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The Role of Authority in Retrieval Enhanced Suggestibility (RES)

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Abstract

Retrieval Enhanced Suggestibility (RES) is a phenomenon which occurs when participants are given an initial memory test followed by misinformation. The present study found that the manipulation of the authority of misleading information does not have an effect on RES. Ninety-nine undergraduate students completed five phases: watching a video, taking/not taking an initial test, assignment of authority level, presentation of misleading narrative, and a final memory test. The results indicate that testing condition was significant with those who took an initial memory test reporting more misinformation. Sentence type for response time was also significant with control sentences being read faster than consistent or misleading. These results either suggest that misinformation is more influential than authority, or that our authority manipulation was weak.

1. Literature Review

Memory plays a major role in solving criminal cases. Remembering what happened at the scene of a crime is often one of the starting points in an investigation. However, what happens when a witness' memory is not as reliable as one might hope? Questions such as this are the reason eyewitness memory has been a topic of interest in both the criminal justice and psychology fields. A major boom in research regarding this area occurred in the 1970s, the decade it was discovered that one's memory of the past can be affected by exposure to misleading information, aptly referred to as the "misinformation effect" (Loftus, 2005). In a study by Loftus, Miller, and Burns (1978), the misinformation effect was exemplified through use of the misinformation paradigm. In this paradigm, participants were presented a series of slides depicting a car accident involving a pedestrian. Half of the participants were presented slides which detailed the presence of a stop sign, while the other half were told about the presence of a yield sign. After seeing these slides, participants were presented a series of questions in which half of the participants were asked if the car stopped at the stop sign, while the other half were asked about the yield sign. These questions and slides meant that half of the participants received consistent information between the slides and questions and the other half received conflicting information. After a subsequent recognition test was administered, the results of the experiment demonstrated that the participants presented with conflicting information were unable to distinguish which sign they actually saw in the slide, reporting 34% less correct answers than those in the consistent condition. Loftus et al. concluded that the misinformation presented in the questions affected their memory of the original event.

Since the 1970s through the present day, Loftus and other researchers have examined various influences of the misinformation effect drawing conclusions regarding the importance of when the misinformation was presented and the fate of the

original memory. In one study by Higham (1998), participants viewed a video of a simulated crime and then answered questions about it including those that asked where they drew their conclusions from: the video alone or through the questions asked. Misinformation effects were strongest during short time intervals of 1 – 48 hours between the misinformation and test. This was because participants were still able to recall the misleading questions they read only hours prior. After a long delay, participants were less likely to remember the questions and therefore just select the "video only" option. These findings concluded that short time intervals between misinformation and a subsequent memory test increase the likelihood that a participant would attribute that misinformation occurred (Higham, 1998).

In addition to delving into the questions of "when" in regards to misinformation, Loftus and Hoffman also explored how misinformation could lead to the creation of new memories. In this work, a gentleman named Mike hears a woman named Maria talk about a screwdriver's appearance at the scene of a burglary when in fact it was a hammer that was used. Because Mike never saw the hammer for himself, but heard Maria talk about seeing the screwdriver, he describes seeing the screwdriver as well, therefore reconstructing his memory of the event (Loftus & Hoffman, 1989). The process in which Mike takes Maria's word as fact is referred to as "misinformation acceptance." Referring to her previous study, Loftus indicates that because Mike did not see a hammer for himself, his memory of the event was more malleable and therefore susceptible to false memory. The combination of the memory's lack of "freshness" in his mind and the fact the Mike spoke to another person who witnesses the same event made his memory more susceptible to misinformation acceptance, even creating a new memory entirely. In addition, by speaking to Maria, another person who witnessed the same event, Mike faced a dilemma regarding source misattribution, a phenomenon in which individuals have access to post event infor-

mation, but are confused as to where they got that information (Loftus & Hoffman, 1989).

Source misattribution has also been noted in other studies. Zaragoza and Lane (1994) conducted an experiment in which participants were asked specific questions about memory for suggested items. In the study, participants were presented slides depicting a maintenance man entering an office to fix a chair and along the way finding and stealing $20 and a calculator. Another version of the slides was altered in which six slides omitted an item originally found in them such as either a watch, book, or coffee. For each participant, only two of the six items appeared in the slides they were presented. After viewing the slides, each participant was then exposed to misinformation via either a misleading narrative or misleading questions. The misleading narrative contained 30 sentences, 5 of which were misleading by suggesting the presence of an item that was not shown in the slides. For example, a misleading sentence suggesting the presence of a wristwatch read as, "When the man looked at his wristwatch before opening the door, he appeared anxious." In the misleading questions option, the suggestion of a wristwatch was worded as, "When the man looked at his wristwatch before opening the door, did he seem anxious?" Answering the misleading questions produced stronger and more reliable misattribution effects than just reading the narrative because the questions gave way to participants being more likely to select the "both" response when attributing where they saw a specific detail. Answering misleading questions led participants to believe that they remembered seeing items they only read about within the questions. These results indicated that participants are influenced by the source misattribution effect, a phenomenon in which participants remember things that were suggested to them as if they saw them for themselves in the first place (Zaragoza & Lane, 1994).

Through extensive research Loftus has found that the acceptance of false memories is perva-

sive and impactful in regards to memory recollection. "Pure guessing" is not necessarily to blame for the effect of misinformation (Loftus & Hoffman, 1989). As in previously mentioned misinformation studies, in a study by Loftus, Donders, Hoffman, and Schooler (1989), participants were presented a series of slides depicting a burglary followed by narratives that contained some misinformation about specific details. However, instead of just being tested on their memory of what happened, participants were also tested in regards to their reaction times and confidence levels. When presented a test containing misinformation as a possible answer, participants responded just as quickly with a misleading answer as they did when choosing the correct option. They also accepted misinformation with a high degree of confidence, indicating that guessing is not involved. Misled participants did respond more slowly however indicating that the misinformation presented to them did affect their ability to answer (Loftus et al, 1989).

The way misinformation is presented has also been explored to determine its effect on the misinformation effect, as was done in an experiment by Lee and Chen (2013). In the first experiment the standard misinformation paradigm was administered, however three misleading formats were used for post-event information: an affirmative statement with misleading information, a question with misleading information, and a question with correct information from the video previously seen. An example of an affirmative statement with misinformation was "I reached for the toothpaste besides the Dove cleansing cream." A question with misleading information was, "I reached for the toothpaste beside the cleansing cream. Was it Dove?" The final format was a question containing correct information such as, "I reached for the toothpaste beside the cleansing cream. Was it Johnson?" In this case, the misleading detail is Dove cleansing cream while the correct answer is Johnson. These results indicated that post-event information presented in an affir-

mative statement produced the misinformation effect. Misinformation presented in a question form did not produce the same effect, rather questions increased the recall of correct information (Lee & Chen, 2012).

The finding that questions reduce the effect of misinformation was further explored by LaPaglia and Chan (2013). The two researchers investigated whether differences in the presentation of misinformation affected suggestibility. In two experiments, following the misinformation paradigm, participants watched a video of a bank robbery followed by half the participants being given an initial memory test. After a short delay, participants either then listened to narrative containing misinformation or responded to questions about the narrative that contained misinformation. An example of a narrative statement containing misinformation was "The robber demands that the police get him his money and a car in 1 hour." The same misinformation was presented in question form as, "In addition to the money, the robber gives the police 1 hour to also get him what?" A final recall test was later administered. The results indicated that for participants who were initially tested, those who listened to a misleading narrative written in strictly statement format recalled more false information on the final memory test than those who read misleading information in a question format (LaPaglia & Chan, 2013).

In summation, misinformation plays a major role in one's memory. Through various studies it has been discovered that short time intervals between the presentation of misinformation and the final memory test increase the likelihood of misinformation recollection (Loftus et al., 1978; Highman, 1998). Pure guessing has been ruled out as the culprit for incorrect retrieval however due to reaction times and confidence of the participants' responses. Shorter reading times and high degrees of confidence rule out guessing since it would be expected that participants would weigh their answer choices for a longer amount of time and therefore would be less confident in their answers

(Loftus et al, 1989). The presentation of misinformation also affects the likelihood that misleading information will be recalled with question formats weakening the effect of misinformation (Lee and Chen, 2013; LaPaglia & Chan, 2013).

2. Misinformation and Retrieval Enhanced Suggestibility (RES)

Misinformation research has been expanded in recent years with the discovery of a phenomenon entitled Retrieval Enhanced Suggestibility (RES). RES refers to the finding in which immediate testing of an event affects the accuracy of the memory of the event during a later testing period. Chan, Thomas, and Bulevich (2009) exemplified this finding through their experiment in which young adults watched an episode of the TV show "24" and then were given an immediate test of their memory. This test was followed by an audio summary of the episode that, unbeknownst to the participants, contained misleading details. An identical memory test to the first was then administered. The results of the final recall test were compared indicating that immediate testing of the participant's memory greatly increased the effect of misinformation relative to a control group who did not take an initial test. The same experiment was replicated with older adults in which it was found that older adults were just a likely to recall misinformation (Chan, Thomas, & Bulevich, 2009).

RES was further explored in a study by Gordon and Thomas (2014). In their study, the researchers explored the idea of memory interference by examining three groups of participants in three experiments. In the first experiment the researchers aimed to see if retrieval of critical details prior to misinformation is necessary for RES to occur. In addition to a typical single-test control group and identical-test experimental group, the experimenters included a related-test group in which the initial and final memory tests were similar but not identical. When both the identical-test and related-test groups were compared to the

single-test group, the former two were found to be more likely to offer misinformation in their answers. However, when comparing the results of the participants in the related-test group to the results of the participants in the identical-test group there was no difference. The related-test group and identical-test group were differentiated by the details changed in the questions. The related-test group questions contained details related to questions in the initial test, but which were not asked in the final test. For example, in the initial test, those in the related-test group were asked "How many joints did Teri find in Kimberly's room?", but in the final test they were asked "Where in Kimberly's room did Teri find the joints?" In this case there was reference to joints in both questions, however the location was not mentioned previously so a correct answer could not be chosen. In this study there was no difference found in correct responding between the related and single-test groups. However, both the related-test and identical-test groups were more likely to produce misinformation than those in the single-test group. These results suggest that RES does not necessarily constitute critical detail retrieval as the related-test group was not questioned about crucial detail manipulations in their second test (Gordon & Thomas, 2014).

Additionally, a second and third experiment were conducted to assess if testing prior to new learning facilitated posttest learning and if immediate testing would affect encoding by focusing attention to new information in a post event narrative. Overall these results showed that testing before the presentation of false memory lead to future false memory responses in the post-event test (Gordon & Thomas, 2014). In addition to exploring the role of critical details in RES, Thomas, Bulevich, and Chan (2010) investigated whether participant's confidence and/or warning of misinformation affected retrieval fluency. Retrieval fluency was defined as how easily an individual remembers information. In the study, participants watched an episode of the show *24* and then an-

swered questions about what occurred. However, in this study participants were also asked to indicate their level of confidence in their answers on a scale from 0% (guessing) to 100%. They then listened to an audio recording of what happened in the video, however half of the participants were warned about the lack of validity of the audio recording after listening while the other half were not warned. As a result, participants who were warned about the lack of truthfulness in the audio recording showed enhanced recall accuracy in both the single-test and repeated-test groups. This finding was further qualified in a second experiment in which response latencies were measured. Participants in the repeated-test condition who were warned about the level of truthfulness of the audio took longer to answer misleading questions and also indicated lower confidence levels of their answers. These results indicate that retrieval fluency, or how easily one remembers information, is impacted by warnings ahead of time. Individuals who are warned are more careful with their answer choices, but are also less confident in their choices because reliance on retrieval fluency is diminished (Thomas et al., 2010).

RES and its relationship with the role of attention has also been studied in recent years. According to Gordon, Thomas, and Bulevich (2015), participants who were assigned to a repeated-testing condition focused their attention to details within a post-event narrative that they felt might be pertinent to a final memory test. In the study, participants watched a video and then half of them were given an initial memory test. The remaining half were given a distractor task during this time before all the participants were ultimately given a narrative containing misleading details about what happened in the video. Participants in the repeated-test group spent a longer time reading consistent and misleading sentences, both types which were viewed as useful for answering later test questions. This was due to the sentiment that these sentences pertained to the questions they originally answered and would therefore subsequently

be pertinent to a final memory test. These results indicate that testing enhances one's susceptibility to misinformation by increasing one's attention to detail of post-event information (Gordon et al., 2015).

Misleading suggestions have also been explored as an influence on RES. After watching a video regarding a bank robbery, participants in an experiment by Lapaglia, Wilford, Rivvard, Chan and Fisher (2013) were then randomly assigned to either a distractor task, free recall test, or a cognitive interview to discuss what they remembered. A cognitive interview is an interview of a witness in which rapport is established, interruptions are diminished, and open communication is established. After random assignment, participants then listened to a narrative describing what occurred in the video. There were two versions of this narrative which varied in their mentioning of 12 crucial details. Either version had opposite six neutral versus six misleading items. These change in details was not made known to participants ahead of time to test for changes in memory recollection. Finally, they completed a final memory task containing half neutral and half misleading questions in order to test for suggestibility to the narrative. All three groups demonstrated susceptibility to the misinformation presented in the narrative, suggesting that misleading questions do affect one's memory of an event (Lapaglia, et al., 2013). More specifically, participants appear to be most affected by the presentation of misinformation in the form of peripheral details. In three experiments by Wilford, Chan, and Tuhn (2013), the influence of test format and detail centrality on RES was explored. The test formats varied in the sense that in one experiment both initial and final tests were cued recall, in another they were both free recall, and in the final one there was one of each. The results for all three experiments showed strong results for misinformation's effect on peripheral details, however central details are not necessarily immune as there was also a small effect for misinformation's effect on central de-

tails when the results of all three experiments were combined (Wilford, et al., 2013).

In summation, across 6 papers, RES has been demonstrated in multiple ways, ranging from an increase in misinformation recall of 20-50%. The effect is strongest in peripheral details but is weakest in critical detail retrieval. However, to date, these manipulations have focused on the characteristics of question type and attention, but not the quality of narrative, which is the focus of the present study.

3. RES and Authority

This idea of source misattribution, or confusion regarding the origins of post-event information (Loftus & Hoffman, 1989), and its effect on memory has some implications for the role of authority/expertise on one's memory. Various studies have explored the effect of group discussion of an event on an individual's memory. When participants discuss what they witnessed in a specific event they were more likely to record false information based on the confidence of the other person (Wright, Self, & Justice, 2000). This confidence is also related to the expertise of the other individual with those perceived as possessing higher expertise being more influential than those with perceived lower expertise. In a study by Williamson, Weber, and Robertson (2013) in which participants were seated with a confederate who either stated they were a) an ex-policeman (high expertise) or b) an ex-electrician (low expertise). Both the confederate and the participant would then watch a crime video clip and subsequently either take a memory test of the event or begin discussing together what they recalled. The confederate would always introduce misinformation which was later assessed for influence by a post discussion memory test. The results of this experiment included that participants changed their answers to the presented misinformation from the ex-police officer, suggesting that perceptions of expertise affects how information is processed or

used (just like with fluency, they may process it the same way but discount it or enhance its value depending on source). In this case, normative influence (changing one's behavior to appear more favorable) seemed to prevail over informational influence (seeking to remember what one saw), an occurrence also referred to as memory conformity (Williamson, Weber, and Robertson, 2013; Deutsch & Gerard, 1955). When two participants discuss their differing memories of a certain situation, the partner who is perceived to be more credible tends to influence the overall recollection of a memory (French, Garry, Mory, 2009). In our present study, we assessed how RES is affected by memory conformity. As in previous studies, participants watched a video of a crime, read a misleading narrative, and then had their memory tested. This time the narrative had an authority manipulation informing participants that it was written by a "high" or "average" scorer.

Assessing memory conformity's effect on RES has implications for the legal system in how to best interview witnesses to a crime. It has already been discovered that taking an initial recall test of an event can affect one's susceptibility to misinformation (Gordon & Thomas, 2014; Chan, Thomas, Bulevich, 2009). However, is this susceptibility further exacerbated by the influence of authority? If our results indicate that the narrative by the perceived level of higher authority resulted in more changes in answers than did the narrative by the lower level authority, this implies that eyewitness memory reports given are not always accurate. Participants might have trusted what was said by the higher level authority and second guessed their own recollection. A real world application of this would be if an eyewitness were asked misleading questions by a police officer or lawyer. The witness might be more likely to sway their answers to fit the expectations of the question posed by someone with a high level of perceived credibility (French, Garry, Mori, 2009). We hypothesize that participants given an initial recall test and presented with a misleading narrative by

the "high" scorer will result in more changes in answers on the post-narrative memory test. This would suggest that the participants were influenced the "high" scorers expertise on the test.

4. Method

4.1. Participants

Ninety nine students from Seton Hall University of at least 18 years of age and of either gender voluntarily signed up for the experiment using the Seton Hall Department of Psychology research pool. Participants were students enrolled in psychology courses on campus and were awarded participation credit for psychology courses.

4.2. Materials

Materials used for the study included a 22 minute long, silent, black and white movie clip from the film *Rififi* depicting a crime being committed. Participants then used a computer to take a memory test which we used with permission from Dr. Leamarie Gordon's dissertation on Retrieval and Attention. Questions in this memory test referred to specific details about what transpired in the video such as, "What color shoes does assailant D put on? What item does an assailant move off the piano? What draws the officer's attention to the alley?" These questions were counterbalanced via session number which were labelled 1-3 to control which questions would be consistent, control, or misleading in the memory test in order to eliminate the potential for certain questions becoming confounding variables. A misleading narrative describing what occurred in the video was presented to all participants regardless of their assigned condition. The changed details in this narrative were in reference to the questions asked in the memory test. Lastly, word searches were used as a distractor for participants who did not have an initial test to ensure that all participants spent an equal amount of time in the study.

4.3. Design

In order to assess authority's effect on Retrieval Enhanced Suggestibility, a 3 (authority condition: high, average, or none) x 2 (testing condition: initial test or no initial test) x 3 (sentence type: consistent, control, misleading) mixed design was conducted. In this experiment, the independent variables were the Level of Authority of the narrative (either "high" or "average" written narratives, or no reference to authority), whether or not participants took an initial recall test to assess their memory of the video (test or no test), and the sentence type of information in the narrative (consistent, control, and misleading). The dependent variable was the final test performance. Reaction time data when reading the passages was also analyzed.

4.4. Procedure

The entirety of the experiment lasted for roughly one hour. Before beginning the session, each participant was given a consent form that explained what would occur during the experiment, why it was being conducted, and the rights of the participant including their ability to leave at any time. Participants were instructed not to use their phones during the experiment in order to prevent distraction. All participants were randomly assigned to either take or not take an initial memory test followed by further random assignment of authority level and sentence type, the latter of which was randomly assigned via session number (1-3). A visual depiction of this experiment's procedure can be seen in Figure 1.

After the consent form was signed the experiment began with participants being shown a silent, black and white movie clip from the film *Rififi* depicting an ongoing crime, this video lasted roughly 22 minutes. After watching the video, participants were divided into groups: the Initial Test group and the No Initial Test group.

4.5. Initial test group.

The Initial Test group were administered an online questionnaire regarding their demographic information such as their age, grade level, gender, etc, as well as the initial memory test containing 24 questions assessing their retention of the information presented in the video. The questionnaire and initial memory test combined lasted roughly 7 minutes. All questions presented in the initial memory test were allotted 15 seconds each so that participants were unable to pass through the test too quickly or too slowly. This also ensured that all participants were given an equal amount of time to answer every question.

4.6. No initial test group.

Participants were given an online questionnaire regarding their demographic information alongside a distractor word-search task to account for the time the other group would spend on an initial test. Research assistants were instructed to return to the participant 7 minutes later so that all participants spent an equal amount of time before they completed the second and final memory test.

4.7. Misleading narrative presentation.

After completing the first memory test all participants were presented a misleading narrative explaining what transpired in the video that contained changed details. Which sentences were consistent, control or misleading within the narrative depended on the session number randomly assigned to the participant prior to commencement of the experiment. Additionally, prior to reading the narrative participants were given the option to choose a level of authority of its authorship by choosing "option 1" or "option 2", participants were then randomly assigned a narrative "written" by either someone who scored "high" or "average" respectively on the same memory test. In reality, all participants were presented the same misleading narrative. Participants in no author-

ity conditions were not given any information or choice in regards to authority level.

4.8. Final test.

The last portion of the experiment involved every participant taking a final memory test over what happened in the video. The test was the same for all participants and matched the initial test for those who had been administered one in phase 2. After the final test, participants in authority conditions were asked to recall the level of authority of the written narrative they were assigned. This was done to ensure that participants encoded this detail.

After completing the final memory test a debriefing slide explained to the participants the purpose of the experiment. The debriefing slide explained how the purpose of the experiment was to determine how authority influences retrieval enhanced suggestibility. It also indicated some potential real world applications such as the eyewitness interview process which is often repetitive. Participants were then granted the opportunity to ask any questions they might have about the experiment before leaving.

5. Results

All data were considered significant at a p value of $<.05$ unless specified.

5.1. Correct Responses during Final Test

Correct response rates were analyzed using a 3 (authority condition: high, average, or none) x 2 (testing condition: initial test or no initial test) x 3 (sentence type: consistent, control, misleading) mixed factor ANOVA using the proportion of correct responses as the DV. Means as a function of condition are presented in Table 1. (Tables appear at the end of the paper.) There was no main effect of authority, $F(2, 91) = 1.519$, $p<.224$. There was no main effect of testing condition, $F(1, 91) = 2.463$, $p<.120$. There was also no interaction
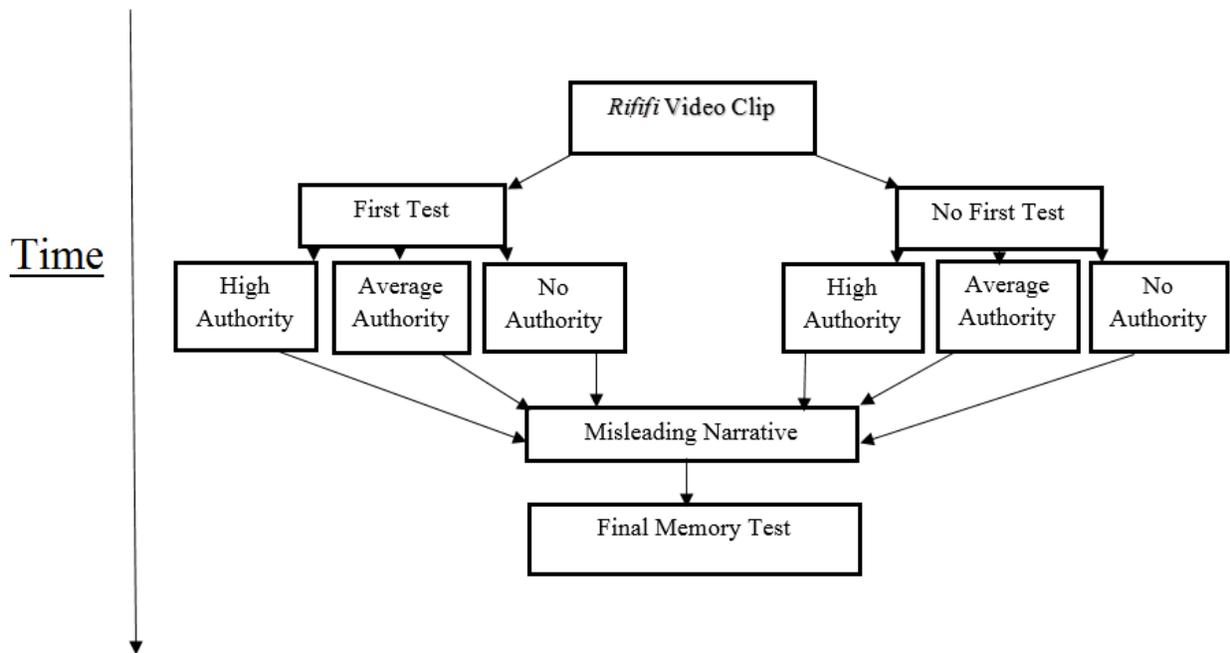
Figure 1. An illustration of the methods process for the experiment.

between sentence type and authority, $F(4,182) = .140, p<.967$. However, there was a main effect of sentence type $F(2,182) = 142.265, p<.001$. Pairwise comparisons indicated that the differences between sentence type were each significant. Consistent sentences resulted in the most correct answers ($M= .738$), followed by control sentences ($M= .378$), and finally misleading sentences ($M= .259$). Table 1 indicates the estimated marginal means for correct responses based on the three different conditions. The effect of sentence type was further qualified by an interaction between sentence type and testing condition, $F(2,182) = 4.989, p<.008$. Bonferroni comparisons specified that the reason for the interaction was equal accuracy for control and consistent sentences ($p>.622$), but the tested group was less accurate for misleading sentences ($p<.001$). There was no interaction between sentence type and authority condition or among sentence type, authority condition, and testing condition, F's <1.

5.2. Reporting of Misinformation during the Final Test

Misinformation recall rates were analyzed using a 2 (testing condition: initial test or no initial test) x 3 (authority: high, average, none) factor ANOVA. Figure 2 illustrates the mean percentage of correctly misled misleading answers. There was no main effect of authority condition, $F(2,96) = .356, p<.0702$ nor was there an interaction between authority condition and testing condition, $F(2,96) = .533, p<.589$. However, there was a main effect of testing, $F(1,96) = 21.259, p< .01$. Participants who were in the initial test group reported more misleading information ($M= .644$) than those who were not given an initial test ($M= .418$) (see Figure 2). This finding represents RES.

5.3. Response Times

In order to detect differences in reading the misleading narratives, response time data were an-
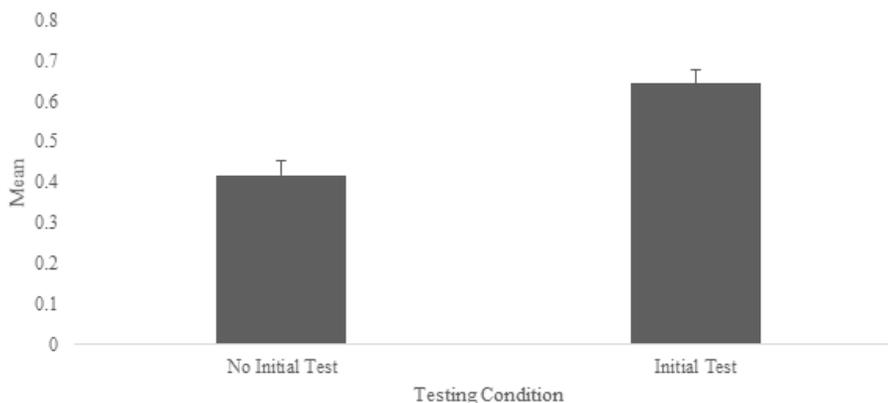
Figure 2. Proportion of misleading information reported as a function of testing condition. This demonstrates RES.

alyzed using a 3 (authority condition: high, average, or none) x 2 (testing condition: initial test or no initial test) x 3 (sentence type: consistent, control, misleading) mixed factor ANOVA. Table 2 indicates the mean reading times for sentences in misleading narrative (in milliseconds). There was no main effect of authority on response time, $F(2, 82) = .047$, $p < .955$. There was also no main effect of testing condition, $F(1, 82) = .072$, $p < .788$. Additionally, response times were not affected by an interaction between sentence type and authority, $F(4,164) = 1.034$, $p < .391$, or by a three way interaction of sentence, type, authority, and testing condition, $F(4,164) = .311$, $p < .870$. There was, however, a main effect of sentence type on response time, $F(2,164) = 6.715$, $p < .002$. Pairwise comparisons of the response times by sentence type indicate that control sentences ($M = 2557.279$) were read faster than consistent ($M = 2853.987$) or misleading ($M = 2870.434$) sentences (see Table 2).

6. Discussion

The present study hypothesized that high authority paired with an initial memory test would result in more misinformation reported on a final memory test. However, contrary to previous research which indicates that participants will change their answers on a memory test to match

those of someone they perceive to be more credible (Williamson et al., 2013; French et al, 2009), authority did not have an effect on memory performance. Rather, sentence type and testing condition affected the length of narrative reading time and how much misinformation was recalled.

The effect of sentence type is relevant to previous research indicating that how misinformation is presented affects memory recollection. According to Lee and Chen (2013), misinformation presented in an affirmative statement resulted in the more recalled misinformation, whereas misinformation presented in a question form did not produce the same effect. In the present study, misinformation was presented in a statement format in the form of a narrative. Therefore, it is not surprising that there was an increase in misinformation recalled. Of the three types of sentences, misleading sentences resulted in the least amount of correct answers. This is not surprising since previous research has indicated that misleading questions do affect one's memory of an event (Lapaglia et al., 2013). Additionally misleading sentences were misleading in regards to minor details that occurred in the video such as the color of an assailant's shoes. Peripheral details have been shown to be the most susceptible to the misinformation effect (Wilford et al., 2013), perhaps because participants might not focus too

much of their attention on them. In the present study, participants demonstrated an effect of misinformation based on whether or not they took an initial test and any misleading questions were regarding smaller details and not central plot points. Therefore, the results fall in line with previous research which indicates that participants who were placed in a related test group recalled an equivalent amount of misinformation as those in an identical test group, and more than those in a single test group (Gordon & Thomas, 2014). The effect of testing condition further supports previous research demonstrating the effect of RES. As has been explored in earlier studies, taking an initial memory test followed by the presentation of misinformation affects one's memory of the original event (Loftus et al., 1978; Chan et al., 2009; Gordon & Thomas, 2014). However, unlike in previous research where an RES effect has been paired with a change in response time, the results indicate that testing condition did not have an effect on response time. Regardless of testing condition, participants read misleading sentences as fast as consistent sentences, however both misleading and consistent sentences were read more slowly than control sentences. This differs from previous findings which suggest that test participants spend more time reading misleading sentences because they viewed these sentences as being pertinent to a later memory test (Gordon et al., 2015) and because attention was enhanced due to previous testing of one's memory (Loftus et al., 1989). A reason that control sentences were read faster than consistent or misleading sentences could be that control sentences contained less details than did consistent or misleading sentences. For example, the consistent sentence "To reveal the wooden floor beneath, the carpet is rolled back by three assailants", changes the word "three" to "some" in control form, and from "three" to "two" in misleading form. The neutral phrase "some" could have led participants to gloss over this statement and therefore read it quicker than consistent or misleading sentences which referred to a specific amount.

The impact of testing condition also supports the idea of source misattribution, a phenomenon that occurs when participants refer to referenced material as truth (Loftus & Hoffman, 1989). In this study, participants had access to post-event misinformation (the misleading narrative) and when asked questions in a final memory test, were unsure of where they recalled the correct information from (the *Rififi* video or misleading narrative). When they answered with the misinformation they are falsely attributing the source of the correct answer because they are referring to the misleading narrative. The results also suggest that participants remember things that were suggested to them as if they witnessed it for themselves, much like participants in Zaragoza and Lane's study where answering misleading questions led participants to believe they remembered seeing items they only read about (Zaragoza & Lane, 1994). In regards to source misattribution however, the results contradict previous studies which indicate that source-monitoring resulted in fewer memory errors (Lindsay & Johnson, 1989). In the present study, participants assigned an authority level were instructed to recall whether or not they were assigned a misleading narrative by either a "high" or "average" scorer *after* taking the final memory test. The accuracy on this question was very high with almost every participant correctly recalling what level of authority they were assigned. However, in spite of this accuracy, if participants were asked what level of authority they were assigned in *addition* to where they recalled their answers from (either the video or narrative) there may have been fewer memory errors.

While the results might support the idea of source misattribution, they contradict the idea of memory conformity. While previous studies have indicated that participants are likely to change their answers to match another's if that other person is perceived as more confident or knowledgeable (Wright et al., 2000; Williamson et al., 2013), the results indicate that the authority of

the misleading narrative did not have an effect on memory performance. Regardless of the authority level of the narrative assigned to participants, they were not more or less likely to report misinformation. This illustrates a limitation in our study: how the authority manipulation was presented. Perhaps our goal of assessing how authority affected memory recollection was too obvious to participants? Previous researched has described the effect of normative influence (changing one's behavior to appear more favorable) on memory recollection (Williamson et al, 2013; Deutsch & Gerard, 1955). In the present study participants did not feel a need to change their behavior to match another's since they received credit for participating in the study regardless and were not face to face with another person. Perhaps if a similar study were conducted in a non-isolated environment, participants would feel more influenced authority and therefore more compelled to change their answers.

Although the results both follow and contradict previous research, there are a few potential applications to consider. Firstly, going off these results it appears that authority is not influential in regards to testing. Therefore, if a student were to refer to a fellow classmate's notes, their memory would not appear to be affected by the class standing of that other student. Meaning, if they referred to the notes of an A student or C student, their memory recollection would not significantly different. However, because there was an effect of testing condition, if the same student tested themselves on information and then referred to another person's misleading notes, the student's memory on a later memory test would be affected. In this case it appears that the effect of testing oneself on information before a final test is dependent on the feedback and validity of the information studied which is this case is exemplified via the misleading narrative.

Future studies should consider other ways of manipulating authority that might have more of an impact. For example, previously mentioned studies manipulated authority by having the person with a perceived higher level of credibility be in the room with the participant (William et al., 2013). Therefore, if this study were to be replicated perhaps participants should be placed in a room with a confederate whom they are told scored a certain way to discuss what they remember. Authority can also be manipulated have someone administer the test questions to participants. For example, it would be interesting to see how participants would respond to questions when a teacher versus a fellow student asked misleading questions about what they viewed.

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Authority Condition	Testing Condition	Sentence Type	Mean	Std. Error
No Authority	No Initial Test	Consistent	.703	.056
		Control	.383	.055
		Misleading	.359	.051
	Initial Test	Consistent	.779	.055
		Control	.375	.054
		Misleading	.191	.049
High	No Initial Test	Consistent	.772	.055
		Control	.426	.054
		Misleading	.412	.049
	Initial Test	Consistent	.778	.053
		Control	.361	.052
		Misleading	.160	.048
Average	No Initial Test	Consistent	.705	.060
		Control	.330	.059
		Misleading	.232	.054
	Initial Test	Consistent	.692	.058
		Control	.392	.057
		Misleading	.200	.052

Table 1. Proportion of correct responses as a function of condition.

Authority Condition	Testing Condition	Sentence Type	Mean	Std. Error
No Authority	No Initial Test	Consistent	3030.533	342.084
		Control	2647.533	296.825
		Misleading	2878.033	333.143
	Initial Test	Consistent	2967.906	331.222
		Control	2407.281	287.400
		Misleading	2912.969	322.565
High	No Initial Test	Consistent	2972.433	342.084
		Control	2667.333	296.825
		Misleading	3187.733	333.143
	Initial Test	Consistent	2716.214	354.091
		Control	2306.929	307.243
		Misleading	2696.464	344.836
Average	No Initial Test	Consistent	2287.000	367.457
		Control	2421.962	318.841
		Misleading	2456.269	357.853
	Initial Test	Consistent	3149.833	342.084
		Control	2892.633	296.825
		Misleading	3091.133	333.143

Table 2. Mean Reading Times for Sentences in Misleading Narrative (in milliseconds).