information that they can identify with (Hamami et al., 2011). Also supporting the self-referencing theory, Horgan et al. (2009) suggest that women have stronger interpersonal skills, which may lead them to more accurately remember facts about people. Davis' (1999) findings also support the theory that women more accurately remember facts about people because they have greater interpersonal skills. Davis conducted five studies to assess whether males or females remembered autobiographical memories better, and found that females consistently remembered more childhood memories than males. Additionally, Horgan et al. (2009) found that females more accurately remember events and facts involving people, but there was not an analogous pattern for objects or physical spaces.

Horgan et al. (2012) further tested the self-referencing theory in the context of testimonies. In the study, a confederate presented participants with information about his or herself and about his or her friends and family. The researchers found that although there was no gender difference in recall of the information of the confederate, females

better remembered information about the confederate's friends and family. In another study, the self-referencing theory applied to females but not males. Females more accurately remembered female faces than male faces but males did not show an analogous gender-matching pattern (Lovén, Herlitz, & Rehnman, 2011). Further supporting this theory, Herlitz and Yonker (2002) found that females performed better on facial recognition and verbal episodic memory tasks, but found no sex difference on performance for nonverbal episodic memory tasks. The above findings, particularly those of Horgan et al. (2012) and Lovén et al. (2011), inform our interaction hypothesis: we hypothesize that female participants will be more persuaded (show greater memory distortion) by female testimony than by male testimony, but male participants will not show an analogous gender-matching pattern.

Another factor to investigate is the overall effect of informant gender on persuasion. According to social role theory, there are different expectations for gender. When people do not act in accordance with these expectations, they are negatively perceived (Eagly, 1987). The implications of social role theory are highlighted in courtroom testimonies, as certain characteristics may lead a jury to perceive an account as more or less credible. Socially, women are expected to display higher levels of overall expressed emotion and men are expected to display higher levels of expressed anger. The present study characterizes emotion in both of these ways; we do not expect social role theory to interfere with the overall persuasive power of the informant. Perrot and Weber (2010) tested whether female or male victims' accounts of sexual assault were more likely to be trusted. They found that although participants were equally empathetic towards the male and female victims, participants perceived female victims to be more

trustworthy. In contrast, Armstrong and McAdams (2009) conducted a study in which participants rated the credibility of a blog post based on author gender. The researchers found that participants perceived posts by male authors to be more credible than posts by female authors. These findings demonstrate that both male and female informants have different sources of persuasive power. In the present study, we expect there to be no main effect of informant gender on memory distortion.

### **The Present Study**

The misinformation effect is well-documented and researched in a number of ways. Participant factors and event factors in particular have been found to produce main effects. However, few aspects of the misinformation source itself have been investigated. Leading questions have been shown to affect memory (Loftus & Zanni, 1975), but researchers have not investigated factors of the informant doing the leading or misleading (emotion, gender, etc.). Considering the growing prevalence of third-party accounts on current events, this topic needs attention. For example, newscasts and court testimonials essentially come from third party informants, and both have significant implications on the public's perception and interpretation of events.

In the present study, the researchers investigated the relationship between misinformant factors and susceptibility to memory distortion by presenting participants with a video of an event and then exposing them to one of four conditions of a third-party report of the event with some reinforced and some distorted information. Specifically, we focused on the influence of the misinformant's gender and emotionality on participants' susceptibility to the misinformation effect, resulting in the four conditions of the testimony video (female/neutral, female/emotional, male/neutral, male/emotional).

Gender and emotion are two of the more transparent and salient factors communicated to the viewer, and we expect both to influence an individual's susceptibility to memory distortion. Memory accuracy for the original event was measured with a memory test that asked three types of questions: (1) regarding information that was observed in the original event video and reinforced in the testimony video, (2) regarding information that was observed in the original event video and distorted in the testimony video, and (3) regarding information that was observed in the original event video but unmentioned in the testimony video. Participants were asked to indicate their confidence level for each question as well in order to examine whether participants were guessing or sure of their memory for the event. The goal of the present study is to shed light on the potential biases or persuasive power of gendered and/or emotional testimonies.

The hypotheses of the present study are as follows:

H1: Memory will be most accurate and most confident for questions about reinforced facts.

H2: Memory will be least accurate and least confident for questions about distorted facts.

H3: Emotional testimonies will lead to greater memory distortion and higher confidence in those distorted memories than neutral testimonies will.

H4: Emotional testimonies will lead to more accurate memory for reinforced facts than neutral testimonies will.

H5: There will be no main effect of informant gender on memory distortion.

H6: Female participants will be more persuaded (show greater memory distortion) by female testimony than by male testimony, but male participants will not show this analogous gender-matching pattern.

## **Method**

### **Participants**

The sample was composed of 58 female and 29 male Whitman College students (71.3% White, 12.6% more than one race, 9.2% Asian, 2.3% other, 1.1% African American, 1.1% Native Hawaiian or other Pacific Islander; 2.3% of participants did not report their racial identity). Participants were recruited through email and Facebook blasts and invited to volunteer via a Google Doc sign-up sheet. Participants were compensated with a baked good and submission into a raffle for a gift card to a local restaurant. We did not omit any participants' data from the sample, resulting in a final sample of 87 individuals.

### **Research Design**

We conducted a 2 x 2 x 2 fully between-groups experiment. After observing a video of an event, each participant also observed a single testimony which distorted some facts of the event and reinforced others. Half of the participants viewed an emotional testimony and half viewed a neutral testimony. Likewise, within each of these conditions, half of the participants viewed a male testimony and half of the participants viewed a female testimony. Following the testimony, participants' memory for aspects of the original event was tested with a series of forced-choice questions about both the distorted and reinforced event facts as well as about facts not mentioned in the testimony. The numbers of each of these types of questions answered correctly served as our dependent measures. For each of these accuracy measures, we examined the main effects of three variables: emotionality of the testimony (neutral vs. emotional testimony), informant gender (male vs. female), and participant gender (male vs. female). In addition, we

looked for interactions between these factors (i.e., interactions between emotionality and gender of the informant, between emotionality and gender of the participant, and between gender of the informant and gender of the participant). Of particular interest were the effects and interactions pertaining to the number of accurate responses to questions about distorted facts, as this measure represents susceptibility to memory distortion.

### **Materials**

All participants were given a packet upon entering the testing room that included an informed consent form, four sudokus, a memory test, and a demographic questionnaire. Following the informed consent form, all pages were marked only by the participant's unique number to ensure confidentiality of their responses.

**Event video.** Participants were shown a five-minute video of an electrician excessively rummaging through a house while the residents were not home. The electrician moved some things around, took several of the residents' possessions with him, and did not complete the job for which he was actually hired. For example, the electrician tried on a hat in the bedroom, looked through a photo album on the coffee table, and opened a can of soda from the fridge. This video was made available to the researchers by Takarangi, Parker and Garry (2006).

**Testimony video.** Participants were later shown a two-minute video of the residents' police report testimony of the electrician event. The resident provided two types of information about the event: facts consistent with the original video and facts inconsistent with the original video. For example, the testimony claimed that the electrician tried on a hat in the bedroom (consistent), took photos from the photo album (inconsistent), and poured himself an alcoholic drink (inconsistent). Each participant was

assigned to one of four groups, and each group was given one of the following testimony conditions: female/neutral, female/emotional, male/neutral, male/emotional. The four conditions allowed the researchers to examine if the testimony's emotionality and/or gender led participants to be more susceptible to memory distortion.

The testimony videos were filmed by the researchers, using one middle aged-female and one middle-aged male volunteer as actors. The scripts of the videos were nearly identical: words were changed in the emotional testimonies to add emotion (i.e., "I don't drink alcohol" vs. "I *never* drink alcohol!"). Additionally, inflection and body language of the informant were more exaggerated to add emotion. Besides gender and emotionality, the videos controlled for potential confounding variables. The informants wore similar clothing and the videos were filmed in front of an identical, neutral background. A manipulation check ensured that the emotional differences between the conditions were consistent and effective.

**Filler activity.** Following the event video and again following the testimony video, participants were given two simple sudokus to fill ten minutes of time between tasks. Sudokus were generated by a random online puzzle generator. They were not meant to be strenuous, they were simply meant to fill time so that memory for the event would be somewhat challenged.

**Memory test.** The memory test was composed of 24 forced-answer questions about the facts of the event. Eight questions addressed information observed by the participant in the first video but manipulated by the testimony (observed-changed), eight questions addressed information observed by the participant in the first video and reinforced by the testimony (observed-reinforced), and eight addressed information

observed by the participant in the first video but not mentioned in the testimony (observed-unmentioned). The observed-changed questions measured memory distortion, the observed-reinforced questions measured memory for repeated facts, and the observed-unmentioned questions acted as the control for our analyses: these questions measured memory for the event without any additional or misleading information.

The three types of questions on the memory test were interspersed and randomly ordered to ensure participants did not find a pattern in the types of questions. All responses were forced-answer. For observed-changed questions, the two responses corresponded to the information given in the original event and in the manipulated testimony, to force participants to choose one definitively. For the observed-reinforced and observed-unmentioned, the incorrect answer was a random, but plausible fact. Forced-answer responses were only necessary to measure memory for the observed-changed facts, but all responses were forced-answer to maintain consistency. After each question, participants were asked to rate their confidence on a scale from “1” (not at all confident) to “5” (very confident). This was to measure whether participants guessed in their responses or were confident in the information. See the Appendix for a full copy of the memory test.

**Demographic questionnaire.** The demographic questionnaire asked about participants’ class year, gender, racial identity, and hours of sleep obtained the night before (included to obscure the purpose of the study). The questionnaire then asked participants to guess the purpose of our study to check for potential demand characteristics.

## **Procedure**

Participants were recruited via several campus-wide listservs and student Facebook groups. Whitman College students were invited to sign-up for a testing date with a Google Doc sign-up sheet. Participation was entirely voluntary as students were given the link to a sign-up sheet where they signed-up on their own accord. In the recruiting blasts, all Whitman students were politely invited to participate in the study and informed that their time would be compensated with a baked good and a chance to win a raffle for a \$30 gift certificate to the Walla Walla restaurant of their choice. A convenience sample of 87 participants was obtained.

Up to six participants were tested at each fifty-minute session. At the time of the session, participants entered a reserved classroom in Maxey Hall and were seated at a chair with a packet. The experiment was conducted in a controlled environment with minimal audio or visual distractions. By providing a controlled environment, we attempted to eliminate potential confounding variables.

At the beginning of the session, all participants completed an informed consent form that detailed the minimal risk factors associated with the study and made clear that participants were free to leave or withdraw data at will. After completing an informed consent form, participants were shown the five-minute video of a crooked electrician. All four groups were shown this same video. Following the video, participants were given ten minutes of filler time to work on sudokus.

Next, participants were shown a two-minute testimony video of the resident's police report. Participants attending the same session were all in the same group and shown the same testimony condition (male/female reporter, emotional/neutral testimony). Condition was assigned to each session before participants signed-up, and participants

were not informed of their assigned condition. Following the testimony video, participants were given another ten minutes of filler time to work on the remaining two sudokus.

Following the ten minutes of filler time, participants were administered the memory test. The test took approximately ten minutes. Once the memory task was completed, participants completed the demographic questionnaire. After all materials were completed, participants were debriefed about the purpose of the study and asked not to discuss the study with other students. Lastly, individuals were offered a baked good and a raffle ticket as compensation for their participation.

### **Results**

The researchers in the present study examined the effects of third-party reporter gender and emotion on the misinformation effect by conducting a 2 x 2 x 2 fully between-groups experiment. The first between-groups independent variable was the gender of the third party reporter (male vs. female) and the second was the emotionality of the third party reporter (neutral vs. emotional). Lastly, participant gender (male vs. female) was a subject variable. The dependent variables were the accuracy and confidence of responses on a memory test of the original event video. Based on previous research, we predicted memory would be most accurate and most confident for questions about reinforced facts, and least accurate and least confident for questions about distorted facts. We further predicted emotional testimonies would lead to greater memory distortion and higher confidence in those distorted memories than neutral testimonies would and that emotional testimonies would lead to more accurate memory for reinforced facts than neutral testimonies would. Lastly, we hypothesized that there would be no

main effect of informant gender on memory distortion, but that female participants would be more persuaded by female testimony than by male testimony while male participants would not show this analogous gender-matching pattern.

The 24-question memory test measuring the dependent variable consisted of three types of questions: regarding details observed in the event video and reinforced in the testimony video (reinforced), regarding details observed in the event video and changed in the testimony video (distorted), and regarding details observed in the event video but unmentioned in the testimony video (unmentioned). Participants were given three scores, each indicating the total number of questions answered correctly for one of the three question types (max score per type = 8). Participants were also given three confidence scores, each indicating their average reported confidence for each question type (max score per type = 5). Prior to the main analysis, data for the questions within each type were subjected to a one sample z-test to remove outliers. One observed-unmentioned question was removed because on average, participants' accuracy for that question was over two standard deviations below the mean of observed-unmentioned questions. As a result, we converted means to a proportion correct out of eight to ensure consistency. Table 1 shows the descriptive statistics for each question type across all conditions.

To analyze memory accuracy and confidence by type of question, we conducted two one-way repeated measures ANOVAs. The first one-way ANOVA analyzed the relationship between question type and memory accuracy across all conditions. This analysis yielded a significant effect of question type,  $F(2, 84) = 6.66, p < .002$ . Post-hoc Tukey's HSD tests showed that memory accuracy for questions about distorted information ( $M = 7.03$ ) was significantly lower than memory for reinforced information

( $M = 7.38$ ),  $p < .05$ , and than memory for unmentioned information ( $M = 7.47$ ),  $p < .01$ . However, questions about reinforced information did not lead to significantly higher memory accuracy than questions about unmentioned information; accuracy for both these types of questions was very high, indeed perfect for many participants. The mean scores for each question type by condition and across all conditions are presented in Table 1.

The second one-way ANOVA analyzed the relationship between question type and confidence across all conditions. This analysis also yielded a significant effect of question type,  $F(2, 84) = 11.59$ ,  $p < .0001$ . Post-hoc Tukey's HSD tests showed that confidence for questions about reinforced information ( $M = 4.51$ ) was higher than confidence for questions about distorted information ( $M = 4.26$ ),  $p < .01$ , and than confidence for unmentioned information ( $M = 4.19$ ),  $p < .01$ . Contrary to the hypothesis, questions about distorted information did not lead to the lowest confidence overall. Rather, confidence was similar for questions about distorted and unmentioned information. The mean confidence scores for each question type by condition and across all conditions are presented in Table 2.

We continued to explore the results on confidence by comparing participants' mean confidence levels for correct versus incorrect answers to questions about distorted information. A correlated samples t-test showed that for individuals who had both correct and incorrect answers within the observed-changed questions, they reported significantly higher confidence for the questions they answered correctly ( $M = 4.30$ ,  $SD = 0.48$ ) than for those they answered incorrectly ( $M = 2.97$ ,  $SD = 1.08$ ),  $t(55) = 8.53$ ,  $p < .01$ . In other words, participants were less confident when the questions asked about information that had been successfully distorted in their memories. We did not conduct similar statistics

for confidence on questions about reinforced and unmentioned information because for both of these categories, more than 50% of participants answered every question correctly and therefore could not be given a mean confidence score for incorrect answers. As a result, we would have had to leave a significant number of participants out of our analyses and therefore would not be able to make valid conclusions about the sample.

The results for memory accuracy with the distorted information corroborate the misinformation effect. We next conducted a 2 (emotion) x 2 (testimony gender) between-groups ANOVA on the scores for distorted information to determine if either testimony emotion or testimony gender influenced the extent of the misinformation effect. We hypothesized that emotional testimonies would lead to greater memory distortion. Contrary to this hypothesis, there was no main effect of testimony emotion on accuracy for distorted information,  $F(1, 83) = 0.18, p = 0.68$  (see Table 1). Additionally, we hypothesized that there would be no main effect of testimony gender on memory distortion, and accordingly, we found no difference in memory distortion caused by female testimony ( $M = 7.11$ ) as compared to male testimony ( $M = 6.95$ ),  $F(1, 83) = 0.24, p = .63$  (see Table 1). Finally, we predicted that there would be a significant interaction between testimony gender and emotionality on memory accuracy for distorted information. The interaction results were not significant at the .05 significance level,  $F(1, 83) = 2.40, p = .13$ . However, these results are close to being significant at the .1 significance level. We further investigated the means and saw that participants' memory accuracy for observed-changed information was lower for emotional female testimonies ( $M = 6.84$ ) compared to neutral female testimonies ( $M = 7.32$ ) but higher for emotional

male testimonies ( $M = 7.10$ ) than neutral male testimonies ( $M = 6.83$ ) (see Figure 1, Table 1).

We then conducted a second 2 (emotion) x 2 (testimony gender) between-groups ANOVA on the confidence scores for distorted information to determine if either testimony emotion or testimony gender influenced participants' confidence for questions about distorted information. We hypothesized that emotional testimonies would lead to higher confidence on those distorted memories. There was no main effect of testimony emotion on participants' confidence for questions about distorted information  $F(1, 83) = 0.80, p = .38$  (see Table 2). Similarly, there was no main effect of gender on confidence for questions about distorted information  $F(1, 83) = 1.18, p = .28$  and no interaction between testimony emotion and testimony gender,  $F(1, 83) = .09, p = .76$ .

Next, we conducted two further 2 (emotion) x 2 (testimony gender) ANOVAs on both memory accuracy and confidence for questions about reinforced facts. We hypothesized that emotional testimonies would lead to greater accuracy and greater confidence for reinforced facts than neutral testimonies would. We found no significant difference in memory accuracy for reinforced facts between neutral testimonies ( $M = 7.35$ ) and emotional testimonies ( $M = 7.41$ ),  $F(1, 83) = 0.09, p = .77$  (see Table 1). We further found that emotional testimonies ( $M = 4.55$ ) did not lead to increased confidence in reinforced facts compared to neutral testimonies ( $M = 4.48$ ),  $F(1, 83) = 0.48, p = .49$  (see Table 2). Neither of these two analyses yielded a main effect or an interaction involving testimony gender either.

To test our gender-matching hypothesis that female participants would be more persuaded (show greater memory distortion) by female testimony than by male testimony

and that male participants would not show this analogous gender-matching pattern, we conducted a 2 (testimony gender) x 2 (participant gender) between-groups ANOVA on the scores for distorted information. As in earlier analyses, this ANOVA showed no main effect of testimony gender,  $F(1, 83) = 0.24, p = .63$ . Unexpectedly, we found a main effect of participant gender on susceptibility to memory distortion,  $F(1, 83) = 4.21, p = .04$ . Male participants' memory for distorted facts ( $M = 6.69, SD = 1.42$ ) was significantly lower than female participants' memory for distorted facts ( $M = 7.21, SD = 0.91$ ). In other words, male participants were overall more susceptible to the misinformation effect. Although the interaction results were not significant at the .05 significance level, they were significant at the .1 significance level,  $F(1, 83) = 3.62, p = .06$ . However, this pattern was not in the direction we anticipated. As seen in Figure 2, female participants were slightly more persuaded by male testimony ( $M = 6.97, SD = 1.12$ ) than by female testimony ( $M = 7.45, SD = 0.57$ ), whereas male participants were more persuaded by female testimony ( $M = 6.47, SD = 1.85$ ) than by male testimony ( $M = 6.93, SD = 0.73$ ).

To test if male participants were more susceptible to the misinformation effect or if they simply had significantly lower recall across all question types, we conducted a 2 (participant gender) x 3 (question type) mixed-factor ANOVA. As seen above, the analysis revealed a main effect of question type,  $F(2, 84) = 6.66, p < .002$ . There was no significant main effect of participant gender ( $F(1, 85) = 1.29, p = .26$ ), but there was an interaction of participant gender on accuracy by question type,  $F(2, 170) = 2.94, p = .05$ . Male participants scored lower than female participants on questions about distorted information but male and female participants' scores did not significantly differ in

questions about reinforced nor unmentioned information (see Figure 3). This demonstrates that males were in fact more susceptible to the misinformation effect rather than simply worse at event recall.

### **Discussion**

The current study was an exploration of the factors that may influence the misinformation effect. Leading questions and planted memories have been empirically shown to successfully alter an initial memory for an event (Loftus & Zanni, 1975; Loftus, Miller, & Burns, 1978). Modern misinformation research focuses on the factors that may influence an individual's susceptibility to the misinformation effect. Of this, the background research of the current study primarily focused on the effects of emotion and gender on memory. Porter et al. (2003) found that participants were more likely to be misled about previously seen negative images than positive images. In contrast, Hoscheidt et al. (2014) found that negative, emotional events were more resistant to memory distortion than neutral events. Despite similarity in memory capacity between males and females, females have been shown to better remember interpersonal details than males (Horgan et al., 2012). Similarly, females more accurately remembered female faces than male faces, but males did not show this analogous gender-matching pattern (Loven, Herlitz, & Rehman, 2011).

Despite strong evidence for the misinformation effect, the majority of misinformation research is centered around the original event. Given the public's dependence on third-party sources (news, viral videos, word of mouth), understanding the factors of communication that most effectively promote memory distortion is of the utmost importance. The researchers of this study sought to expand the current body of

literature by focusing on how the misinformation is given (i.e., the factors of a third party source). The goal of this research was to shed light on the potential biases of gendered and/or emotional testimonies. In the present study, the researchers investigated the relationship between the gender and emotionality of a misinformant and their influence on an individual's susceptibility to memory distortion. Participants watched a short video of a crime, followed by one of four testimonies in which a witness recounted both consistent and misleading information.

We hypothesized that the misinformation effect would be present in the current study. As expected, we found that memory was least accurate for facts that had been distorted by a post-event testimony. Contrary to our expectation, we did not find that confidence was lowest for questions about distorted facts. After further investigation, we found that confidence for changed questions answered incorrectly was significantly lower than confidence for changed questions answered correctly. The relationship between confidence and memory accuracy has been considered across multiple studies; the correlation has been found to be relatively low ( $r = .29$ ) (Radvansky, 2011). The results of the present study add to the body of research on the relationship between confidence and memory accuracy for the misinformation effect by suggesting that there may be a stronger correlation between confidence and accuracy than previously found.

We found no support for our emotionality hypotheses. Participants were not more persuaded by reinforced facts in an emotional testimony, nor were they misled more by distorted facts in an emotional testimony. Similarly, the emotionality of a testimony had no effect on participants' confidence. In previous research on the effects of emotion on the misinformation effect, mixed results were found on whether the emotionality of an

event enhances memory for that event or makes an individual's memory for that event more susceptible to the misinformation effect. More specifically, researchers theorized that a narrowing of one's attention occurs in emotional events such that an individual's memory for an emotional event is more accurate for central details but less accurate for peripheral details (Waring & Kensinger, 2009). It is possible that in the present study, the emotional testimonies evoked arousal in the participants and this central-peripheral trade-off occurred. Thus, possibly memory for central details was better remembered in the emotional testimony conditions whereas memory for peripheral details was worse in the emotional testimony conditions, balancing out the effect of emotionality on memory overall. Unfortunately, the nature of the present study makes it difficult to determine whether individual questions asked about peripheral or central details as the original event was a video. Eye-tracking measures would have been necessary to determine what details participants focused their attention on.

We predicted that female participants would be more persuaded by female testimony than by male testimony, but that male participants would not show this analogous pattern. Contrary to our hypothesis, we found a nonsignificant trend in a different direction. Females were more persuaded by male testimony than by female testimony, and males were more persuaded by female testimony than by male testimony. As seen in Figure 2, male testimony was received similarly by all participants. However, the reception of the female testimonies varied greatly between male and female participants. Males tended to be more persuaded than females by female testimony. Although we did not expect male or female participants to differ in terms of their susceptibility to the misinformation effect, we found that males were persuaded

significantly more than females. This finding suggests that men may have more trust in information gathered from third party sources than women. This is generally in line with prior research on the gender differences of trustingness. Researchers who examined gender differences of trust and trustworthiness in trust/investment games found that men tend to be more trusting than women. Furthermore, men tend to trust women more than they trust men (Garbarino & Slonim, 2009; Rau, 2012; Zhao & Zhang, 2016). This aligns with our findings; the men in the current study were more susceptible to the misinformation effect and were most susceptible when presented with a female testimony.

The present study was subject to several limitations. First, it is possible that a stronger emotional/neutral manipulation would have resulted in significant findings for the hypothesis that emotional testimonies would lead to greater memory distortion and higher confidence in those distorted memories than neutral testimonies would. The researchers recruited family friends to volunteer to act in the testimony video; however, trained actors may have been more persuasive in communicating the emotions they were asked to portray. Although the videos were controlled such that the male and female actors were in the same location, wearing similar colored clothes, and following the same script, better control over the manipulated emotionality would have been beneficial to the study. Furthermore, the average standardized number of questions correct out of 24 ( $M = 21.89$ ,  $SD = 1.70$ ) was considerably high. It is possible that we cannot see the extent of our manipulation due to a ceiling effect. To avoid this limitation in future research, researchers using memory tests should utilize a greater number of difficult questions. Additionally, stronger expressions within the emotional condition such as crying,

swearing, ranting, or raving could have elicited a stronger emotional response in the viewer and increased the extent of the misinformation effect.

Second, the present study was composed of primarily female participants. The external validity of the study was compromised as a result of the female-majority sample because the findings cannot be generalized to the greater population. Furthermore, the small male sample was not ideal for testing the gender-matching hypothesis. We had significantly more data to analyze regarding female participants. A more equivalent sample size would have strengthened the external validity of these results.

The present study could also benefit from attention to central-peripheral details. Waring and Kensinger (2009) found that individuals who receive negative arousing information tend to better remember central details but less accurately remember peripheral details. This could have been controlled for in the present study by balancing central and peripheral details across question type. We chose not to focus on the central-peripheral information trade-off because determining central and peripheral details in a video can be difficult considering the interaction between visual and contextual information; however, future researchers should design experiments with this factor in mind through the use of eye-tracking devices.

The misinformation effect was successful within the limitations of the sample and the lab environment. All participants attended the same small liberal arts college, and many participants were enrolled in psychology courses and likely knew the phenomenon that they were being tested for. Even so, participants scored significantly lower on questions about distorted information. Due to the strength of the misinformation effect, future researchers should study the phenomenon in a naturalistic setting. For instance, the

present study could be replicated in law school mock-trials, where a witness's emotionality and gender is manipulated across mock-trial sessions and jury deliberation and verdict are recorded.

Further, future researchers should consider variables beyond emotionality and gender when examining the effects of third-party reports on the misinformation effect. Trustworthiness was a variable we did not investigate, but research has indicated that gender and trustworthiness interact differently in different contexts (Armstrong & McAdams, 2009; Perrot & Weber, 2010). Additional variables such as age, physical appearance, social status, and perceived expertise could be investigated experimentally in order to help inform jurors and the public on how characteristics of an informant influence one's susceptibility to the misinformation effect.

The misinformation effect has proven time and again to be a powerful phenomenon. Research on the characteristics of an event has shed light on the properties that influence memory distortion. In the present day, third-party accounts serve as a primary source of information. It is important to investigate how the characteristics of communication across news-reports, eye-witness testimonies, and social-media may inform the public differently. Research on the present topic is crucial for navigating the new forms of communication in our society.

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## Appendix

You will now be asked some questions about the repairman video you watched. We are testing your memory for the events that happened in the first video.

Each question has two parts:

1. The first part asks you to identify the correct answer, according to your memory.
2. The second part asks you how confident you are about your answer.

1. Eric's shirt was \_\_\_\_\_.

- a. blue with stripes                      b. solid blue

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

2. Eric tried on and stole a \_\_\_\_\_.

- a. ring    b. belt

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

3. Eric sat on a \_\_\_\_\_ in the living room.

- a. chair    b. couch

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident



8. Eric \_\_\_\_\_ in the kitchen.

- a. poured himself a drink      b. opened a can of soda

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

9. Eric stole a \_\_\_\_\_ from the bedroom.

- a. pair of earrings                      b. necklace

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

10. Eric tried on a \_\_\_\_\_.

- a. shirt                      b. hat

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

11. Eric looked at a \_\_\_\_\_ while sitting on the bed.

- a. magazine                      b. book

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

12. Eric looked through \_\_\_\_\_ in the kitchen.

- a. a stack of mail                      b. A stack of magazines

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

13. Eric \_\_\_\_\_.

- a. left the back door open              b. closed the back door before he left

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

14. Eric looked through the \_\_\_\_\_ in the bedroom.

- a. desk                                      b. closet

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident

---

15. Eric turned on the TV in the \_\_\_\_\_.

- a. living room                              b. bedroom

How confident are you that your answer is correct?

1                      2                      3                      4                      5

Not at all confident

Very confident







Table 1  
*Descriptive Statistics for Gender and Emotionality of the Testimony for Correct Answers by Question Type*

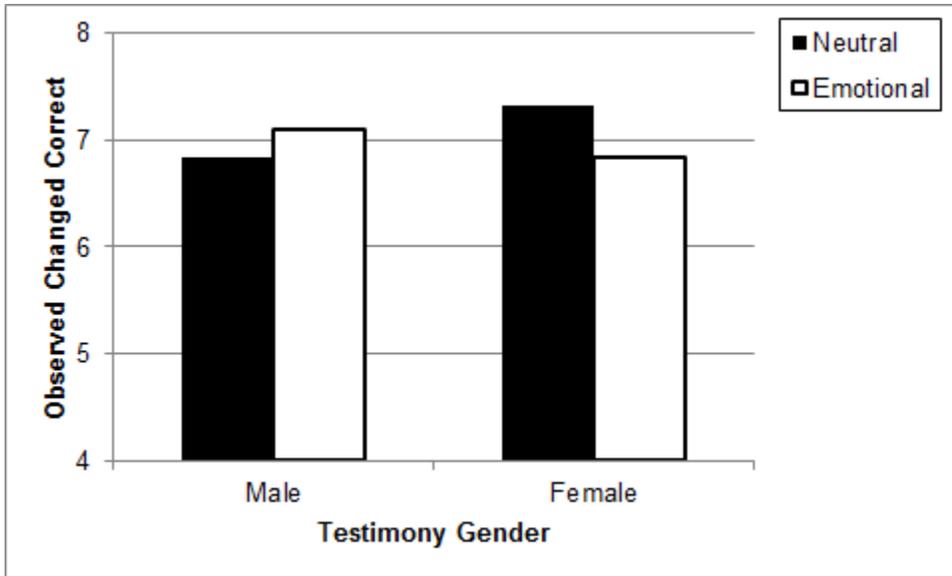
| Testimony Factor   | <i>n</i> | Observed Reinforced |           | Observed Changed |           | Observed Unmentioned |           |
|--------------------|----------|---------------------|-----------|------------------|-----------|----------------------|-----------|
|                    |          | <i>M</i>            | <i>SD</i> | <i>M</i>         | <i>SD</i> | <i>M</i>             | <i>SD</i> |
| Female             | 44       | 7.27                | 0.82      | 7.11             | 1.24      | 7.40                 | 0.72      |
| Male               | 43       | 7.49                | 0.70      | 6.95             | 1.00      | 7.55                 | 0.71      |
| Neutral            | 48       | 7.35                | 0.73      | 7.08             | 0.90      | 7.48                 | 0.71      |
| Emotional          | 39       | 7.41                | 0.82      | 6.97             | 1.37      | 7.47                 | 0.73      |
| Female x Neutral   | 25       | 7.32                | 0.75      | 7.32             | 0.90      | 7.36                 | 0.74      |
| Female x Emotional | 19       | 7.21                | 0.92      | 6.84             | 1.57      | 7.46                 | 0.70      |
| Male x Neutral     | 23       | 7.39                | 0.72      | 6.83             | 0.83      | 7.60                 | 0.65      |
| Male x Emotional   | 20       | 7.60                | 0.68      | 7.10             | 1.17      | 7.49                 | 0.78      |
| All Conditions     | 87       | 7.38                | 0.77      | 7.03             | 1.13      | 7.47                 | 0.63      |

*Note.* Correct answers are standardized and given out of 8 possible points.

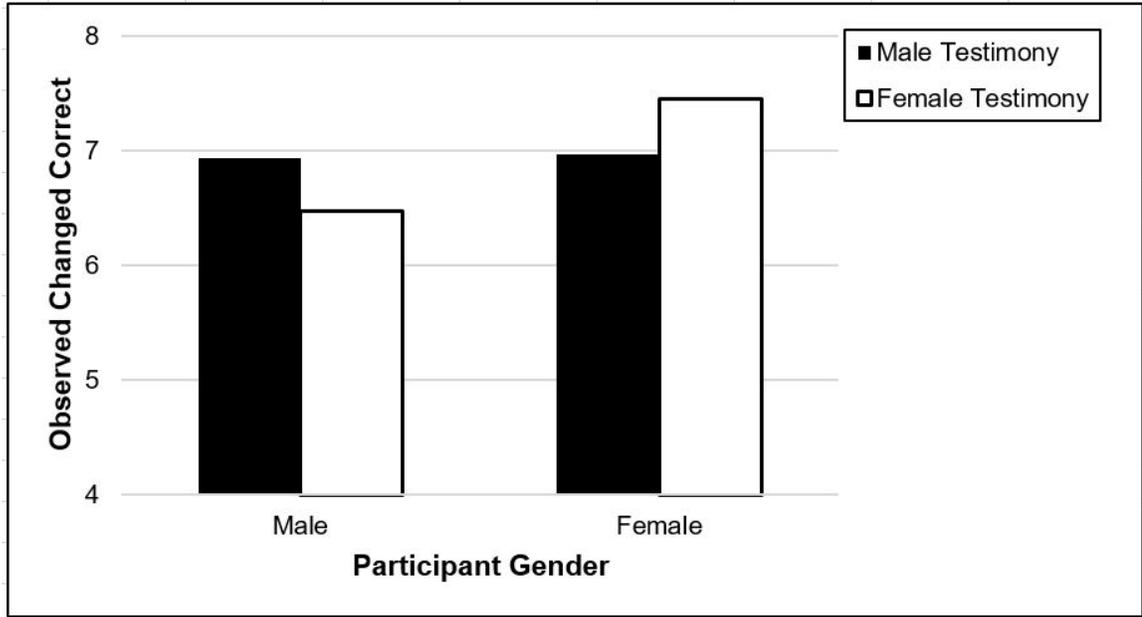
Table 2  
*Descriptive Statistics for Gender and Emotionality of the Testimony for Confidence by Question Type*

| Testimony Factor   | <i>n</i> | Observed Reinforced |           | Observed Changed |           | Observed Unmentioned |           |
|--------------------|----------|---------------------|-----------|------------------|-----------|----------------------|-----------|
|                    |          | <i>M</i>            | <i>SD</i> | <i>M</i>         | <i>SD</i> | <i>M</i>             | <i>SD</i> |
| Female             | 44       | 4.43                | 0.48      | 4.21             | 0.39      | 4.18                 | 0.58      |
| Male               | 43       | 4.59                | 0.38      | 4.31             | 0.44      | 4.21                 | 0.49      |
| Neutral            | 48       | 4.48                | 0.44      | 4.22             | 0.42      | 4.15                 | 0.58      |
| Emotional          | 39       | 4.55                | 0.43      | 4.31             | 0.41      | 4.25                 | 0.47      |
| Female x Neutral   | 25       | 4.43                | 0.43      | 4.19             | 0.37      | 4.05                 | 0.59      |
| Female x Emotional | 19       | 4.44                | 0.54      | 4.24             | 0.42      | 4.34                 | 0.54      |
| Male x Neutral     | 23       | 4.54                | 0.45      | 4.26             | 0.47      | 4.25                 | 0.57      |
| Male x Emotional   | 20       | 4.66                | 0.26      | 4.37             | 0.41      | 4.16                 | 0.38      |
| All Conditions     | 87       | 4.51                | 0.43      | 4.26             | 0.42      | 4.19                 | 0.53      |

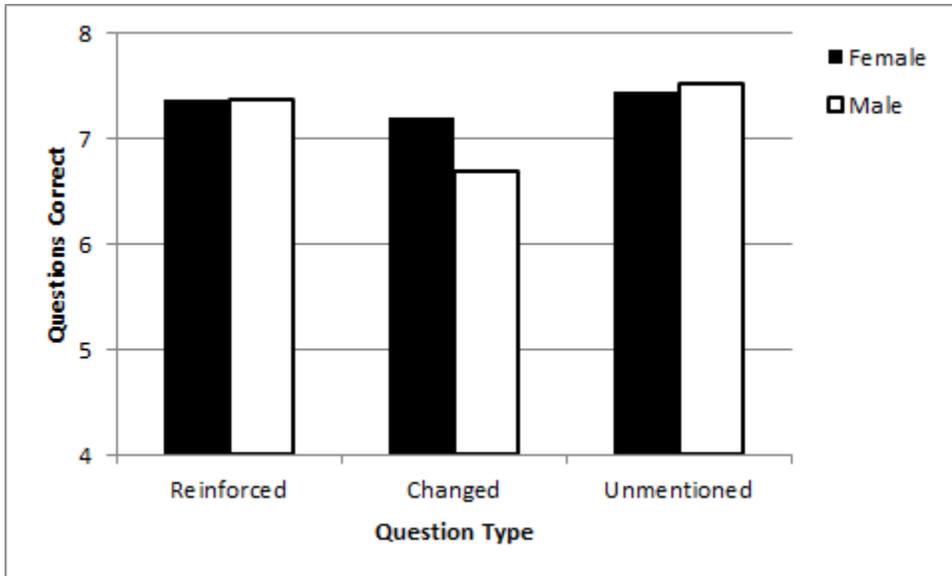
*Note.* Confidence is given out of 5 possible points.



*Figure 1.* The near-interaction between testimony gender and emotionality on observed-changed questions answered correctly out of eight.



*Figure 2.* The near-interaction between participant gender and testimony gender on observed-changed questions answered correctly out of eight.



*Figure 3.* The interaction between participant gender and question type on memory accuracy.