Simultaneous Misinformation Effect on Eyewitness Memory

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This study examined the effects of simultaneous misinformation on eyewitness memory. Two hundred forty five college students participated. In one condition (Simultaneous condition), participants viewed a video of a simulated crime simultaneously presented with accurate, misinforming, or neutral audio narrations. In the other condition (Post-event condition), participants read accurate, misinforming, or or neutral narratives after viewing the video. One week later, participants had a recognition memory test. The results showed memory about misinforming information was significantly less accurate and less confident than the accurate or neutral information categories, for both conditions. Overall memory accuracy and confidence rate were lower for the simultaneous condition than the post-event condition, although the accuracy for the misinforming information were not different between two conditions. There was no difference on memory accuracy between perpetrator related and environment related items. The results indicated the negative effect of simultaneous misinformation on eyewitness memory when there were changes of timing, modality, and attention about the misinformation from the previous post-event misinformation research.

Key words : Eyewitness memory, Misinformation effect, False memory, Source misattribution

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Memories of events can be distorted by many different factors, even to the point that the source of the memory is confused or the memory is misattributed to a different time or place. In recent years, eyewitness memory related research has become noticeably applicable to the judicial system. It has been shown that officials in the judicial system place too much weight on eyewitness confidence and often cannot tell the difference between an inaccurate and accurate eyewitness. Faulty eyewitness testimony is believed to be a major cause of wrongful conviction at least in the United States of America (Loftus, 2003; Costanzo & Krauss, 2012). Due to the important applications of the fallibility of memory, a large quantity of research and experimentation has been done in this area. One of the main questions often seen here relates to the effect (or lack thereof) that post-event information can have upon the original memory of an event. Often referred to as the "misinformation effect," research on this phenomenon has been conducted primarily by Elizabeth Loftus and colleagues.

The original test procedure for presenting misleading information about an event was first used by Loftus, Miller, & Burns (1978) in which slides of a specific event were shown to the participants. After looking at the slide, participants were given different narratives about the event they have just witnessed. The test condition was given a narrative with misleading information regarding a particular detail, but the control condition did not have this misleading information. Usually, the control group was found to perform better on the memory test for the detail specified than the group given misleading information (Loftus, Miller, & Burns, 1978; as cited in McCloskey & Zaragoza, 1985).

This misinformation effect has been extensively studied and shed light on understanding the effects of post-event misleading information on eyewitness memory (see Loftus, 2005; Laney, Morris, Bernstein, Wakefield, & Loftus, 2008), and other research on creation of false memory and planting inaccurate memory on sexual abuse and other crime cases (see Costanzo & Krauss, 2012; Ceci, Kulkofsky, Klemfuss, Sweeney, & Bruck, 2007).

However, there have not been many studies about the effect of timing when the misinformation is provided. Most of the studies were about the post-event misinformation effect where the misinformation was given after the crime scene. Eakin, Schreiber, and Sergent-Marshall (2003) compared the effect of misinformation presented before and after a witnessed event. They then tested the degree of memory retrieval blocking that occurred. It was found that the retrieval blocking occurred when the misinformation was presented either before or after the event, and that it still occurred when warnings were given about the

misinformation.

In everyday situation, there are many cases that wrongful, verbal information is provided at the same time as the visual information is presented, such as when inaccurate verbal information is announced while the visual scene of an accident is broadcasted. It is possible that the misinformation affects negatively on eyewitness memory not only as a post event, but as a simultaneous event. Simultaneous misinformation may have more adverse effect because it could affect not only storage and retrieval of the memory, but encoding of the memory of the original information. When the original memory is not clear from the beginning, it is also easier to replace the original memory with the misleading information presented at the same time. This is especially the case with lack of the time difference cues.

If misinformation is presented simultaneously, it is usually with a different modality from the original information, such as visual information with auditory misinformation or auditory information with visual misinformation. With simultaneous misinformation, attention is divided into information with two different modalities, and therefore less attention is paid to the one that will be asked to remember. This accordingly may lead to less accuracy of memory and stronger misinformation effect with simultaneous misinformation.

In this study, it is hypothesized that when participants receive misinformation simultaneously with the original information, they will incorporate this misinformation directly into their original memory for the event, and thus score lower on memory tests for these events than on those questions in which no misinformation, or only neutral information is given. It is also hypothesized that the misinformation effect is stronger for the simultaneous condition than the post-event condition.

Methods

Participants

A total of 245 participants aged 18-22 years old college students (102 male and 143 female) participated. They are undergraduate students from a liberal art, private university in southern California. Participants fulfilled course requirements for General and Developmental Psychology by participating in this study.

Procedure

Four simulated crime videos were used as stimuli. The videos were about a male or female perpetrator breaking into an apartment and stealing different items. Both male and female perpetrators were used in the video to see if there was an own gender effect (OGE) which indicated a higher memory accuracy with the matching gender between perpetrator and

witness. The audio narration was later added to the video in the form of an accurate, neutral, and misinforming narrative of the event. A written narrative of the event was prepared using the same script as the simultaneous audio condition. The audio/narrative included several misinforming statements involving the perpetrator and/or the environment of the event.

All 4 videos were identical except that two were with a male and the other two were with a female perpetrator, and misinforming and accurate items in the videos were counterbalanced between two videos with two narratives for the same gender perpetrator.

A frame of the video used in the experiment is in Figure 1, and a part of the narration is "….Walking by a plant, the perpetrator, already wearing a headband and hand protection, stops and notices another item of clothing … The perpetrator has now moved to the bedroom. The perpetrator grabs drumsticks out of a cup next to an iPod on the dresser." In this example of video 1, the narration of "iPod" was accurate, "drumsticks" were misinforming, and "hand protection" was neutral. In the second video with the same perpetrator, "iPod" was misinforming ("cell phone" was accurate), "drumsticks" were accurate, and "hand protection" was neutral. The purpose of the counterbalance was to control familiarity or schema effect of the items in the video on memory. Neutral information was in a general term and this category was to measure baseline memory accuracy that could be compared with other two categories.

A summary of the design is in Table 1. Participants were divided into two groups of simultaneous condition and post-event condition, and for each condition, participants were divided into 8 groups with 4 videos and 2 narratives. Gender, video and timing (simultaneous vs. post-event conditions) factors were in a

Figure 1. A frame of the video used in the experiment

Table 1. A summary of design in 4 video x 2 narrative Post-event condition: an example of items used in the video such as iPod and cell phone were listed (the same design was used for the simultaneous condition.)

Video 1 (iPod) Female perpetrator	Narrative 1 (iPod: accurate)
	Narrative 2 (cell phone: misinforming)
Video 2 (cell phone) Female perpetrator	Narrative 1 (iPod: misinforming)
	Narrative 2 (cell phone: accurate)
Video 3 (iPod) Male perpetrator	Narrative 1 (iPod: accurate)
	Narrative 2 (cell phone: misinforming)
Video 4 (cell phone) Male perpetrator	Narrative 1 (iPod: misinforming)
	Narrative 2 (cell phone: accurate)

between-subjects design, and type of information (accurate, misinforming, and neutral categories) factor was in a within-subjects design.

Participants in the simultaneous condition watched the video while simultaneously listening to an audio with some information about the perpetrator, items in the environment, and the perpetrator interacting with items in the environment. Participants in the post-event condition watched the muted video and they immediately were given a narrative that had the same information as in the simultaneous condition.

Upon returning one week later, participants were given an unexpected recognition memory test, with instructions to ask participants to base their answers to the questions only on what they had seen in the video. Questionnaire included 18 multiple choice questions: 6 questions about accurate information, 6 about misinforming information, and 6 about neutral information. For example, for video 1, about accurate information, "In the bedroom scene, what was next to the cup?" with the following three options: (a) cell phone, (b) iPod, and (c) digital camera. About misinforming information, "In the bedroom scene, what was in the cup on the dresser?" was asked with options of (a) markers, (b) drumsticks, and (c) spoons. About neutral information, "What did the perpetrator wear on his hands?" was asked with the options of (a) latex gloves, (b) mittens, and (c) leather gloves.

For each question, confidence about how sure the participant was about his/her answer was asked in a Likert scale of 1 - 7 (1: not sure at all to 7: absolutely sure). Six demographic questions such as gender, age, and learning style were asked the last.

Results

Results showed that there was a significant difference in the percentage of correct and incorrect responses among the three types of narration (accurate, misinformation, neutral), χ^2 (2, N=4410)=79.89, p<.001, Cramer's V=.135. Significantly more correct responses were reported for questions with accurate narration (87.94%) than for either questions with misinformation (74.62%) or questions with neutral information (75.61%). (Figure2)

The first hypothesis about the misinformation was supported. For those in the simultaneous audio condition, there was a significant difference in the number of correct responses given among the different types of questions regarding the information (accurate, misinforming, and neutral),

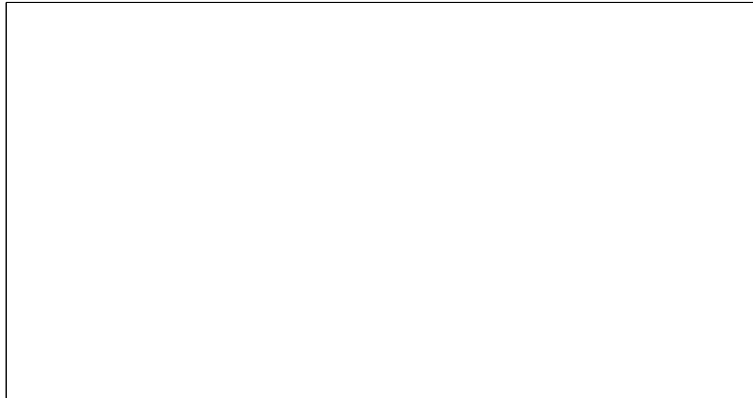Figure 2. Percentage of correct/incorrect answers for three types of information in the questionnaire

Figure 3. Percentage of correct response for simultaneous and post-event conditions

χ^2(2, N=2178)=36.96, p<.001, V=.13. More correct responses were given for accurate information, than for misinforming information. The same result was found in the post-event condition, χ^2(2, N=2231)=54.10, p<.001, V=.16. (Figure3)

The second hypothesis about the stronger negative effect in the simultaneous condition than the post event condition was supported for the accurate and neutral categories, but not for the misinforming category. The percentage of correct responses for participants in the post-event condition (M=82.17, SD=10.10) was higher than those in the simultaneous condition (M=74.86, SD=13.53), F(1,243)=22.86, p< .001, h^2=.086. The percentage of incorrect answer in accurate category and the percentage of incorrect answer in neutral category were higher in the simultaneous condition than post-event condition, F(1,243)=22.81, p<.001, h^2=.086 and F(1,243) =6.47, p<.001, h^2=.026,

respectively. However, the percentage of incorrect responses in misinforming category (selection of the misinformed item) was not different between two conditions, F(1,243)=.124, p=.725, h^2= .001. (Figure 4)

Levels of confidence in answers chosen were also measured. Participants from the simultaneous condition (M=5.23, SD=2.01) were less confident in general, than those from the post-event condition (M=5.86, SD=1.73), Z=-9.94, p<.001. Higher level of confidence was reported for correct responses (M=5.94,SD=1.66) than for incorrect responses (M=4.08, SD=2.03), Z=-26.09, p<.001. There was also a significant difference in the level of confidence among three categories of answer for the accurate information (M=5.98, SD=1.67), misinforming information (M=5.54, SD=1.80), and the neutral information (M=5.08, SD= 2.05), F(2,4380)=84.37, p<.001, h^2=.037. (Figure 5)

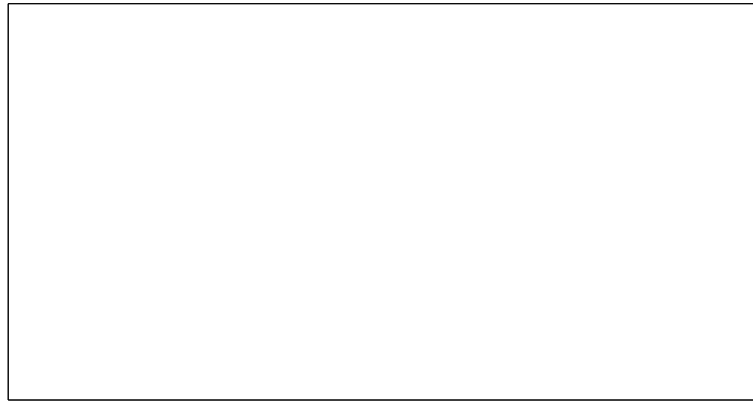Figure 4. Percentage of correct/incorrect responses in simultaneous and post-event conditions

Figure 5. Confidence rating for different conditions and responses
(1: not sure at all – 7: absolutely sure).

Gender difference was found: Female participants (M=80.42, SD=12.24) were more accurate than male participants (M=75.93, SD=12.29), F(1,243)=10.57, p=.001, h^2=.042. There was no own gender effect found, F(1,243)=.743, ns. There was no difference between perpetrator related memory and environment related memory for both conditions, χ^2(2,N=2940)=2.79, p=.095, V=.031.

Discussion

The purpose of this study was to determine if original information and misinformation can be distinguished from one other, if they have been presented simultaneously. If this distinction could occur, then it would be expected that participants would report an equal number of correct answers for questions on a memory test that had originally incorporated misinformation as those questions that had only accurate information from the simulated crime. If, however, this distinction could not occur, then it would be expected that participants would report more correct answers for the accurate information questions, than for the misinforming information questions. The results of this study indicate that, in support of our hypothesis, this distinction between original information and misinformation is quite difficult. Participants reported a greater number of correct answers for questions in which they only received accurate information (either in the audio or written narrative format), than questions in which they were misinformed or only provided with neutral information. Misinformation effect was reported in both post-event narrative condition and simultaneous condition.

A second purpose of the present study was to compare the memory scores for participants in the simultaneous condition and the post-event

condition. It was hypothesized that those in the simultaneous condition would report lower memory scores since the misinformation would truly be presented simultaneously with the original information, rather than immediately afterwards (as in the written narrative condition). Simultaneous condition showed lower accuracy than post-event narrative condition in all categories except misinformation narration category, which showed no difference between two conditions. And the participants from the post-event condition were more confident on their answers than in the simultaneous condition.

When the misinformation was given simultaneously and in an audio form, it had more negative effect on the memory of original information than when the information was given afterwards and in a narrative form at least in the neutral and accurate information categories. Simultaneous misinformation could have affected encoding as well as storage and retrieval of the memory, and it could have affected more adversely on the source attribution. Source misattribution which is the confusion about the source (i.e. whether particular information is originally heard or visually perceived) could have led to more inaccurate memory of the original information more in the simultaneous condition. Overall less confidence in the simultaneous condition also supports this negative effect of misinformation more in the simultaneous condition than in the post-event condition.

However, when the information is misleading (where the crucial misinformation effect has been demonstrated), the negative effect in the simultaneous condition is not different from the post-event condition. This similarity could have been due to the overriding effect of attention with audio stimuli applied simultaneously to the video stimuli. For example, if participants heard "cell phone," when they saw an iPod, that audio stimuli of "cell phone" could have played a role as a warning and made them pay more attention to the stimuli. Nonetheless, the result showed simultaneous misinformation effect is as strong as the post-event misinformation effect, and demonstrated the negative effect of simultaneous misinformation on eyewitness memory when there were changes of timing, modality, and attention about the misinformation from the previous post-event misinformation research.

As in the original study by Loftus, Miller, & Burns (1978), some misinformation was obviously still being either incorporated into the original memory, or not distinguishable from the original memory, since participants from the written narrative condition reported a greater number of incorrect answers for the misinformation questions, than for the accurate information questions for both conditions. When added to the growing body of literature in the field of eyewitness memory and misinformation (Costanzo & Krauss, 2012), this study helped to control for between-subjects error by using within

-subjects design, providing all participants with misinformation and accurate information. Although this study was limited to a group of college student participants, this age group is believed to be representing young adult population. Further studies with different age ranges and diverse SES backgrounds are to be explored. Gender difference found in this study was similar to other research results that showed women were superior for recognizing certain part of appearances to men (see Horgan, Mast, Hall, & Carter, 2004). In conclusion, the results of this study are promising, but suggest that much more research is still needed in this area. Further studies are to be conducted to single out possible overlapped effects of timing, modality and attention on misinformation and memory. This area of research is of great importance due to its high applicability to the reliability of eyewitnesses, as well as officials in the judicial systems.

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동시 오류 정보가 증인 기억에 미치는 효과

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본 논문은 증인기억에 동시적으로 주어지는 오류정보가 미치는 영향에 관하여 오류정보가 주어지는 시간과 감각 형식의 변화와 함께 연구하였다. 총 245명의 대학생을 대상으로 하였으며 다음의 두 조건을 비교하였다. 한 조건은 범죄가 행해지는 video를 바른 구체적 정보, 오류정보, 중립적 정보를 청각적으로 동시에 들으면서 보는 "동시조건"이고, 다른 조건은, 같은 video를 소리정보 없이 본 후에 동시 조건과 같은 바른 구체적 정보, 오류정보, 중립적 정보가 들어있는 글을 읽는 "사건 후 조건" 이다. 결과에서 두 조건 다 오류정보를 받았을 때 바른 정보 때보다 기억이 정확하지 않으며 자신의 답에 대한 신뢰도가 떨어짐을 밝혔다. 또 동시조건에 있어 바른 정보와 중립정보의 경우 기억의 정확도와 신뢰도가 사건후 조건보다 떨어지지만 오류정보의 경우에는 두 조건에 차이가 없음을 밝혀, 종전 몇 십년간의 연구에서 보여준 사건 후 오류정보가 증인 기억에 미치는 부정적 효과(Post event misinformation effect)가 시간과 감각 형식, 또 주의집중의 변화가 반영된 동시조건에서도 부정적 효과로 나타남을 밝혔다.

주요어 : 증인 기억, 오류정보 효과, 허위 기억, 근원 귀인