The Counterintuitive Relationship between Conceptual and Perceptual Similarities and Eyewitness Suggestibility

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Summary: The tendency to confuse witnessed and suggested information can result in inaccurate eyewitness testimonies and convictions of innocent people. Studies that tested how similarities between witnessed and suggested information affect the tendency to confuse them reached inconsistent results. Here, we claim that there is a more complex and not necessarily linear relationship between similarity and memory distortions. Participants (164) viewed two subsequent stories, which varied in the conceptual and perceptual similarities between them. We found a significant interaction between conceptual and perceptual similarities. When we presented two conceptually different stories, perceptual similarity increased the suggestibility effect compared with perceptual dissimilarity. Conversely, when we presented two conceptually similar stories, perceptual similarity decreased suggestibility compared with perceptual dissimilarity. Accordingly, we suggest that similarity between two events may increase the suggestibility effect. However, counter-intuitively, once similarity reaches a certain threshold, the coherence level between the events reduces the tendency to confuse them. Copyright © 2014 John Wiley & Sons, Ltd.

INTRODUCTION

Eyewitness testimony has a powerful effect on legal decisions. However, numerous studies have shown that it can be inaccurate and lead to wrongful convictions of innocent people (refer to Cutler & Penrod, 1995; Wells & Olson, 2003 for reviews). One reason for inaccurate testimonies is eyewitness suggestibility, which occurs when suggested information is remembered as part of a witnessed event (e.g., Loftus, 1979; Loftus, Miller, & Burns, 1978; for reviews, refer to Loftus, 2003; Zaragoza, Belli, & Payment, 2007). Over the years, a large body of research has examined how similarities between a witnessed event and subsequent suggested information affect memory. Intuitively, it seems like there is a linear relationship between the level of similarity and the suggestibility effect; thus, the more similarity between two events, the greater the tendency to confuse them. However, studies in this field revealed inconsistent results. While several studies reported that memory distortions are more probable when the witnessed and suggested information shares conceptual, perceptual, or temporal features (e.g., Abeles & Morton, 1999; Allen & Lindsay, 1998; Lindsay, 1990; Roebers & McConkey, 2003), other studies failed to find similar effects (e.g., Bonto & Payne, 1991; Shaw, García, & Robles, 1997). One way to explain these contradicting results is because of a more complex and not necessarily linear relationship between similarity and memory distortions in conditions of eyewitness testimony. In the present study, we aim to better understand the nature of this complex relationship, by systematically exploring the unique and interactive effects of conceptual and perceptual similarities on memory distortions.

Two studies that examined this question directly reached surprising results. A study by Mitchell and Zaragoza (2001) tested whether overlap between witnessed and suggested information as manipulated by using conceptual and perceptual similarities increases the tendency to confuse them. All participants witnessed the same event and later received suggested information with various levels of overlap. In the high-overlap condition, the suggested information provided a detailed and coherent retelling of the witnessed event and was presented in chronological order. In the low-overlap condition, most of the original details were deleted from the suggested information and the temporal cues of the narrative were presented in a random order. This condition reduced the cohesiveness of the story line and significantly compromised the structure of the witnessed event. Surprisingly, participants in the high, but not low, overlap condition were less likely to misattribute suggested items to the witnessed event. Thus, high overlap between witnessed and suggested information resulted in a better discrimination compared with low overlap. Lindsay, Allen, Chan, and Dahl (2004) reported similar results, showing that participants were less likely to confuse two similar events (museum/palace burglary) when they were part of the same experiment and presented consecutively in the same room by the same experimenter. However, when the two events were part of different experiments, presented within a 48-hour interval, and conducted in different rooms by different experimenters, they were more likely to confuse them.

These findings support our claim regarding a complex relationship between conceptual and perceptual similarities and memory distortions in eyewitness testimony conditions. It shows that counter-intuitively, in some conditions, high conceptual and perceptual similarities between witnessed and suggested information improve memory performance. However, it is difficult to reach sound conclusions because like other studies in the field, these two studies attempted to maximize the discriminability between the witnessed and suggested events. Therefore, they manipulated several similarity dimensions simultaneously including perceptual, environmental, temporal, and conceptual features. In this case, it is hard to isolate the effect of each dimension or to determine what critical causal factors educe memory improvement.

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In order to allow such examination in the present study, we manipulated only a *single* conceptual variable and a *single* perceptual variable in a 2 conceptual similarity (different *versus* the same stories) × 2 perceptual similarity (different *versus* the same formats) factorial design. Because of a non-linear relationship between similarities and memory distortions, we predict no significant main effects of conceptual or perceptual similarities. However, we expect to find a significant interaction between the variables indicating that while on some level, the similarity between the witnessed and suggested events may increase the suggestibility effect, once it reaches a certain threshold, the coherence level may improve memory performance.

METHODS AND MATERIALS

Participants and design

We tested 166 participants; two of them were excluded because of erroneous use of the keyboard during the test. The remaining 164 (85 women and 79 men) were undergraduate students (*M* age = 24.21 years old, range 18–32), who volunteered to participate in the study without compensation. Participants were randomly assigned to one of four experimental conditions: (i) different stories–different formats; (ii) different stories–same format; (iii) same story–different formats; and (iv) same story–same format.

The eyewitness suggestibility task

The basic task design is similar to other highly validated tasks in the field (McCloskey & Zaragoza, 1985; Pezdek & Greene, 1993). In the task, participants view two sets of 79 slides in a sequence. Each set tells a story. Each story contains 15 critical items (e.g., shape of a key chain, type of jacket, and kind of writing instrument). These items appear in different forms across the stories (e.g. in one story, participants can see a key chain in a form of a fish and in the other, in a form of a heart). In the current study, we manipulated the conceptual and perceptual similarities between the two stories (Figure 1). *The conceptual similarity* was manipulated by using two different stories: (i) a house story and (ii) an office story. The house story described a woman who arrives at home and performs routine activities such as reading, watching TV, and preparing dinner. The office story described a different woman, who is involved in a variety of activities in the office such as talking on the phone, operating a computer and conducting meetings. Participants in the same-story condition viewed the same story twice (either the house story or the office story) each time with 15 different critical items. Participants in the different story condition viewed one story (e.g. the house story) and then the other story (e.g. the office story) each time with 15 different critical items. *The perceptual similarity* was manipulated by using two formats of presentation: pictures and words. Pictures and words corresponded. In a preliminary study, 10 participants were asked to describe in one sentence each of the pictures in the study. Two graduate students selected together one suggested sentence for each picture that best

describes it. The selected sentence had to reflect the same idea as most of the suggested sentences. We used simple and clear pictures that can be easily described, and hence, in most cases, the vast majority of the suggested sentences were very similar, and the decision was easy and based on minor grammatical considerations. Each sentence was 8–12 words in length and could contain up to one critical item. Participants in the same-format condition viewed the two stories in the same format (both presented in either pictures or words). Participants in the different format condition viewed the first story in one format (e.g. pictures) and the other story in a different format (e.g. words). In order to control for possible differences in learning of pictures *versus* words, we counterbalanced the learning format of the first witnessed story in each of the four experimental conditions. Therefore, regardless of the perceptual manipulation, half of the participants in each experimental condition learned the witnessed story as pictures and half of the participants learned the witnessed story as words (i.e. in the same-format condition, half of the participants learned the two stories in pictures, and half of the participants learned the two stories in words. In the different format condition, half of the participants learned the first story in pictures and the second story in words and the remaining learned the first story in words and the second story in pictures). After participants viewed the witnessed and suggested stories, we conducted a recognition memory test for the 15 critical items that were presented at the first witnessed story (Figure 1). Participants received 15 three-alternative forced choice questions. In each question, three forms of a critical item were presented: the witnessed item (e.g. the fish-shaped key chain), the suggested item (e.g. the heart-shaped keychain), and a new non-critical lure, which served as a control item (e.g. the hand-shaped keychain). Participants had to choose the item that was presented as part of the first witnessed story. The correct answers were rotated through locations on an item-by-item basis. In order to minimize possible effects of testing format, participants were randomly assigned to either picture or word testing formats. Hence, around half of the participants in each one of the experimental conditions viewed the questions in pictures, and the rest of the participants viewed it in words.

Procedure

Participants were tested individually in the presence of an experimenter. They were given the following written instructions on-screen: 'In this study, we compare memory for words and pictures. You will view two different stories. Please pay close attention to these stories.' Story titles 'House/Office Story' together with the number 1 or 2 (according to the sequence of the stories) were presented on a separate screen for 6 seconds and were followed by 79 story slides. The slides in each story were presented serially for 3 seconds each in a 7 × 6.5-cm box, using SuperLab (Cedrus, San Pedro, CA, USA). After viewing the witnessed and suggested stories, participants were given a short filler task in which they had to count down from 100 to 0 by threes. This was followed by a recognition memory test. The following instructions were given (bold and underlined

TARGET INFORMATION- home story presented as pictures

CRITICAL ITEM (1 of 15)- type of jacket

SUGGESTED INFORMATION- Presentation according to the four experimental conditions:

Option 1- conceptual and perceptual similarities (same story- same format)

Option 2- conceptual dissimilarity and perceptual similarity (different stories- same format)

Option 3- conceptual similarity and perceptual dissimilarity (same story- different formats)
"The woman was wearing a jeans jacket when she left the house"

Option 4- perceptual and conceptual dissimilarity (different stories- different formats)
"There was a jeans jacket hanging on the wall"

Figure 1. Example of the conceptual and perceptual similarity manipulations

words as presented to the participants): 'Now you are going to be tested on the **first** (house/office—according to the different conditions) story **only**. You will see three items at a time. Only **one** of them was presented as part of the first story. You have to decide whether the item shown in the first story now appears on the left-hand side, the middle or the right-hand side of the screen, by using the keys indicated on the keyboard.' The experimenter ascertained that participants understood the instructions before they started the test. After completing the test, participants were debriefed. This testing method enabled participants to make a relative recognition judgment by comparing witnessed, suggested and new non-critical lures. The new non-critical lures served as a baseline for memory performance because choosing it over the two presented items implies a general memory problem rather than confusion of the two stories (for a similar method, refer to Levy-Gigi & Vakil, 2010, 2012).

RESULTS

Learning and testing format

We conducted a preliminary $2 \times 2 \times 2$ ANOVA to detect possible effects of learning format. Learning format (first story was learned as pictures *versus* words), conceptual similarity (different *versus* same story) and perceptual similarity (different *versus* same format) served as the independent variables, and false alarm rates served as the dependent variable. There was a significant main effect of learning format ($F(1,156) = 4.29$, $p < .05$, $\eta_p^2 = 0.03$), indicating that participants made significantly less mistakes when the witnessed story was presented as pictures than as words. These results are aligned with previous findings in the literature showing that pictures are better remembered than words (Levy-Gigi & Vakil, 2012; Nelson, Reed, & Walling, 1976;

Paivio, 1971, 1986). However, further analysis revealed no significant interactions between learning format and other variables ($Fs < 1.5$).

In order to detect possible effects of testing format, we conducted a 2×4 ANOVA with testing modality (pictures *versus* words) and experimental condition (different stories–different formats, different stories–same format, same story–different formats and same story–same format) as the independent variables and percentage of false alarms as the dependent variable. The results revealed neither a significant main effect of testing format ($F(1,156) = 0.24$, $p = .63$) nor an interaction between testing format and experimental group ($F(3,156) = 0.84$, $p = .47$). Therefore, in order to simplify our report, we collapsed the two learning format conditions and the two testing format conditions.

Baseline memory performance

In order to test differences in baseline memory performance, we conducted a 2×2 ANOVA with conceptual similarity (different *versus* the same story) and perceptual similarity (different *versus* the same format) as the independent variables and the percentage of non-critical lures errors as the dependent variable. The results revealed no significant main effects ($F(1,160) = 0.49$, $p = .48$; $F(1,160) = 0.09$, $p = .76$, for conceptual and perceptual similarities respectively) or interaction between conceptual and perceptual similarities ($F(1,160) = 0.004$, $p = .95$). Specifically, the percentage of non-critical lures errors did not differ across the four experimental groups [different stories–different formats ($M = 14.6$; $SD = 9.9$), different stories–same format ($M = 15.09$; $SD = 7.06$), same story–different formats ($M = 13.73$; $SD = 9.94$) and same story–same format ($M = 14.06$; $SD = 7.37$)]. These results indicate no differences in baseline memory performance. Because we used a forced-choice recognition test, these results suggest a negative correlation between false alarms in which participants chose the suggested items and hit rates; thus, conditions with higher false alarm rates have lower hit rates and *vice versa*. Therefore, in our analyses, we solely used false alarms as our dependent variable.

False alarm rates

In order to test the effect of conceptual and perceptual similarities on the tendency to confuse the witnessed and suggested information, we conducted a 2×2 ANOVA with conceptual similarity (different *versus* the same story) and perceptual similarity (different *versus* the same format) as the independent variables and false alarm rates as the dependent variable. The results are presented in Figure 2. There were no significant main effects of either conceptual similarity or perceptual similarity ($F(1,160) = 1.74$, $p = .19$; $F(1,160) = 0.03$, $p = .86$ respectively). However, a significant two-way interaction of conceptual similarity and perceptual similarity was found ($F(1,160) = 9.98$, $p < .003$, $\eta_{p}^{2} = 0.06$). Similar results obtained when we used d' measure [Z(hits) $- Z$ (total false alarms)] as the dependent variable ($F(1,160) = 2.18$, $p = .14$; $F(1,160) = 0.006$, $p = .94$; $F(1,160) = 9.26$, $p < .004$, $\eta_{p}^{2} = 0.06$ for the main effects and interaction respectively). Follow-up analyses revealed a significant effect of perceptual
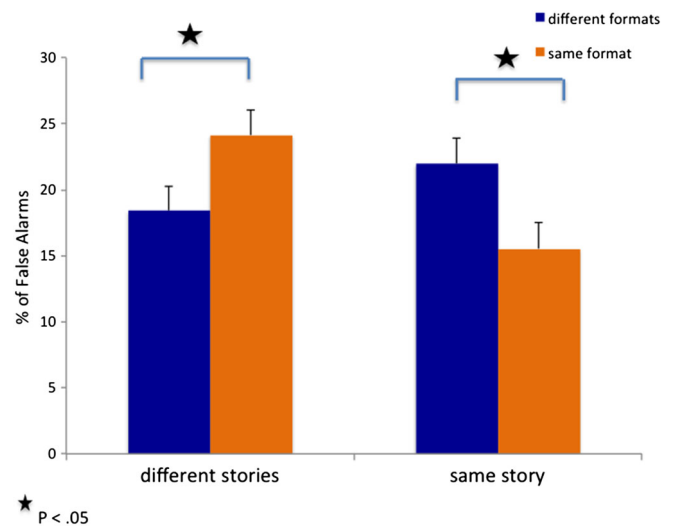

Figure 2. Mean percentage of false alarm rates as a function of conceptual and perceptual similarities between the witnessed and suggested events

similarity in both conceptual conditions ($F(1,79) = 4.57$, $p < .05$, $\eta_{p}^{2} = 0.06$; $F(1,81) = 5.43$, $p < .05$, $\eta_{p}^{2} = 0.06$, for different stories and the same story respectively). These analyses indicated that when participants saw two different stories, the same format impaired performance compared with different formats. Whereas when participants saw the same story, the same format improved performance relative to different formats.

DISCUSSION

The purpose of the present study was to examine how conceptual and perceptual similarities between witnessed and suggested information affect the tendency to confuse them. Intuitively, it seems like the more the similarity between two events, the greater the tendency to confuse them. However, the results suggest a complex relationship between conceptual and perceptual similarities and memory distortions in conditions of eyewitness testimony.

As expected, when measured separately, neither perceptual similarity nor conceptual similarity significantly affected the suggestibility effect. These findings are consistent with several studies in the literature that manipulated the perceptual similarity and reported a null effect (e.g. Bonto & Payne, 1991; Shaw et al., 1997). Studies that reported an opposite effect (Lindsay, 1990; Allen & Lindsay, 1998) used multiple perceptual, conceptual and temporal elements, and therefore, it is hard to determine whether the effect was the same if only one of them was manipulated. More importantly, we found a significant interaction between perceptual and conceptual similarities. Hence, when participants saw two different stories, the same format impaired performance compared with different formats. However, when participants saw the same story, the same format improved performance relative to different formats. Although counter-intuitive, the results recapitulate similar findings in other studies (Lindsay et al., 2004; Mitchell & Zaragoza, 2001) suggesting that once the similarity between two events

reaches a certain threshold, the coherence between them improves memory performance.

One can claim that these results are opposed to the source monitoring framework, which claims that the more the similarities between two events (i.e. either perceptual or conceptual), the greater the tendency to confuse them (Johnson, Hashtroudi, & Lindsay, 1993; Lindsay, 2008; Lindsay & Johnson, 1989; Lyle & Johnson, 2007; for review, refer to Mitchell & Johnson, 2009). A possible explanation for this contradiction is that in accordance with the source monitoring framework, similarity between two events increases the confusion between them up to a certain point. However, after reaching a high level of accumulative similarity (e.g. conceptual and perceptual), that tendency is changed, and similarity may be used to improve discrimination. This explanation is in line with other findings in the literature, showing that thinking about an event in a way that reactivates its accurate details improves memory performance (Henkel, 2004; Migueles & García-Bajos, 2007). A support for such claim may also be found in attention theories. According to these theories, differences between items are more salient against their shared background, and therefore, detecting them may be easier and require less attention resources (e.g. Pearce, 1994; Treisman & Gelade, 1980).

A different way of looking and interpreting these results relates to the compatibility of conceptual and perceptual similarities. When conceptual and perceptual similarities were matched (i.e. different stories–different formats and the same story–same format conditions), the suggestibility effect was eliminated. However, mismatch conditions (i.e. different stories–same format and the same story–different forma conditions) resulted in a suggestibility effect. It is possible that in conditions of partial compatibility, participants use liberal criteria and are less attuned to detect differences between the events, while in conditions of complete similarity, they are more motivated and are using a stricter criterion to do so.

The counter-intuitive relationship between conceptual and perceptual similarities of two events and the tendency to confuse them has several possible implications for eyewitness testimony. It is important to note that when recalling a witnessed event, the conceptual and perceptual similarities are limited. No matter how vivid and detailed the recollection may be, it would never be the same as the experience of the actual event. Nevertheless, there is a wide range of conceptual and perceptual similarities between witnessed and suggested events. The possible implications of our results relate to the differential effects of these similarity levels on eyewitness testimony.

First, the results may suggest that people are more likely to confuse details from a witnessed event with details from another unrelated subsequent event when the two events share similar perceptual features. It is well known that a person who witnessed a car accident may mistakenly replace the type or colour of the car with those of another car. However, the present study suggests that it is more likely to make such errors when the witnessed and suggested information are viewed in different conceptual contexts. For example, replace the colour of a car that was involved in the accident with the colour of the neighbour's car rather than with the colour of a different unrelated car, which was

seen in the accident scene. Interestingly, if the person is exposed to suggested information not only in a different conceptual context but also in a different perceptual format, the chances to confuse it with the witnessed event seem to be lower, for example, to confuse the type of car that was involved in an accident with a type of unrelated car, which was mentioned in a novel that the witness is reading.

In addition, the results may suggest that reinstatement of the witnessed event in similar perceptual conditions (e.g. in the original scene of the event) may enhance memory performance even if it includes some wrong suggested details. For example, if a lawyer reinstates an event while investigating a witness in the crime scene, such reinstatement may facilitate the memory of the event even if it includes some suggested details. Moreover, it may help the witness to be more aware of the suggested information and better detect possible discrepancies between the reinstatement and the actual event. These results are aligning with other studies in the field, which showed that reinstatement of contextual information as part of a cognitive interview improves the memory of a witnessed event (e.g. Fisher & Geiselman, 1992; Geiselman et al., 1984; for a review, refer to Memon, Meissner, & Fraser, 2010). However, it may suggest that such an action may also inoculate individuals against possible erroneous information.

On the other hand, according to the results of the present study, it seems like exposure to suggested information about the witnessed event in conditions that reduce perceptual similarity may increase the susceptibility of a witness to suggested information. For example, reading an article about the witnessed event that includes suggested information in the newspaper may increase the chances of memory distortions. These implications are especially important because of the powerful effect of eyewitness testimony on legal decisions and should be taken into account not only in order to improve recollection of witnessed events but also in order to protect witnesses against misinformation.

A possible limitation of the current study relates to the fact that we used two sets of slides instead of movies that depict the witnessed and suggested information. However, such manipulation is very common when testing the suggestibility effect in a lab setting (e.g. Gordon & Shapiro, 2012; Lane & Zaragoza, 2007; McCloskey & Zaragoza, 1985). Using slides allows better control for variables such as information load, exposure time and presentation sequence, compared with a movie, which may have more ecological validation but may also add possible confounds. Moreover, it is important to note that the aim of the present study was to illuminate a unique phenomenon in which similarity between two events improves discriminability and facilitates memory performance. The results provide theoretical basis for future studies with more ecological validity.

Further studies are needed in order to fully evaluate the possible interpretations of our results. For example, a future study may aim to manipulate exposure time, allowing deeper attention for the differences between the events. In addition, it is important to compare not only the same and different stories but also stories that reflect intermediate levels of similarity. Finally, it would be interesting to explore whether the influence of conceptual and perceptual similarities is unique or possibly a more comprehensive phenomenon

obtained while manipulating different types of context, such as temporal context, mood, emotional state or type of cognitive processing.

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