

**Misinformation Modality and its Effects on Memory**

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### Abstract

Eyewitness testimonies are often regarded as one of the most compelling pieces of evidence in court cases, though research has shown that subjects' memories can be easily and unintentionally manipulated. In this study, we manipulated misinformation modality (narrative, direct interview, indirect interview) and misinformation type (contradictory, additive) to measure how these variables affected misinformation acceptance. The misinformation paradigm was used: participants saw an event, received post-event information, and took a recognition test featuring forced choice questions, confidence scales, and open-ended response questions. Those in the direct interview modality group accepted less misinformation than the indirect group and narrative group. There were mixed results between item types (additive, contradictory, control). These findings could have an impact on the legal system and how witnesses are questioned, both directly after a crime and during court appearances.

*Keywords: Misinformation, direct, indirect, narrative, modality, additive, contradictory*

### **Misinformation Modality and its Effects on Memory**

Memory is far more unreliable and more malleable than many people believe. There is research that shows that our memory can change our memories (Loftus, 2003). Changes in memory has been found to be common in a court setting (Wells et al., 1998; Jack et al., 2014). The Innocence Project looks at criminal convictions for which there is reason to doubt the accuracy of the conviction. They estimate around 69% of those erroneously convicted had mistaken eyewitness identifications in their cases (Innocence Project, 2021).

Often, witnesses do not take the stand until months, sometimes years, after the crime occurred (New Zealand Law Society, 2013). Over time, their memory of the event may be altered, and they might incorporate new details that differ from the actual event. This is known as the misinformation effect (Loftus, 1975). In 1975, Dr. Elizabeth Loftus, who is one of the world's leading experts on memory, discovered the misinformation effect (Loftus, 1975). Since then, hundreds of studies have expanded upon the idea of misinformation and looked at what areas can affect this paradigm (Jack et al., 2014; Loftus, 1979b, 2005; Loftus et al. 1978; Moore & Lampinen, 2016; see Loftus, 2005 for review). The misinformation effect is caused by incorrect post-event information interfering with memory recall. Post-event information is any type of information about an event that is received after the event occurred. This information has been shown to strengthen or weaken memory recall based on if the information is correct or not. If incorrect information is presented, we may change our memories to match that of the post-event information. The typical timeline for the misinformation effect is as follows: 1) An event takes place and memories of this event are created, 2) Some time may pass, then a person is exposed to incorrect post-event information, 3) Sometime later the person must recall the

original event. Misinformation is transmitted in the second stage, and the misinformation is recalled in the third stage.

As Loftus points out in her 1975 study, we are rarely required to recall events exactly as they occurred. Said another way, it is rarely necessary to remember all the details of an event and to do so accurately. Research has found that people are more likely to remember general pieces of information than the details (Reyna & Brainerd, 1995). However, in the case of crimes or accidents thorough and accurate recollection is often required.

There are many theories on causes of the misinformation effect. Loftus and colleagues (Loftus 1975, Loftus et al., 1978) believe that misinformation overrides the correct information present in our memories. Loftus theorized that misinformation replaces the correct information and erases the original information. Other researchers have attributed the misinformation effect to the inability to differentiate between sources of misinformation (Lindsay & Johnson, 1989a, 1989b; Lindsey, 1990). Some studies have argued that if a person believes one source of misinformation is wrong, they are more likely to believe others are wrong, creating a “barrier” that increases misinformation protection (Loftus, 1979b). Finally, other researchers have found that misinformation acceptance is sometimes due to complying with social pressure (Gabbert et al., 2004; McCloskey & Zaragoza, 1985).

### **Misinformation Modality**

Misinformation can be instilled in many ways, such as through discussion with other witnesses, stories heard after the event from either word of mouth, such as a police officer, news reports, or police reports/written narratives of the event. The way post-event information is presented is referred to as modality. Possible misinformation modalities for eyewitnesses to a crime include co-witness discussion (from one eyewitness to another) and information gained

through a third party (such as a police officer, a written report, or the media). Jack, Zydervelt, and Zajac (2014) found a misinformation effect in both the co-witness and interviewer source but found no significant differences between them. In another study, co-witness discussion led to lower accuracy (21.6%) than leading questions (43.4%) when a person is given incorrect post-event misinformation, with both doing worse than the control group (51.4%) (Paterson & Kemp, 2006).

It should also be known that the current study is the second study in a series. Study 1 used less direct questions (“Did the man eat an apple?” was used in Study 1 instead of “Where did the man eat the apple?”), and it did find an effect in the direct category. However, the first study was also conducted in person whereas the study reviewed in this paper was conducted online which may impact misinformation acceptance.

### **Types of Misinformation: Additive and Contradictory**

In addition to misinformation modality, the way that misinformation interacts with the details from the original event has an impact on misinformation acceptance (Huff and Umanath, 2018; Moore & Lampinen, 2016). We call this misinformation type. There are two types of misinformation: contradictory and additive. Contradictory misinformation is misinformation that contradicts a part of the original memory. For example, changing the color of an object (a blue hat becomes red), changing an object (a stop sign becomes a yield sign), or changing any other piece of information that contradicts something in the original event would all be contradictory in nature. Additive misinformation is misinformation that does not contradict the original information, instead it is in addition to what occurred in the originally witnessed event. For example, adding something that did not occur, such as asking what type of weapon a person was carrying when they did not have a weapon would all be additive in nature. The majority of past

research has found support for differences in misinformation acceptance by misinformation type. Frost (2000) found that additive misinformation was more likely to be accepted than contradictory misinformation after 1-week intervals. Huff and Umanath (2018) and Moore and Lampinen (2016) also found that additive misinformation was more likely to be accepted than contradictory misinformation. However, Nemeth and Belli (2006) did not find a difference between additive and contradictory misinformation acceptance in schema consistent (misinformation that matches the scene, like a book on a bookcase) or non-schema consistent (misinformation presented that is out of place, like a picnic basket on a bookshelf) conditions. Taken together, this evidence suggests that in a traditional misinformation paradigm additive misinformation will be accepted at a higher rate than contradictory misinformation.

### **The Present Study**

In the current study, we examined the impact of misinformation modality and misinformation type on misinformation acceptance. The procedure uses additive and contradictory misinformation presented in either an indirect interview, a direct interview, or a narrative modality. We investigated how modality and question type affect misinformation acceptance. There were two hypotheses for this experiment. First, those in the direct interview modality group will accept less misinformation than the indirect group, which will accept less than the narrative group. Second, additive misinformation is more likely to be accepted than contradictory misinformation.

## **Methods**

### **Participants**

A total of 103 participants took part in this study. 27 were male, 73 were female, and 3 did not respond. The mean age was 21 years, with a range from 18 years to 52 years. Participants

were undergraduate students, recruited through Oklahoma State University's Psychology department. Participants were granted SONA credit in return for their participation. Participants were required to read and write fluent English, be 18 years of age or older, and have no form of color blindness.

Among the 103 total participants, 34 were in the direct group, 35 were in the indirect group, and 34 were in the narrative group.

### **Design**

Participants were randomly assigned in a 3 (Misinformation modality: indirect interviews, direct interviews, and narratives) x 3 (Question Type: additive, contradictory, and control) mixed design, with the within factor being the question type. Participants were randomly assigned to a misinformation modality. The participants were exposed to the misinformation through one of three sources after viewing an event. Indirect interviews included questions that presupposed the misinformation, but misinformation acceptance was not required to answer the question. They could ignore the misinformation and still answer the question. The direct interviews included questions about the misinformation, and the participants were required to confront or accept the misinformation to answer the questions. The narratives introduced the misinformation in the form of a written account of the video they observed. Furthermore, some of the misinformation was additive and some of the misinformation was contradictory. Additive means the misinformation presented was completely new. This would involve adding something that did not occur, whether it be items, information, or actions. Contradictory means that the misinformation contradicts something that occurred. Something could change location or color. Control contains no misinformation. The materials used in this study were adapted from Moore and Lampinen (2016).

## **Materials**

### ***Videos***

The participants watched one of six versions of a video that showed a repairman entering and working in a house. Throughout the video, the man can be seen stealing things and searching through locations not involved with his repairs. The video consisted of photos that were displayed on the screen for a total of 2 seconds, and all videos lasted between 1:30 to 1:34 minutes.

### ***Narratives***

The narrative consisted of around 400 words and described the events of the video. Each narrative had 6 pieces of misinformation, 3 additive and 3 contradictory. For the additive misinformation, which add new misinformation to the narrative, one narrative read: “He found a note from the homeowner on the counter in the kitchen.” when the man did not read a note. For the contradictory misinformation, which have misinformation that contradicts an event, one narrative read: “He picked up a woman’s bracelet, which he inspected carefully and slipped it into his pocket.” when the man did not steal a bracelet.

### ***Indirect Interviews***

The interview consisted of 12 questions: 3 additive misinformation questions, 3 contradictory misinformation questions, and 6 foil (true) questions. For the additive questions, which add new misinformation to the question, one question was: “The man did several things in the kitchen including eating an apple. Did he repair any items in the kitchen?” when the man did not eat an apple. For the contradictory questions, which have misinformation that contradicts an event, one question was: “The man stole a bracelet. Did he steal anything else?” when the man did not steal a bracelet.



### ***Direct Interviews***

The interview consisted of 12 questions: 3 additive misinformation questions, 3 contradictory misinformation questions, and 6 foil (true) questions. For the additive questions, which add new misinformation to the question, one question was: “Did the man eat an apple?” when the man did not eat an apple. For the contradictory questions, which have misinformation that contradicts an event, one question was: “Did the man steal a bracelet?” when the man did not steal a bracelet.

### ***Filler Tasks***

The study had two filler tasks. One was a matching game where participants matched two of the same card. The second was a game of tic-tac-toe between them and a computer.

### ***Recognition Test***

Participants took one of two versions of a post-misinformation recognition test. It consisted of a yes/no question, an open-ended question asking why they answered yes/no, and a confidence scale for each question.

### ***Post-Session Information***

Participants answered questions about whether they believed misinformation occurred, if they had heard of the misinformation effect, if they were suspicious of being tricked, what they believed the study was about, and multiple questions about their demographic characteristics.

### **Procedure**

Participants signed-up for the survey through a university research software called SONA. Participants took the survey on their own time and results were collected via Qualtrics. The study was conducted via a Qualtrics survey to avoid unnecessary possible exposure to Covid. The survey started with consent and a pre-screening to ensure participants qualified for the study. This was followed by the crime video. Participants then played tic-tac-toe for 3

minutes. At this point, the survey randomly assigned participants to experience the direct interview, the indirect interview, or the narrative that matched the video watched. Participants completed another 3-minute filler task, this time a matching game. Lastly, they took the recognition test followed by the post-session information questionnaire. The demographic characteristics questions are located in the post-session information questionnaire.

### Results

Accuracy rates for the critical items are in Figure 1. A mixed factors ANOVA revealed that accuracy on the critical items (control, additive, and contradictory) differed significantly,  $F(2, 200) = 14.40, p < .001, \eta^2_p = .13$ . Control item accuracy ( $M = 0.74, SE = 0.03$ ) was higher than additive item accuracy ( $M = 0.54, SE = 0.03$ ). Control item accuracy ( $M = 0.74, SE = 0.03$ ) was not higher than contradictory item accuracy ( $M = 0.65, SE = 0.03$ ),  $p = .087$ . In addition, contradictory item accuracy ( $M = .65, SE = .03$ ) was higher than additive item accuracy ( $M = .54, SE = .03$ ),  $p = .004$ .

There was no main effect of misinformation modality on misinformation acceptance,  $F(2, 100) = 2.58, p = .08, \eta^2_p = .05$ , but there was an interaction between Modality and Item Type,  $F(4, 200) = 5.44, p < .001, \eta^2_p = .098$ . To follow up this interaction, repeated measures ANOVA (3 item type: additive, contradictory, control) were run on each misinformation modality type (Figure 1). In the direct interview condition, there was not an effect of item type,  $F(2, 66) = 2.48, p = .094, \eta^2_p = .07$ . There was no difference in accuracy among the control ( $M = .67, SE = .06$ ), additive ( $M = .68, SE = .05$ ), or contradictory ( $M = .78, SE = .04$ ) items. In the indirect interview group, there was a main effect of item type,  $F(2, 68) = 11.06, p < .001, \eta^2_p = .246$ . Control item accuracy ( $M = .74, SE = .06$ ) was higher than contradictory item accuracy ( $M = .52, SE = .06$ ),  $p = .007$ . Control item accuracy ( $M = .74, SE = .05$ ) was higher than additive item

accuracy ( $M = .46, SE = .06$ ),  $p = .001$ . There was no difference between contradictory ( $M = .52, SE = .06$ ) and additive item accuracy ( $M = .46, SE = .06$ ),  $p = .910$ . In the narrative group, there was a main effect of item type  $F(2, 66) = 10.586, p < .001, \eta^2_p = .243$ . There was no difference between control ( $M = .80, SE = .05$ ) and contradictory ( $M = .65, SE = .05$ ) item accuracy,  $p = .110$ . Control item accuracy ( $M = .80, SE = .05$ ) was higher than additive item accuracy ( $M = .49, SE = .06$ ),  $p = .001$ . Contradictory item accuracy ( $M = .65, SE = .05$ ) was higher than additive item accuracy ( $M = .49, SE = .06$ ),  $p = .028$ .

### Discussion

In this experiment, we examined how modality and question type affect misinformation acceptance. Participants completed a traditional misinformation paradigm. We varied misinformation type within subjects and misinformation modality between subjects. We hypothesized that those in the direct interview modality group would accept less misinformation than the indirect group, which will accept less than the narrative group. That means the direct group should have the highest accuracy, followed by the indirect group. Secondly, we hypothesized that additive misinformation is more likely to be accepted than contradictory misinformation. We found a misinformation effect for additive misinformation but not contradictory misinformation. This was qualified by an interaction between misinformation modality and item type. In the direct interview condition, there were no misinformation effects for either item type. There was no difference in accuracy among the control, additive, or contradictory items. The indirect interview condition had a main effect of item type. Control item accuracy was higher than additive and contradictory item accuracy. There was no difference between contradictory and additive item accuracy. In the narrative group, there was a main effect of item type. There was no difference between control and contradictory item accuracy. Control

item accuracy was higher than additive item accuracy. Contradictory item accuracy was higher than additive item accuracy.

### **Current Findings**

In regard to modality, one of our hypothesis theorized that the direct interview modality group would accept less misinformation than the indirect group, which would accept less than the narrative group. To examine the effect of misinformation acceptance variance, we looked at the interaction between misinformation modality and item type (to account for guessing via our control item types). We found an interaction between modality and item type. Accuracy rates on both contradictory and additive misinformation were higher in the direct interview condition than the indirect interview condition. Additionally, the narrative group was more accurate at contradictory misinformation than the indirect interview group. This supported our hypothesis in all areas except the contradictory narrative group being higher than the indirect group.

In other research that has examined the impact of misinformation type, researchers have used narratives, interviews, witness discussions, and mock media report modalities (Paterson & Kemp, 2006; Jack, Zydervelt, & Zajac, 2014). Patterson and Kemp (2006) looked at narratives in the form of a mock news report and narratives that they claimed were written by other witnesses, interviews in the form of leading questionnaires, and co-witness discussion with confederates. They found that accuracy was lowest in the discussion group (22%), followed by the narrative claimed to be from another witness (36%), followed by the leading questions interview (43%). The media group had no effect. This was similar to our findings, as the narrative group (mock witness report) was less accurate than the interview group. Jack, Zydervelt, and Zajac (2014) used a 2 (co-witness misinformation, no co-witness misinformation) by 2 (interviewer misinformation, no interviewer misinformation) within-participants design. This had some

participants getting misinformation via interview, some getting misinformation via discussion with another witness, some getting misinformation from both sources, and some getting no misinformation. They found that there was no significant difference in the modality.

In regard to question type, hypothesis 2 theorized that additive misinformation would lead to lower accuracy than contradictory misinformation. There was an overall effect of item type and our hypothesis was upheld, people were more accurate at contradictory misinformation than additive misinformation. However, this main effect was qualified by an interaction with misinformation modality. Participants accepted additive misinformation at higher rates than contradictory misinformation in the narrative group, leading to lower accuracy score. However, contradictory misinformation and additive misinformation were accepted at the same rate in the indirect and the direct modality group. Therefore, we found support for the hypothesis in the narrative group but not in either interview group.

Why did we not find differences in the acceptance of additive and contradictory misinformation in the interview groups? Many researchers have found differences in misinformation acceptance by type (Frost, 2000; Moore & Lampinen, 2016; Huff & Umanath 2018). We offer several reasons why we did not find this effect in the interview groups. In the indirect interview condition, misinformation acceptance rates were highest of any group and that may account for the equal acceptance of both types. However, this may also be due to the low sample size in the current study. In the direct interview condition, we expected that accuracy on the misinformation items would be high but did not anticipate that this modality would necessarily eliminate the misinformation effect. However, there is some research that would show an elimination in the misinformation effect. Specifically, a barrier effect (Loftus, 1979b) could be taking place. The barrier theory argues that if a person believes one piece of

misinformation is wrong, they are more likely to believe others are wrong, creating a “barrier” that increases misinformation protection. This could come into play if a participant can clearly remember that misinformation listed in one question is incorrect. Even if they are unsure of the misinformation on other questions, they may reject misinformation since a previous question was wrong. This study is the second study in a series. Study 1 used less direct questions in the direct category (“Did the man eat an apple?” was instead “Where did the man eat the apple?”), but it did find an effect in the direct category. The shift in questions to a more direct wording could have been enough to cause a barrier effect in study two, even when there was.

### **Limitations**

Current results have not looked at or removed results that failed the attention checks. Attention checks are used to confirm that the participants are reading the questions and not just entering random answers. We have not yet removed those that failed these checks yet due to the low sample size collected at the time of writing this paper. Currently, this study is just under the halfway mark of data collection. This is due to low participation due to COVID, and delays caused by the pandemic.

### **Applications and Future Research**

Further studies will be based on the results obtained at completion. Future research could focus on if it is possible to prevent misinformation acceptance in witnesses when they recall the details of a crime, possibly by informing them of the misinformation effect, similar to Blank et al. (2013). Future research could examine the interviewing process of witnesses following a crime and whether standardized rewording of questions can limit false memories. Furthermore, the effects of time on false memories and the degradation of memories should be studied further. Another theory to look into during modality future research is statement bias (Pandelaere &

Dewitte, 2006; Lee & Chen, 2013). Research has found that the way misinformation is phrased (questions with misleading information vs. statements with misinformation) can have an effect on misinformation acceptance. Both questions and statements cause a misinformation effect, but the questions lead to higher accuracy overall.

There are many possible applications for these findings. The intended direct effects can be applied to the legal system and to the questioning of witnesses, both directly after a crime and during their court appearances. Police officers and first responders could undergo training to limit witness discussion and ask questions that pinpoint if any information was exchanged through any means that could cause misinformation.

### **Conclusion**

This study examines how modality and item types affect memory accuracy following a mock crime. There was an effect between modality and item type, but not between modality and accuracy. Accuracy rates on both contradictory and additive misinformation were higher in the direct interview condition than the indirect interview condition. Additionally, the narrative group was more accurate at contradictory misinformation than the indirect interview group.

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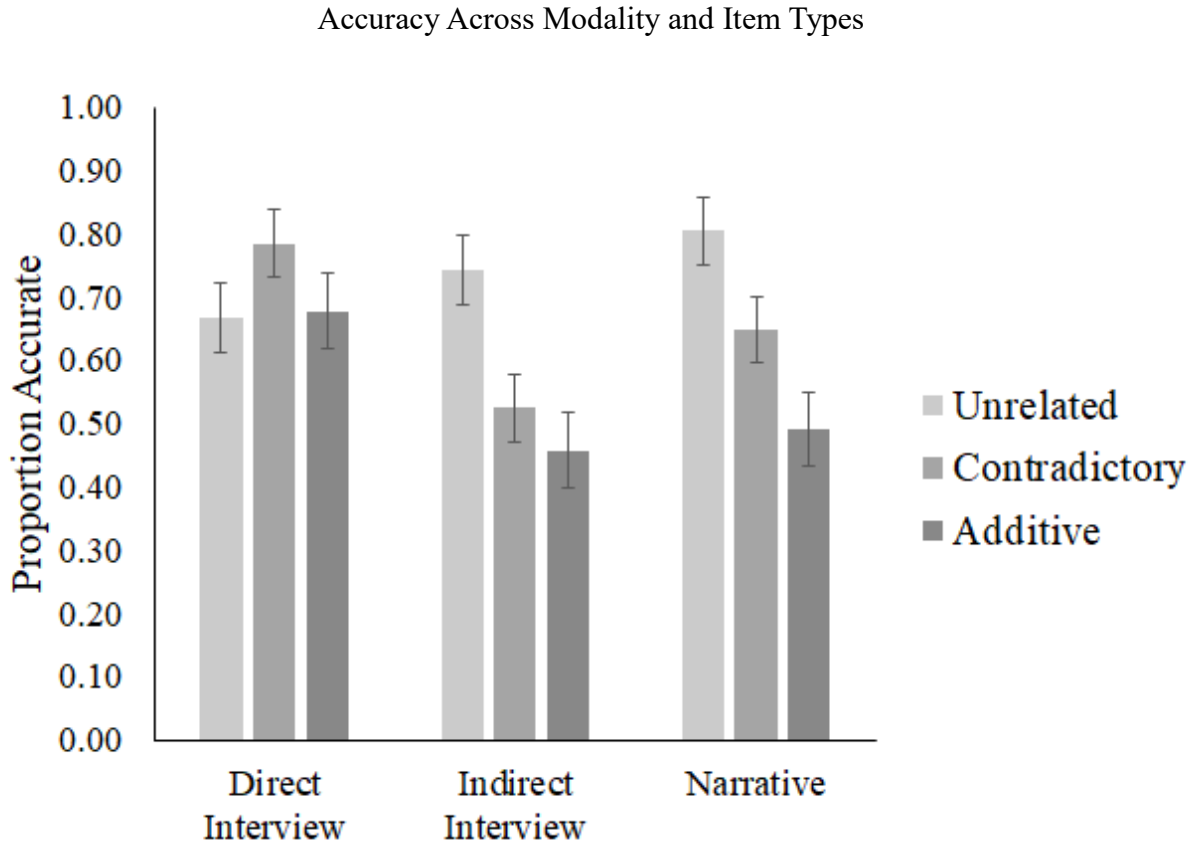


Figure 1. Accuracy rated by item type and modality