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The Impact Of Co-Witness Misinformation On Memory For A Traumatic Event

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THE IMPACT OF CO-WITNESS MISINFORMATION ON MEMORY FOR A TRAUMATIC EVENT

by

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This thesis, submitted by Kira Krupa in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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Abstract

The misinformation effect has long been studied, but little research has examined how misleading post-event information affects traumatic memory. Misinformation presented by a co-witness has been found to be particularly powerful, often producing the strongest effects on eyewitness memory. The current study sought to analyze the impact of co-witness misinformation on memory for a traumatic event. Participants viewed a short film displaying a gruesome murder and completed an immediate recall test. After a short delay, participants read a narrative summary of the film (accurate or misleading), with some being told the narrative was written by another eyewitness. A subsequent recall test was given. Significant misinformation effects were found despite the traumatic nature of the film. The co-witness information did not impact recall of misleading items as expected. Implications for eyewitness memory for traumatic events are discussed.

The Impact of Co-Witness Misinformation on Memory for a Traumatic Event

Eyewitness Memory and the Misinformation Effect

Eyewitness memory is highly susceptible to error and influence. One way a witness's memory for an event can be contaminated is through exposure to post-event information—or information that is encountered after an event. Within the eyewitness literature, there has been a particular focus on the effects of encountering *inaccurate* post-event information (i.e., misinformation), as this is a potentially serious cause of witness error. The act of reporting misinformation in place of the original information is known as the misinformation effect (Loftus, 1975).

The misinformation effect has been studied extensively over the past few decades and has revealed that misleading post-event information can be incorporated into an eyewitness's memory for an event. The standard three-stage procedure typically used in involves showing participants a complex event and then exposing some of them to misinformation about the event. Participants are then asked to remember what they saw in the original event. The misinformation typically produces a robust impairment in memory, as participants often report the misinformation as being part of the original event. The distortion in memory caused by misinformation has been demonstrated in hundreds of studies involving a wide variety of materials. For instance, participants have erroneously recalled non-existent objects (e.g., broken glass at the scene of a car accident) as a result of misleading post-event information. Or they have been misled into remembering objects that were different than what they were actually shown (e.g., remembering a hammer as a screwdriver or a yield sign as a stop sign), or misremembering that large objects were part of a scene when, in reality, they were never present (Loftus, 2005).

Further, in some cases, misleading post-event information has led to inaccurate memory for details related to simulated crimes. For instance, Loftus et al. (1989) showed participants a slide sequence depicting a burglary and then exposed them to a narrative that included misinformation or neutral information about critical details in the witnessed event. Participants were then tested on their memories of what they saw. Misinformation items were incorrectly selected as responses for 32% of the questions and participants reported feeling confident in making these incorrect choices. Similarly, Takarangi et al. (2006) showed participants a movie of a tradesman snooping around and stealing items inside a house. They then read a narrative describing the tradesman's activities inside the house, which contained misinformation about critical items and neutral information about others. A recognition test revealed that participants' responses were more accurate to questions about control items than to questions about misled items. Altogether, results from these studies indicate that exposure to post-event misinformation can lead to distortions in memory for details of a witnessed event. These findings have troubling implications for eyewitness memory, as actual eyewitnesses are routinely exposed to post-event information (Paterson & Kemp, 2006).

Theoretical accounts of the misinformation effect include the trace alteration theory (Loftus, 1975), which suggests the misinformation effect happens because the original memory is permanently lost and updated with misleading post-event information. Additionally, the memory coexistence and retrieval blocking account (Bekerian & Bowers, 1983) proposes that memories of the original information and misleading information co-exist. But retrieval of the original memory trace is blocked by retrieval of misinformation, which is a stronger and more recent trace. Further, the social-demand characteristics approach (McCloskey & Zaragoza, 1985) focuses on how social-related factors contribute to accepting false information. In particular,

misleading suggestions may be reported because of social-demand characteristics that promote compliance from participants.

The Impact of Co-Witness Information

Eyewitnesses can encounter post-event information about a crime in a few different ways. In some instances, witnesses may be asked questions about the event by police officers, lawyers, or friends. In other instances, they may encounter post-event information through media coverage of the event. Or, the post-event information may come from a co-witness. Co-witness information can either be passed directly from one eyewitness to another through a conversation, or indirectly through a third party, such as a police officer, who informs one witness about what another witness has said (Luus & Wells, 1994). Discussing a crime with a co-witness is worrying as it could lead to the transfer of misinformation. Indeed, research has indicated that the strongest misinformation effects are associated with co-witness misinformation compared to other sources of misinformation (Rivardo et al., 2013).

For instance, in a series of three experiments, Shaw et al. (1997) compared the effects of co-witness information on memory with that of leading questions. In Experiment 1, the co-witness information was presented as answers to questions about a highly publicized murder trial that were supposedly given by anonymous co-witnesses. In Experiments 2 and 3, the co-witness information came from a confederate posing as a witness. In all three experiments, misleading co-witness information produced larger detrimental effects on memory accuracy than leading questions.

Additionally, Paterson and Kemp (2006) compared the impact of different methods of encountering post-event information on eyewitness memory. Participants were shown a video of a robbery and exposed to correct and incorrect post-event information through one of four

methods: leading questions, a mock newspaper report, a narrative supposedly written by another participant, or a discussion with a confederate trained to provide the post-event information. After a one-week delay, participants took a free recall test and a recognition test that included both true and false statements about details of the robbery. Results indicated that co-witness information had the strongest effect on memory, as participants were more likely to recall misleading post-event information encountered in the co-witness narrative and co-witness discussion. Additionally, those who received misleading post-event information through the co-witness narrative and co-witness discussion were significantly less accurate on the recognition test. Altogether, these findings suggest that memory is more negatively impacted by misleading post-event information presented in co-witness situations.

Similarly, Gabbert et al. (2004) compared the impact of different types of socially-encountered misinformation on recall accuracy. In this study, participants viewed a video of a simulated robbery and then either read a narrative supposedly written by another eyewitness or discussed the video with a confederate. The narrative and discussion included both accurate information about the event and several items of misinformation. A cued recall test followed, which indicated that participants in the narrative and discussion conditions were more likely to report misinformation compared to the control condition. Additionally, participants were more influenced in the confederate discussion condition than the narrative condition, suggesting that encountering co-witness information through discussion may be more powerful than encountering it more indirectly through a co-witness narrative. The present study utilized a co-witness narrative to examine the effects of co-witness misinformation on memory. Despite being a less powerful form of co-witness information compared to co-witness discussion, co-witness

narratives have successfully been able to elicit misinformation effects in prior studies so their use seems justified for the present study.

Examining the effects of co-witness information on memory is important because eyewitness testimony should ideally be independent, and for this reason, legal procedures are designed to prevent eyewitnesses from discussing a crime with other witnesses. If witnesses discuss a crime, then their testimonies cannot be treated as independent observations (Paterson et al., 2009). Despite attempts to keep eyewitness testimony independent, witnesses reportedly *do* often talk to each other about an event. In fact, a survey of actual eyewitnesses found that when there was at least one other witness present at an event and of these, 86% reported that they discussed details of the event with their co-witness (Paterson & Kemp, 2006).

Memory Conformity

As previously discussed, significant memory distortion can happen when co-witnesses are allowed to discuss an event prior to their memories being tested. This can result in 'memory conformity', where the individual memory report of one person becomes more similar to another person's memory report following their discussion of an event. For instance, Gabbert et al. (2003) explored memory conformity effects between pairs of participants who viewed a simulated crime video. Participants were led to believe they saw the same video of a crime scene, but there were two versions filmed from different angles to simulate different witness perspectives. This allowed for different features to be observed by each participant. After viewing the film, participants recalled the event either alone or in pairs. An individual recall test was then given to see if co-witness discussion impacted memory reports. A substantial proportion (71%) of witnesses who discussed the event reported at least one erroneous detail acquired during the discussion with their co-witness.

Similarly, Wright et al. (2000) showed pairs of participants an identical crime, except that half saw an accomplice with the thief and half did not. Participants' initial memories were very accurate, but after discussing the crime with the other person in the pair, who saw a slightly different sequence, a majority of participants exhibited memory conformity. The present study tested whether memory conformity occurred by comparing participants' immediate recall of the witnessed event with their recall after being presented with misleading post-event information in the co-witness narrative.

Memory Confidence

Another factor relevant to the discussion of eyewitness memory is subjective memory confidence. Many studies have examined the relationship between participants' ratings of memory confidence and memory accuracy, as memory confidence judgments are generally considered to be an estimate of the accuracy of participants' recollection (Roebers, 2002). Confidence is an important factor affecting perceptions of eyewitness credibility (Penrod & Cutler, 1995). Although it has been a matter of debate over the years, the now prevailing view is that there is a consistent positive, however not perfect, relationship between eyewitness confidence and recognition and recall accuracy (Gustafsson et al., 2019). Specifically, misinformed participants have been found to exhibit overconfidence in their incorrect responses compared to the responses of witnesses who did not receive misleading post-event information (Weingart et al., 1994). Or, misinformed participants may show as much confidence in their correct responses as they do to their incorrect responses to misleading questions (Loftus et al., 1989).

The presence of co-witness information also tends to inflate confidence in memory accuracy, especially in participants who receive misleading post-event information. Paterson and Kemp (2006) found that those in co-witness information conditions reported higher levels of

confidence in incorrect responses that were based on misleading post-event information. Similarly, Goodwin et al. (2017) found that participants who received misleading post-event information from a co-witness were significantly more confident in their recall of questions based on misleading post-event information than questions based on neutral information. Taken together, these increased confidence levels suggest that participants in co-witness information conditions are more likely to believe misleading post-event information to be true when in reality it is not.

Memory for Central vs. Peripheral Details

The type of information presented can also affect how well a person may remember that information (i.e., central vs. peripheral details). Central details are specifically connected to the source of emotional arousal while peripheral details are less relevant to the main source of emotional arousal. For example, in observing a car accident, recognizing which car instigated the accident, the intersection of the accident, and the number of cars involved may be considered central details. On the other hand, the colors of the cars and the demographics of the drivers would most likely be considered peripheral details. Studies comparing memory for central and peripheral details typically suggest the more emotionally arousing the stimulus is, the greater retention a person tends to have for central details (Christianson et al., 1991), whereas details peripheral to the main stressor are usually less accurately remembered (Loftus & Burns, 1982). Some findings are contradictory to this, however, suggesting that the differential recall of central and peripheral details for emotionally arousing events has not been consistent over similarly replicated studies. However, the bulk of the published literature does tend to support a stronger memory for central over peripheral details, especially for emotionally arousing events (Wessel et al., 2010).

Eyewitness Memory for Traumatic Events

The data on memory accuracy for highly negative emotional stimuli are somewhat contradictory. Several field and laboratory studies have suggested that information eliciting a strongly negative emotional reaction tends to be remembered with greater accuracy (Bernsten & Thomsen, 2005; Christianson, 1992). Additionally, when an event is highly distressing, the main stressor tends to be better remembered due to heightened pre-attentive processes and greater rehearsal and consolidation (Christianson, 1992). By contrast, other research has suggested that peripheral details in a stressful event are less accurately remembered compared to neutral events (Loftus & Burns, 1982). However, it is possible that these studies have not included events that are sufficiently traumatic, so memory interference is not actually experienced (Deffenbacher et al., 2004).

The debate about distress and memory is relevant to the question of whether stressful and traumatic events are somehow immune to the misinformation effect. If features of highly negative events are retained with greater accuracy, then they may be resistant to misleading post-event information. Relatively few studies have examined the effects of misinformation on these types of events. Porter et al. (2003) showed participants highly positive or highly negative emotional photographs or neutral photographs, followed by misinformation. The misinformation more adversely impacted recall for misleading peripheral details compared to central details.

Additionally, in a particularly compelling demonstration, Morgan et al. (2013) found that misinformation can impact memory for a highly stressful personal event. Military personnel were confined for 72 hours in a very stressful mock POW camp as part of their survival school training. After being "captured" during a wilderness evasion, the officers were subjected to an intense interrogation, isolation, and the presentation of group propaganda. After the camp

concluded, some received misinformation about details and events they had experienced. Others were exposed to a misleading photograph while they were in isolation. A memory assessment followed and showed that memory for the details of the event was negatively affected by the presentation of misinformation. Further, those exposed to the misleading photograph were more likely to falsely identify the interrogator after the interrogation was over. These findings demonstrate that memories for highly stressful events can be prone to change by exposure to misinformation.

Finally, Paz-Alonso and Goodman (2008) and Paz-Alonso et al. (2013) utilized the classic three-stage misinformation paradigm to determine whether misinformation affects memory for a highly negative event. Participants viewed a distressing film and then read either a misleading or an accurate narrative about the film. A recognition test followed and revealed a significant misinformation effect, which further suggests that memory is not immune to inaccuracies and suggestive influences, even for a highly negative event.

The Present Study

Bringing these areas together, the present study examined the impact of co-witness misinformation on memory for a traumatic event. Memory confidence and centrality of information were additional variables of interest. In the present study, participants viewed a gruesome film and took an immediate recall test to assess initial memory accuracy. After a short delay, participants were presented with a misleading narrative or an accurate narrative. Some participants were told the narrative was a recounting of the film's events from another eyewitness and others did receive this co-witness information. Finally, the same recall test was given to assess post-manipulation memory accuracy. Based on previous findings, the following predictions were made:

A) *Misinformation effects will be replicated, even for a highly negative event.* Although eyewitness memory has been studied for years using the misinformation effect paradigm, relatively few studies have examined such effects for traumatic acts, such as murder. Confirming whether memory for highly negative events is immune to inaccuracies and suggestive influences is important since controversy exists regarding the generalizability of misinformation effect findings to traumatic material (Paz-Alonso & Goodman, 2008). Consistent with classic misinformation effects, misinformed participants are expected to report misinformation more frequently than control participants. Thus, misinformation effects are predicted despite the traumatic nature of the witnessed event.

B) *Co-witness misinformation effects will occur, even for a highly negative event.* Prior studies on co-witness misinformation have predominantly utilized eyewitness events involving less serious crimes (e.g., theft or robbery), so nothing is known regarding the potential impact of co-witness misinformation on memory for more serious, violent crimes (e.g., murder). It is uncertain whether participants will be as susceptible to co-witness misinformation for a more serious, violent crime. In particular, it is possible that the highly negative event will be better remembered, and therefore that participants will be less susceptible to co-witness misinformation. On the other hand, it is also possible that participants will be just as susceptible to co-witness misinformation even for a highly negative event, given the strong nature of co-witness misinformation effects. Furthermore, given that actual eyewitnesses have reported discussing more serious, violent crimes with other co-witnesses (Paterson & Kemp, 2006), more information is needed about how co-witness misinformation may impact memory for highly negative events.

Similar to prior co-witness information studies, participants in the co-witness information condition are expected to report more misinformation during recall than those in the control condition. Since co-witness information has consistently been found to have a powerful effect on subsequent memory, these findings are still expected despite the traumatic nature of the witnessed event.

C) *The presence of misinformation and co-witness information will increase confidence in misleading post-event information.* Prior research has indicated that post-event misinformation and co-witness information impact memory confidence. The present study sought to replicate prior findings by comparing confidence judgments between those in the misinformation and control conditions and those in the co-witness information and control conditions. The present study sought to extend memory confidence findings by examining confidence in memories for a highly negative event in participants that are exposed to co-witness misinformation.

Based on evidence from misinformation studies, it is expected that misinformed participants will exhibit as much confidence in their correct responses to neutral questions as they do in their incorrect responses to misinformation questions (Loftus et al., 1989). Further, with respect to the impact of co-witness information on confidence, participants in the co-witness information condition are expected to be more confident in both their correct responses to neutral questions and their incorrect responses to misinformation questions compared to the control condition.

Method

Participants

In total, there were 232 undergraduate student participants (75 males and 157 females), ranging in age from 17 years to 32 years (M = 19.42 years). Most participants were freshmen (38.8%) and sophomores (32.3%), while 20.3% were juniors and 8.6% were seniors. Participants were 81.5% Caucasian, 11.2% Latino/Hispanic, 4.3% Asian American, 1.3% African American, and 1.7% "Other." All participants were compensated for their participation in the form of class credit toward their undergraduate psychology courses.

Materials

Demographic Questionnaire

In order to obtain demographic information to characterize the sample, participants were asked to complete a demographic questionnaire. The questionnaire asked them to provide data regarding their age, gender, ethnicity, and years of education. Additionally, two questions pertained to the film itself: Whether participants were familiar with the film prior to the study (none reported to be familiar with the film) and how distressing participants found the film to be on a scale ranging from 1 (not at all distressing) to 7 (very distressing). Analyses indicated that the film was judged to sufficiently distressing, but not overly distressing (M = 3.84, SD = 1.73).

Eyewitness Stimulus Film

A clip of a murder event obtained from Kieslowski's film "Decalogue V: A Short Film About Killing" (Chutkowski & Kieslowski, 1988) was used for the witnessed event. The clip has been used in prior studies (Paz-Alonso & Goodman, 2008; Paz-Alonso et al., 2013) and was found to successfully elicit misinformation effects for a traumatic event. The entire clip was 10 minutes in length, with a 2.5-minute introduction, a 5 minute 30 second emotional climax, and a

2-minute ending. From the introduction, a young man is traveling in a taxicab and the driver stops at a crosswalk to allow a group of children and an adult pass by. The cab continues to the edge of town before the young man abruptly begins strangling the taxi driver with a rope and then proceeds to repeatedly hit him with a metal rod. After dragging the body to a nearby lake, the young man bashes the taxi driver over the head with a large rock, ultimately killing him. The ending of the clip displays the young man sitting in the cab, calmly listening to the radio after committing the murder.

Narrative Texts

Two forms of a narrative text summarized the film clip (see Appendix A and B). The misleading narrative included items of misinformation regarding the details in the clip (e.g., "The young man strangled the driver with a chain", when in fact, it was with rope), while the neutral narrative summarized the clip accurately (e.g., "The young man strangled the driver with a rope"). The narrative texts were presented to the participants as either a general narrative of the clip written by the researchers or a general narrative of the clip written by a hypothetical co-witness who had previously watched the same clip.

Filler Tasks

A series of filler tasks were used in both phases of the experiment (in between viewing the film and the initial recall, and in between reading the narrative and the post-manipulation recall). Participants were asked to answer general knowledge questions and complete the word length effect task as a measure of working memory. Analyses indicated that working memory task performance mostly followed a normal distribution (M = 70.81, SD = 9.95).

Cued Recall Test

The present study utilized cued recall to assess memory accuracy. To date, fewer studies have used more open-ended questioning procedures to examine the misinformation effect. Compared to recognition tests, recall tests are preferable as they are more similar to actual eyewitness interviews and recall situations.

A cued recall test was created based on the eyewitness stimulus film (see Appendix C). Some of the questions were "misinformation questions" that were related to the misinformation items presented in the misleading narrative. The remaining questions were "neutral questions" that were related to details from the film. The test was given to participants both before (Recall 1) and after (Recall 2) the manipulation phase. Participants were able to answer "I don't know" or "I don't remember" to any of the questions for which they could not recall or answer. Allowing participants the option to say "I don't know" is important for memory accuracy (Koriat & Goldsmith, 1994). Additionally, witnesses can provide "don't know" answers in forensic contexts, which are clearly preferable to an incorrect answer (Wells & Bradfield, 1998).

Participants were additionally asked to provide a confidence rating (1 = "low confidence" and 6 = "high confidence") for each item on the cued recall test for which they provided an answer other than "I don't know" or "I don't remember".

Manipulation Check

A questionnaire was developed to determine whether participants in the experimental conditions were aware of the experimental manipulation. In particular, they were asked whether they had discussed the film or study with anyone else who had participated in the experiment and what they thought the purpose of the experiment was. Any participants who reported discussing

specific details of the study with others or that guessed the correct purpose of the study were not included in the data analyses.

Procedure

Participants were run either individually or in small groups. Each participant session began with the experimenter informing participants that they would be watching a video depicting a gruesome murder. Participants were warned that some scenes might cause discomfort and that they are free to leave the room if desired.

Following similar procedures used in eyewitness memory studies (i.e., Gabbert et al., 2004), immediately after watching the film, participants had 10 minutes to complete the working memory filler task. Then participants completed the cued recall test to assess initial memory accuracy. Another 20 minutes of filler tasks followed and then the manipulation was introduced. In particular, participants were asked to read through a post-event narrative containing a summary of the events in the film. Those in the *misleading narrative* conditions read a version that contained items of misinformation embedded within the narrative (e.g., "The driver pulls onto a paved road uphill from the river", when in reality, he pulled onto a dirt road downhill next to the river). Those in the *control narrative* conditions read the same version of the narrative, but with accurate items instead of misleading items. Participants in the *co-witness information* conditions were told that the post-event narrative was an account of the events from the film given by another eyewitness. In response to any questions about the accuracy of the account, the experimenters re-iterated that the narrative was simply another eyewitness's account and that no further information could be provided (Gabbert et al., 2004). Participants in the *no co-witness information* conditions did not receive the co-witness information instructions prior to reading the narrative.

After reading the narrative, participants engaged in filler tasks for another 20 minutes before being given the cued recall test for a second time. Finally, the manipulation check was given. Participants were then asked to complete the final demographic questionnaire and were debriefed and asked not to discuss the experiment with other potential participants.

Results

Initial Overall Recall Accuracy

Participants completed the 18-item cued recall test as a measure of initial recall accuracy for the events in the film. The initial recall test took place 10 minutes after viewing the film and completing a filler task. To compare differences in initial recall accuracy between the different conditions, a two-way ANOVA was conducted. The main effect of *misinformation* was nonsignificant, indicating that initial accuracy for the film details was not significantly different for the misinformation and control conditions (F (1, 232) = .237, p =.246). However, the main effect of *co-witness information* was significant (F (1, 232) = 6.479, p = .009). Follow-up Bonferroni comparisons revealed that those in the co-witness information condition were initially less accurate than those in the no co-witness information condition. Further, the *misinformation x co-witness information* interaction was nonsignificant (F (1, 232) = 1.170, p =.645).

Initial Recall Accuracy: Central vs. Peripheral Details

Half of the items on the recall test included central details and half included peripheral details. Initial recall accuracy differences for these details were compared between the different groups. A two-way ANOVA was conducted for initial peripheral detail accuracy and found no significant main effects (*misinformation*: (F (1, 232) = 1.510, p =.470); *co-witness information*: (F (1, 232) = 3.146, p =.126) and no significant interaction (*misinformation x co-witness*

information: F (1, 232) = 1.947, p = .565). A two-way ANOVA was conducted for initial central detail accuracy and found a significant main effect for *co-witness information* (F (1, 232) = 4.748, p = .040). Follow-up Bonferroni comparisons revealed the no co-witness information group initially correctly recalled more central details than the co-witness information group. The main effect for *misinformation* was nonsignificant (F (1, 232) = .688, p = .255), nor was the *misinformation x co-witness information* interaction (F (1, 232) = .075, p = .595).

Initial differences in overall recall accuracy between the co-witness information and no co-witness information groups were not anticipated. Ideally, initial recall accuracy would have been statistically equivalent between all groups. To control for the potential effects of these initial differences on post-manipulation recall, a series of ANCOVAs were performed on each of the post-manipulation recall analyses, with overall initial recall accuracy as the covariate.

Post-Manipulation Overall Recall Accuracy

Participants completed the 18-item cued recall test a second time after the manipulation (i.e., after either receiving the co-witness information or not, followed by reading either the accurate or misleading narrative). To compare differences in post-manipulation overall recall accuracy between the different conditions, a two-way ANCOVA was conducted, controlling for overall initial recall accuracy. The main effect of *misinformation* was significant (F (1, 232) = 54.490, p < .001) and follow-up Bonferroni comparisons showed that overall post-manipulation recall accuracy was significantly higher in the control condition compared to the misinformation condition. Additionally, the main effect of *co-witness information* was nonsignificant (F (1, 232) = 2.224, p = .137), indicating that post-manipulation overall recall accuracy was not significantly different for the co-witness information and non-co-witness information groups. Finally, the *co-witness information x misinformation* interaction was significant (F (1, 232) = 6.258, p = .013).

An analysis of simple effects indicated the co-witness misinformation group had significantly lower overall post-manipulation recall accuracy than the no co-witness misinformation group (F (1, 116) = 7.990, p = .005).

Post-Manipulation Accuracy: Central vs. Peripheral Details

To compare post-manipulation recall accuracy for peripheral items between the different conditions, a two-way ANCOVA was conducted, controlling for initial overall recall accuracy. The main effect of *misinformation* was significant (F (1, 232) = 19.386, p < .001) and follow-up Bonferroni comparisons indicated misinformed participants recalled fewer peripheral items accurately compared to control participants. The main effect for *co-witness information* was nonsignificant (F (1, 232) = 1.342, p = .248), so peripheral item recall accuracy did not differ for the co-witness information and control conditions. The *co-witness information x misinformation* interaction was also nonsignificant (F (1, 232) = 2.433, p = .120).

To compare post-manipulation recall accuracy for central items between the different conditions, a two-way ANCOVA was conducted, controlling for initial overall recall accuracy. The main effect of *misinformation* was significant (F (1, 232) = 33.734, p < .001) and follow-up Bonferroni comparisons revealed misinformed participants recalled fewer central items accurately compared to control participants. The main effect for *co-witness information* was nonsignificant (F (1, 232) = 1.441, p = .231), so central item recall accuracy did not differ for the co-witness information and control conditions. The *co-witness information x misinformation* interaction was also significant (F (1, 232) = 4.281, p = .040). An analysis of simple effects found the co-witness misinformation group recalled significantly more central details accurately than the no co-witness misinformation group (F (1, 116) = 5.357, p = .005)

Misinformation Effects (Post-Manipulation Misleading Item Recall)

To examine differences in recall accuracy based on the presence of misinformation, a two-way ANCOVA was performed comparing recall of misleading items between the misinformation and control conditions, while controlling for overall initial recall accuracy. Results indicated a significant *misinformation effect*, with those in the misinformation condition reporting more misleading items than those in the control condition (F (1, 232) = 56.677, p < .001).

Co-Witness Misinformation Effects (Post-Manipulation Misleading Item Recall)

The same two-way ANCOVA compared recall of misleading items between the co-witness information and no co-witness information conditions. The main effect of *co-witness information* was significant (F (1, 232) = 5.008, p = .026), indicating that recall of misleading items was significantly lower in the co-witness information condition compared to the no co-witness information condition.

Further, there was a significant *co-witness information x misinformation* interaction (F (1, 232) = 7.250, p = .008), indicating that misleading item recall differed significantly between co-witness misinformation participants and non-co-witness misinformation participants. However, the direction of the co-witness misinformation effect was the reverse of what was expected—an analysis of simple effects confirmed participants exposed to co-witness misinformation reported significantly fewer misleading items than participants exposed to misinformation and no co-witness information (F (1, 116), = 12.204, p = .005). Table 1 displays the average misleading item recall for the misinformation and control conditions and the co-witness information and control conditions.

Table 1
Post-Manipulation Misinformation Mean Item Recall (Accuracy)

	Accurate	Misleading	Total
Co-Witness	5.79 (0.49)	5.02 (1.4)	5.39 (1.22)
Non-Co-Witness	5.93 (0.26)	4.46* (1.92)	5.19 (1.56)
Total	5.86 (0.4)	4.74* (1.7)	

Co-Witness Information Effects (Post-Manipulation Correct Item Recall)

To look at whether the presence of co-witness information impacted correct item recall, a two-way ANCOVA was conducted. The main effect of *co-witness information* was significant (F (1, 232) = 7.466, p = .007) and follow-up Bonferroni comparisons revealed that participants receiving co-witness information recalled fewer correct items than participants who did not receive co-witness information, suggesting that the co-witness information did not aid in the recall of accurate items. The main effect of *misinformation* was nonsignificant (F (1, 232) = 2.784, p = .097), indicating that misinformed and non-misinformed participants were similar in their recall of correct items on the post-manipulation recall test. The *misinformation x co-witness information* interaction was also nonsignificant (F (1, 232) = .613, p =.434).

Confidence for Correct Items and Misleading Items

To compare confidence in post-manipulation recall of correct items between the different conditions, a two-way ANCOVA was conducted, controlling for initial overall recall accuracy. The main effect of *misinformation* was significant (F (1, 232) = 14.901, p < .001), and follow-up Bonferroni comparisons indicate that average confidence for correct items was significantly lower for the misinformation condition than the control condition. Further, the main effect of *co-*

witness information was nonsignificant (F (1, 232) = .840, p =.360) indicating that average confidence for correct items did not differ between the co-witness information and control conditions. Finally, the *co-witness information x misinformation interaction* was also nonsignificant (F (1, 232) = 2.782, p =.097).

To compare confidence in post-manipulation recall of misleading items between the different conditions, a two-way ANCOVA was conducted. A significant main effect for *misinformation* emerged (F (1, 232) = 23.375, p < .001) and follow-up Bonferroni comparisons indicated that the misinformation participants were significantly less confident in their recall of misleading items than the control participants. The main effect of *co-witness information* was nonsignificant (F (1, 232) = .911, p =.911), as was the *misinformation x co-witness information interaction* (F (1, 232) = .194, p =.194). Table 2 displays the average misleading item confidence for the misinformation and control conditions and the co-witness information and control conditions.

Table 2

Post-Manipulation Misinformation Mean Item Recall (Confidence)

	Accurate	Misleading	Total
Co-Witness	5.69 (0.4)	5.36 (0.71)	5.54 (0.6)
Non-Co-Witness	5.81 (0.35)	5.36 (0.86)	5.58 (0.7)
Total	5.75* (0.38)	5.38 (0.79)	

Confidence for Post-Manipulation Recall of Central and Peripheral Details

To compare confidence in post-manipulation recall of central details between the different groups, a two-way ANCOVA was conducted, controlling for initial overall recall

accuracy. The main effect of *misinformation* was significant (F (1, 232) = 14.286, $p < .001$), and follow-up Bonferroni comparisons indicate that average confidence for post-manipulation central detail recall was significantly lower in the misinformation condition than the control condition. Further, the main effect of *co-witness information* was nonsignificant (F (1, 232) = .512, p =.475), as was the *co-witness x misinformation interaction* (F (1, 232) = 3.71, p =.543).

To compare confidence in post-manipulation recall of peripheral details between the different groups, a two-way ANCOVA was performed, controlling for initial overall recall accuracy. The main effect of *misinformation* was significant (F (1, 232) = 15.662, $p < .001$), and follow-up Bonferroni comparisons indicate that average confidence for post-manipulation peripheral detail recall was significantly lower in the misinformation condition than the control condition. Further, the main effect of *co-witness information* was nonsignificant (F (1, 232) = .246, p =.620), but the *co-witness x misinformation interaction* was significant (F (1, 232) = 5.983, p=.015). An analysis of simple effects revealed that the no co-witness misinformation group was significantly less confident in peripheral detail recall than the no co-witness, no misinformation group (F (1, 116) = 15.662, p = .005).

Discussion

The present study sought to replicate and extend the current eyewitness memory literature by examining whether co-witness misinformation impacts recall for traumatic events. As hypothesized, the present study replicated misinformation effects for a distressing film concerning a murder (i.e., Paz-Alonso & Goodman, 2008; Paz-Alonso et al., 2013), further confirming that even traumatic events are not immune to the effects of misinformation. After being exposed to misleading post-event information, misled participants in the present study had significantly lower overall recall accuracy for both central and peripheral items These results are

consistent with research showing that details of stressful events may be less accurately remembered than comparable details for neutral events—especially when the details are peripheral in nature (Loftus & Burns, 1982; Paz-Alonso & Goodman, 2008). Further, misled participants recalled significantly more misleading items and were less confident in their recall of correct items. These findings are consistent with other studies that have found misinformation effects for traumatic events (Paz-Alonso & Goodman, 2008; Paz-Alonso, Goodman, & Ibabe, 2013).

The present study was the first known study to examine how co-witness misinformation potentially impacts memory for a traumatic event. Given that co-witness discussion is common among actual eyewitnesses, especially for highly violent events (Skagerberg & Wright, 2008), more information about how co-witness misinformation potentially impacts eyewitness memory for these types of crimes seems relevant. Contrary to what was hypothesized, findings did not reveal co-witness misinformation adversely affected recall of a traumatic event. Rather, the co-witness information manipulation had the opposite effect for the misled participants—the co-witness misinformation group reported significantly *fewer* misleading items than the no co-witness misinformation group. Prior studies using narratives to present co-witness misinformation have reported more misleading item recall in co-witness misinformation groups (Paterson & Kemp, 2006; Gabbert et al., 2004). However, these studies also acknowledged that the narratives were less powerful forms of co-witness influence compared to co-witness discussion. Therefore, co-witness misinformation effects may not have been found in the present study simply because the manipulation was not powerful enough.

Furthermore, the co-witness information manipulation may have created suspicion in the co-witness misinformation participants, leading them to report fewer misleading items than the

no co-witness misinformation participants. It seems plausible that describing the narrative as a recounting from another eyewitness led participants to think more carefully about what they actually remembered from the film, and in turn, they may have resisted reporting more misleading items from the narrative. Similarly, the co-witness misinformation group recalled significantly more central details than the no co-witness misinformation group—further demonstrating the unexpected performance benefits the co-witness information appeared to provide. Again, it is possible the co-witness information prompted these participants to more carefully attend to the narrative or think more carefully about what they actually remembered from the film, so they ended up remembering more of the central details and reporting fewer of the misleading items, despite being exposed to the misleading narrative. Further, the co-witness information group recalled significantly fewer correct items and had lower overall post-manipulation recall accuracy than the no co-witness information group, so there was no benefit of co-witness information for correct recall either. Prior studies utilizing co-witness information narratives have reported improved recall for correct details (Paterson & Kemp, 2006), which further points to the co-witness information manipulation not being as effective in the present study.

Past research has typically found that misled participants report as much confidence in their memory judgments as non-misled participants (Paterson & Kemp, 2006). Contrary to what was expected, participants in the present study were not highly confident in the recall of their misinformed responses. Despite reporting significantly more misleading items, the misinformed participants were not as confident in misleading item recall as control participants—nor were they as confident in their recall of both central and peripheral details. It is possible that the shorter time delay between the event, the manipulation, and the post-manipulation recall may

have contributed to lower misleading item recall confidence. In particular, prior research (Mudd & Govern, 2004; Paz-Alonso & Goodman, 2008) has found that misled participants tend to become more confident in their memories after longer delays (e.g., 1 – 2 weeks). With the shorter time delay in the present study, the initial memory trace may have remained relatively strong, and as a result, participants may not have felt as confident in their misleading item recall (Brainerd & Reyna, 1995).

A number of theoretical approaches have been put forth to explain how and why the misinformation effect happens. While true memory impairment and source monitoring errors may explain why some participants fell prey to the misinformation, other explanations are worth mentioning as well. The *blocking hypothesis* assumes that exposure to incorrect information (i.e., misleading PEI) impairs access to correct information (Bekerian & Bowers, 1983). At the time of test, traces for both the original and misleading items are believed to exist in memory, and the more recent trace may block access to the earlier trace. Indeed, some participants in the present study reported having memories for both the correct details from the film and the misleading details in the narrative, but nonetheless still reported misleading items. It is possible that the misleading information blocked access to (or interfered with) the trace for the earlier information. Additionally, the *strategic effects account* explains the misinformation effect in terms of factors other than true memory impairment, such as task demands (McCloskey & Zaragoza, 1985). In these cases, participants may remember both the original and misleading information but choose to report the items from the misleading narrative to produce results they believe the experimenter wants. The fact that the co-witness misinformation participants reported significantly fewer misleading items suggests that some may have been aware of the

manipulation on some level—and some may have decided to report misleading items due to experimenter demands rather than true memory impairment.

In addition to the weak co-witness information manipulation, other limitations undoubtedly impacted the findings in the present study. Some students reported finding the film clip to be especially distressing, which may have led them to not fully focus on the event and miss crucial details. Indeed, prior research has suggested that too much distress can impair memory for an event (Paz-Alonso et al., 2013). Further, many of the participant sessions took place near the end of the semester when student stress, anxiety, and apathy were all likely high. While this is a common occurrence in undergraduate student populations, it is particularly problematic for research assessing memory performance. Additionally, the short time delay between the witnessed event and recall may have contributed to weaker co-witness information effects. Previous research utilizing longer one- to two-week time delays between event and recall found significant co-witness misinformation effects (Paterson, Kemp, & Forgas, 2009; Rivardo et al., 2013). Finally, the film clip itself may not have been particularly engaging or relatable to participants. A more updated realistic simulated traumatic event (as opposed to a clip from a decades-old foreign film) may be more relevant and capture greater interest and attention.

In addition to correcting for the aforementioned limitations, future research could utilize a confederate as the source of post-event co-witness misinformation. As previously discussed, stronger co-witness misinformation effects have been found when a trained confederate is used to supply the co-witness misinformation via discussion, compared to when it is supplied in a post-event narrative (Gabbert et al., 2004; Paterson & Kemp, 2006). Post-event information encountered through co-witness discussion is likely stronger due to the presence of subtle non-verbal and social cues that may lead to memory conformity (e.g., eye contact, facial expressions,

perceived credibility and trustworthiness, etc.). Additionally, people generally assume information exchanged during a discussion is accurate and truthful and may choose to agree with others to appear more likeable (Gabbert et al., 2004).

Overall, findings from the present study suggest that witnesses are prone to reporting misleading details about a witnessed event, even when the event is traumatic in nature. These inaccuracies extend to both central and peripheral details for the event. Further, despite not finding co-witness misinformation effects, the need for investigators to engage in practices that prevent co-witnesses from discussing the details of an event with each other is still critical. Unfortunately, officers cannot and do not always engage in practices to limit co-witness discussion, and in some cases, they actually *encourage* co-witness discussion (Paterson & Kemp, 2005). This is troubling, as the presentation of inaccurate co-witness information could lead to the transfer of misinformation, which could then be incorporated into a witness' memories (Gabbert et al., 2003). Several real-life examples illustrate how co-witness discussions have led to mistaken eyewitness identifications, and these mistaken identifications have had severe consequences in court and for police investigations (Memon & Wright, 1999; Granhag et al., 2005).

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Appendix A

Accurate Narrative

It is a **dark and dreary day**. A young, **blonde-haired** man is riding in a taxi cab, seated in the back of the car **directly behind the driver**. The car briefly stops to allow **a group of children and an adult** to cross the intersection. The interaction between the young man and the taxi driver is **minimal** as the ride continues through the city. Before the car comes to a stop, the young man abruptly begins strangling the taxi driver with **a rope**. As the car comes to a stop, the driver pulls onto a **muddy road downhill from a river**. Shortly thereafter, a **man riding a bicycle** passes by on a nearby hill. The taxi driver then begins **honking the car horn**. The young man eventually stops strangling the taxi driver and gets out of the car. As a train passes by in the distance, the young man begins to hit the taxi driver several times with a **metal rod**. The young man then takes a **tarp** out of the trunk of the car and covers the taxi driver's head with it. The young man moves the car closer to the river and **drags the taxi driver down the hill**. The young man then bashes the taxi driver's head, ultimately killing him. Following the murder, the young man is seen sitting in the car **listening to the radio**.

Appendix B

Misleading Narrative

It is a **dark and dreary day**. A young, **dark-haired** man is riding in a taxi cab, seated in the back of the car on the **opposite side of the driver**. The car briefly stops to allow a **group of children and an adult** to cross the intersection. The interaction between the young man and the taxi driver is **minimal** as the ride continues through the city. Before the car comes to a stop, the young man abruptly begins strangling the taxi driver with **a chain**. As the car comes to a stop, the driver pulls onto a **paved road uphill from a river**. Shortly thereafter, a **man riding a bicycle** passes by on a nearby hill. The taxi driver then begins **honking the car horn**. The young man eventually stops strangling the taxi driver and gets out of the car. As a train passes by in the distance, the young man begins to hit the taxi driver several times with a **metal rod**. The young man then takes **a blanket** out of the trunk of the car and covers the taxi driver's head with it. The young man moves the car closer to the river and **drags the taxi driver down the hill**. The young man then bashes the taxi driver's head, ultimately killing him. Following the murder, the young man is seen sitting in the car **smoking a cigarette**.

Appendix C

Cued Recall Test

1. What were the weather conditions like? *P, A*
2. What color hair was the young man's hair? *C, M*
3. What color was the sweater the young man was wearing? *C*
4. Where was the young man seated in the taxi? *P, M*
5. Describe the pedestrians that are shown crossing the road. *P, A*
6. Describe the degree of interaction between the young man and the taxi driver. *P, A*
7. What did the young man use to strangle the taxi driver? *C, M*
8. Which article(s) of clothing did the taxi driver remove? *P*
9. What type of road did the taxi driver pull onto before stopping the car? *P, M*
10. What type of animal was shown during the clip? *P*
11. What was the man doing as he passed by on the nearby hill? *P, A*
12. What noise was coming from the car during the strangulation? *C, A*
13. What does the young man hit the taxi driver with while in the car? *C, A*
14. What does the taxi driver lose after being hit over the head in the car? *C*
15. What does the young man use to cover the taxi driver's head? *C, M*
16. Where does the young man move the taxi driver's body? *C, A*
17. What was the taxi driver hit over the head with outside of the car? *C*
18. What is the young man shown doing following the murder? *P, M*
19. Can you remember any other details you want to add about the scene?

C=Central Detail *P*=Peripheral Detail *A*=Accurate detail *M*=Misleading detail