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Typicality and misinformation: Two sources of distortion

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This study examined the effect of two sources of memory error: exposure to post-event information and extracting typical contents from schemata. Participants were shown a video of a bank robbery and presented with high- and low-typicality misinformation extracted from two normative studies. The misleading suggestions consisted of either changes in the original video information or additions of completely new contents. In the subsequent recognition task the post-event misinformation produced memory impairment. The participants used the underlying schema of the event to extract high-typicality information which had become integrated with episodic information, thus giving rise to more hits and false alarms for these items. However, the effect of exposure to misinformation was greater on low-typicality items. There were no differences between changed or added information, but there were more false alarms when a low-typicality item was changed to a high-typicality item.

There are two main sources of incorporating false information into memory. One of them is internal, created in the cognitive system itself, and the other is external, prompted by introducing suggested information. The internal source arises primarily from the use of schemata, i.e. structures that represent all of the knowledge we have about a specific domain (Schank & Abelson, 1977). This knowledge is shared by the majority of the population and includes information on actions, objects and people typically involved in such commonplace activities as going to a restaurant (Bower, Black, & Turner, 1979) or the beach (Miller & Gazzaniga, 1998), and in less ordinary events such as a bank robbery (Holst & Pezdek, 1992; Migueles & Garcia-Bajos, 2004; Tuckey & Brewer, 2003).

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Schemata perform various functions for understanding and retrieving information. For example, information is extracted from schemata to compensate for lost, uncoded or missing information. But it is not just any type of information. People extract the information that most commonly appears in similar situations; in other words, typical or high-typicality information. For example, in an experiment by Brewer & Treyens (1981), in a recall test 30% of the participants claimed to have seen books in a student's room they had just visited, when in fact all of the books had deliberately been removed. In a study on the recall and recognition of a mugging event, García-Bajos & Migueles (2003) found more errors associated with highly typical false actions, such as the victim being threatened with a weapon or the victim shouting for help, than with low-typicality actions.

The process of incorporating schematic knowledge into memory is simple. When we witness an event and the corresponding schema is activated, a representation is stored in our memory which includes encoded episodic information and schema-based default values (high-typicality) in the empty slots. Later, when the memory is retrieved, there are more hits for high-typicality information if the schema default value is consistent with the actual event-related information. But there are also more errors in accepting typical information when the schema default value does not match the real information. This hypothesis has been confirmed in several contexts, including text comprehension (Bower et al., 1979) and the memory for rooms (Brewer & Treyens, 1981; Lampinen, Copeland, & Neuschatz, 2001). It has also been tested in more complex situations. García-Bajos & Migueles (2003), for example, found more hits and false alarms for high- than for low-typicality information in a study of the memory for a mugging; the same pattern of results was replicated in a study by Nakamura, Graesser, Zimmerman, & Riha (1985) on high- and low-typicality actions during a class.

Another source of memory error is external and has been the subject of extensive study in recent years using the post-event information paradigm (Loftus, Miller, & Burns, 1978). Typically in experiments of this type subjects watch a video or slides depicting an event. After a delay false information is introduced by means of a questionnaire or narrative account. Following a time interval, a memory task is administered to determine the effect of exposure to misinformation. A number of experiments have demonstrated that the false information is incorporated into the memory, a phenomenon known as the *misinformation effect* (Frost, Ingraham, & Wilson, 2002; Mitchell & Zaragoza, 2001; Vornik, Sharman, & Garry, 2003; Wright, 1993; Zaragoza & Lane, 1994). This phenomenon can be

explained as an error in source memory retrieval (Lindsay & Johnson, 1989). In other words, subjects confuse false items introduced after an event with the original information in the event. Moreover, it has been suggested that prior exposure to misinformation leads to a more liberal response criterion based on a feeling of familiarity and, as a result, acceptance of misinformation (Hekkanen & McEvoy, 2002; Luna & Migueles, 2007).

These two sources of error – schema activation and post-event information – work together to implant false contents in our memory. Holst & Pezdek (1992) taped several transcripts from a mock trial in which a lawyer questions an eyewitness. While the witness provides an account of the event based on the actual facts, the lawyer introduces false information in the way of details not stated by the witness. In the experimental group the lawyer mentions four highly typical items that are not included in the control group. A week later the subjects completed a free recall task and a recognition test. The lawyer's insinuations had a negative effect on free recall performance, increasing commission errors, but not on recognition. A significant percentage of misinformation was accepted in both cases, which in the authors' opinion was because it was included as part of the schema. In this study, however, only high-typicality misinformation was presented.

Smith & Studebaker (1996, Exp. 1) conducted an experiment based on the classic method of Loftus et al. (1978), in this case using a burglary scenario. The participants listened to an audiotape of a burglary and answered a series of questions, some of which included high- or low-typicality false information. In the multiple-choice final recognition test they had to choose between high-typicality information, low-typicality information or claim that the information did not form part of the original account. The participants accepted more misinformation when it was previously presented, thus demonstrating the effect of post-event information. Moreover, the effect was greater with high-typicality than with low-typicality items.

In the studies by Holst & Pezdek (1992) and Smith & Studebaker (1996) the participants listened to audiotaped descriptions of the events. This implies a certain limitation when generalising results to more realistic situations, which usually include an important visual component. In this study we present a video of a crime, followed by high- and low-typicality false information, and expect to replicate and extend the results of earlier experiments. If information is extracted from scripts to make inferences or fill in gaps, and episodic information is integrated with schema-based default values, we hypothesise that subjects will incorporate typical yet false information into their memory, leading to more hits and false alarms

for these items in the recognition task. Besides causing normal memory deterioration, prior exposure to misinformation may also increase the number of errors due to the accumulation of both sources of error.

Another important aspect which has received little attention from studies on the misleading information effect is if the suggested item is a change in information that already exists in the original material or an addition of completely new material. In some studies true items have been changed to false ones (i.e., a white bear changed to a green bear in Sutherland & Hayne, 2001; a blender changed to a coffee-maker in Wright & Stroud, 1998), while in others completely new items have been added (i.e., the theft of a ring in Drivhdal & Zaragoza, 2001; a coatrack in Lindsay & Johnson, 1989). The few studies that have altered the type of change found that participants were better at rejecting false added information than changed information (Gobbo, 2000, Exp. 2), and more readily accepted changed misinformation than added misinformation (Pezdek & Roe, 1997). These two studies suggest that it may be easier to alter a memory than to implant a completely new one, although no satisfactory explanation to this observation has been offered. In other studies, however, there was no difference in acceptance of changed and added information (Frost, 2000, Exp. 2; Nemeth & Belli, 2006).

Information typicality may help us to understand these two apparently contradictory results. Changing an original high-typicality item for false information can be difficult because episodic memory and knowledge schemata include the same information. However, when the true information is low typicality, false information may be more readily accepted, especially if it is exchanged for a high-typicality false item present in our schemata. In the added information the typicality of original items is of no consequence, since there are none. Therefore, in this experiment we used both changed and added false information. For the changed items we took into account the typicality of the original and the false information. If the typicality of original information affects the acceptance of suggested information, we would expect more false alarms for high- than for low-typicality true items.

Participants in this experiment were shown a video of a bank robbery. Afterwards, they were presented with high- and low-typicality misinformation consisting of either changes made to the elements in the video or additions of new information. Lastly, the participants completed a memory recognition task.

METHOD

Participants. Sixty psychology students from the University of the Basque Country received course credits for participating in the experiment. Participants worked in groups of a maximum of 12 students (47 female, 13 male; mean age = 21.88 years, *SD* = 3.80).

Design. The participants were divided into two groups, experimental and control, acting as the between-subjects variable, with 30 participants assigned randomly to each group. In the experimental group, the questions in the post-event questionnaire included high- and low-typicality false items, whilst the control group responded to the same questions but without false information.

The rest of the variables were repeated measures defined according to type of item in the final recognition task: true information, false information that changed contents from the video, and additions of completely new misinformation. The true items could be high- or low-typicality and did not appear in the post-event questionnaire. For the changed information typicality of original and suggested information was taken into account. Thus, high-typicality original information could be changed to high-typicality misinformation (H-H) or low-typicality misinformation (H-L), and low-typicality information could be changed to high-typicality (L-H) or low-typicality contents (L-L). Additions of false information could also be either high- or low-typicality.

Normative study. Two normative studies were conducted to determine typicality, one for the actions and another for the objects involved in a bank robbery. Original data collected by Migueles & García-Bajos (2004) was reanalysed for the actions. The new analysis was performed to obtain as many actions as possible from which to then select a list of critical items. The normative study was completed by 80 psychology students from the University of the Basque Country, who were asked to list the most typical actions found in a bank robbery. They were given 10 minutes to complete the task.

To determine the typicality of the objects, 35 student volunteers (age *M* = 21.86; *SD* = 4.67) were given 10 minutes to write down all of the objects that might typically appear in a bank robbery. To help them with their task, the participants were given a sheet of paper divided into four sections, each with its own title: objects found inside or outside the bank,

objects related to bank personnel, objects related to customers, and objects related to the bank robbers.

Based on the information obtained, two judges selected a set of highly typical true and false actions and objects mentioned by an average of 34.89% of the participants, and another set of low-typicality true and false actions and objects mentioned by 5.29%. This set of elements is consistent with the general criteria of being mentioned by at least 25% of the sample to be considered high-typicality (Holst & Pezdek, 1992; Tuckey & Brewer, 2003). The low-typicality items were selected from among those that met the criteria of being mentioned infrequently and being inconsistent with the event (Greenberg, Westcott, & Bailey, 1998; List, 1986). Any differences regarding the classification and selection of items were resolved by a third independent judge. The complete list of critical items used is given in the Appendix. None of the subjects involved in the normative studies took part in the experiment.

Materials and procedure. The experiment began with 3-minute video of a bank robbery. The participants were told to pay close attention because their memory would be evaluated afterwards. In the video two security guards unload sacks of money from an armoured vehicle, deposit them in a safe deposit room and drive away. Shortly afterwards, a robber cuts off the bank's electric power supply and drives up to the door. He walks into the bank carrying a sawed-off shotgun and wearing a mask to conceal his identity. He threatens the customers, forces the bank manager to open the safe deposit room, takes the money and drives away.

After the video, the participants were given 5 minutes each to perform two distractor tasks. One was to unscramble letters in 50 anagrams and the other consisted in solving a maze and creating a picture by filling in the dots. Immediately afterwards, they were given an unlimited amount of time to answer 44 open-ended questions following the chronological order of the event. Twelve of the questions in the experimental group were formulated to include false information. The misinformation was never the focal point of the question; it simply added extra information (i.e., changing an original low-typicality item *army boots* for a high-typicality one: The robber was wearing *training shoes* and work overalls. What colour were his overalls?; adding low-typicality information: The robber *closed the door to the bank* so no one could enter and turned to a young man standing next to him. What did he do to him?). There were never two questions in a row containing false information. The rest of the questions included in the questionnaire were fillers about different aspects of the video (i.e., How

does the bank robber conceal his identity?). The control group questionnaire was exactly the same but all references to misinformation were removed. The experimental session took approximately 30 minutes. The purpose of the questionnaire was to introduce the misinformation, and therefore the answers were not analysed.

The following day the participants completed a *True/False* memory recognition test in which they had to say whether or not the information appeared in the video. The test included 32 narrative statements – 12 with misinformation from the post-event questionnaire, 12 with true information (6 high-typicality and 6 low-typicality) – and 8 filler statements with completely new information. The critical statements are given in the Appendix. In this case, the critical information was the focal point of the sentence. The statements were presented in chronological order and there were never two in a row from the same category.

RESULTS

With the data obtained we calculated the percentage of hits and false alarms, as well as *A'* scores for accuracy and B''_D scores for the type of response criterion applied by the participants. All of the scores are shown in Table 1.

Hits

Using the proportion of hits for the 12 true items in the recognition test, we performed an ANOVA 2 (Group: experimental, control) x (2) (Typicality: high, low). There were more hits for high-typicality information ($M = 0.78$) than for low-typicality information ($M = 0.69$) [F (1, 58) = 12.79; $MSE = 0.02$; $p = 0.001$]. In this case, the participants may have encoded and correctly retrieved the high-typicality information, but they also may have extracted the information from the schema if it was not properly processed. Since the true information from the video was the same for the experimental and control groups we did not expect nor did we find differences as a function of this variable (experimental $M = 0.71$; control $M = 0.76$; F (1, 58) = 3.15; $MSE = 0.02$; $p = 0.081$). The interaction between the two variables was not significant [F (1, 58) = 3.59; $MSE = 0.02$; $p = 0.063$].

Table 1. Mean proportion of hits, false alarms, *A'* and *B"*$_D$ as a function of Group and Typicality. False alarms are also shown as a function of Type of change. In this case typicality refers to the suggested information. Standard deviations are reported in parentheses.

	Experimental group		Control group	
	High	Low	High	Low
Hits	0.73 (0.15)	0.68 (0.18)	0.83 (0.16)	0.69 (0.14)
False alarms (total)	0.64 (0.19)	0.59 (0.23)	0.56 (0.23)	0.34 (0.19)
Changed	0.67 (0.24)	0.53 (0.30)	0.60 (0.26)	0.33 (0.20)
Added	0.62 (0.39)	0.65 (0.30)	0.52 (0.40)	0.35 (0.30)
A'	0.558 (0.17)	0.565 (0.20)	0.681 (0.15)	0.723 (0.12)
B"$_D$	-0.560 (0.30)	-0.397 (0.42)	-0.578 (0.40)	-0.046 (0.42)

False alarms

Using the proportion of false alarms for the 12 suggested items in the recognition test, i.e., responses accepting misinformation, we performed an ANOVA 2 (Group: experimental, control) x 2 (Typicality: high, low) x 2 (Type of change: changed, added). *Typicality* in this analysis refers to the typicality of the 12 suggested false items in the questionnaire.

The results show more false alarms in the experimental group (M = 0.62) than the control group (M = 0.45) [F (1, 58) = 15.85; MSE = 0.11; p < 0.001], indicating the detrimental effect of post-event information on memory. There were also more false alarms with high-typicality (M = 0.60) than with low-typicality information (M = 0.47) [F (1, 58) = 13.60; MSE = 0.08; p < 0.001]. No differences were observed between changed (M = 0.53) and added information (M = 0.53) [F (1, 58) = 0; MSE = 0.12; p = 1].

The Group x Typicality interaction was significant [F (1, 58) = 5.31; MSE = 0.08; p = 0.025] (see Figure 1). A post-hoc analysis with the Student's t-test revealed that the control group produced fewer false alarms for low-typicality information than for high-typicality information [t (29) = 4.12; p < 0.001]. This difference was not significant for the experimental

group [t (29) = 1.01; p = 0.322]. The low-typicality information was readily accepted among the experimental group because of previous exposure. This brought about a higher rate of false alarms and eliminated the differences with high-typicality information.

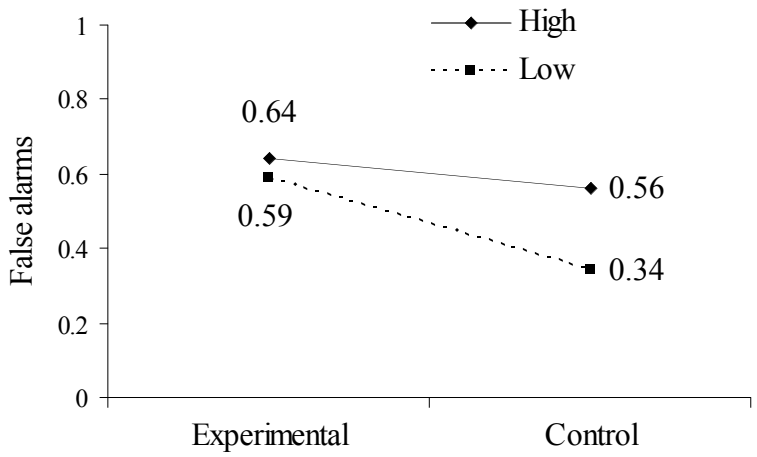

Figure 1. Proportion of false alarms as a function of Group and Typicality.

False alarms for changed information

In the case of true information changed to false information we took typicality into account for both types, i.e., the typicality of the original information presented in the video and the typicality of the suggested information used in the questionnaire. To determine the effect of this manipulation, a 2 (Group: experimental, control) x (2) (Typicality of original information: high, low) x (2) (Typicality of suggested information: high, low) ANOVA was conducted, using false alarms as the dependent variable.

The Group variable was included to explore the possibility of interaction with typicality. Just like the previous analysis there were differences as a function of group [F (1, 58) = 6.84; MSE = 0.16; p = 0.011], but no significant interaction was found for this variable.

The typicality of the original information contained in the video was not significant [high M = 0.52; low M = 0.54; p = 0.702], but the typicality of the suggested information was [F (1, 58) = 24.38; MSE = 0.10; p <

0.001]: more false alarms were elicited with high-typicality (M = 0.63) than with low-typicality false information (M = 0.43). The interaction between the two variables was also significant [F (1, 58) = 7.03; MSE = 0.12; p = 0.010]. There were more false alarms when low-typicality was changed to high-typicality information (L-H; M = 0.70) than for the rest of the alternatives [high-typicality true changed to high-typicality false, H-H, M = 0.57, t (59) = -2.40; p = 0.020; high-typicality true changed to low-typicality false, H-L, M = 0.48, t (59) = -3.62; $p < 0.001$ and low-typicality true changed to low-typicality false, L-L, M = 0.38, t (59) = 4.95; $p <$ 0.001]. There were also more false alarms made with H-H changes than with L-L changes [t (59) = 3.09; p = 0.003]. In this analysis we should point out that the greatest incidence of error in accepting false statements as true was encountered when an uncommon item was replaced with a highly typical item present in the schema.

Accuracy: *A'*

The *A'* score (Snodgrass & Corwin, 1988) is an index of accuracy that takes into account the incidence of both hits and false alarms. Values range from 0 to 1, where 0 is total inaccuracy and 1 is total accuracy. The *A'* score was calculated for each participant, with which we performed an ANOVA 2 (Group: experimental, control) x 2 (Typicality: high, low). Due to the smaller percentage of false alarms, participants in the control group showed higher overall accuracy rates (M = 0.702) than the experimental group (M = 0.562) [F (1, 58) = 19.02; MSE = 0.031; $p < 0.001$]. However, there were no differences in accuracy as a function of information typicality (high M = 0.619; low M = 0.644) [F (1, 58) = 0.83; MSE = 0.02; p = 0.366]. All of the *A'* scores were statistically higher than 0.5 [$p < 0.05$], indicating that the subjects performed better than expected by chance.

Response criterion: B''_D

The B''_D index (Donaldson, 1992) provides information on the response criterion used by subjects when performing the memory task. Scores closer to +1 indicate a conservative response criterion coupled with a tendency to answer *False*, while scores closer to -1 suggest a liberal response criterion and a tendency to answer *True*. 0 scores indicate a neutral response criterion. The B''_D index was calculated for each participant, with which we performed an ANOVA 2 (Group: experimental, control) x 2 (Typicality: high, low). Participants applied a more liberal criterion in the experimental group (M = -0.478) than the control group (M = -0.312) [F (1, 58) = 5.14; MSE = 0.16; p = 0.027], and a more liberal criterion for high-

typicality (M = -0.569) than for low-typicality information (M = -0.221) [F (1, 58) = 26.40; MSE = 0.14; $p < 0.001$]. All of the scores were less than 0 [$p < 0.001$].

The Group x Typicality interaction was also significant [F (1, 58) = 7.49; MSE = 0.14; p = 0.008]. The experimental group adopted a more liberal response criterion for low-typicality items than the control group, but there were no differences for high-typicality items. All of the scores were less than 0 [$p < 0.001$], except for low-typicality information in the control group [t (29) = -0.59; p = 0.558], which was associated with a neutral response criterion.

DISCUSSION

In this study we examine how prior exposure to misinformation and the use of knowledge schemata affect the memory for a bank robbery. Our primary outcome was that both factors influence memory, but the influence overlaps to a certain degree rather than being cumulative.

A number of studies have concluded that schemata can affect how information is processed. When an event schema is activated it facilitates the integration of episodic information and highly typical schema-based elements (Brewer & Treyens, 1981; List, 1986). In our study, when participants retrieved the event and were asked about true information present in the robbery, results showed more hits for high-typicality items. This information may have been incorporated in the memory as episodic memory or it may have been schema-based. But when asked about false information that did not appear in the original video, the incidence of false alarms was also higher with high-typicality items, possibly because the information was incorporated into the memory from the schema. Our findings are consistent with other studies investigating the effect of schemata on memory in everyday situations, such as the memory for objects in a room (Lampinen et al., 2001), and in studies geared more specifically to eyewitness psychology, such as robberies or muggings (e.g., García-Bajos & Migueles, 2003; Greenberg et al., 1998; Holst & Pezdek, 1992).

The participants in the present study included more high-typicality than low-typicality information into their memory, regardless of whether it was true or false. This generally indicates better discrimination (in A' and d' indexes) with low than with high-typicality items (Nakamura & Graesser, 1985; Neuschatz, Lampinen, Preston, Hawkins, & Toglia, 2002), mainly due to the smaller percentage of false alarms for low typicality items (García-Bajos & Migueles, 2003). However, in this study we did not

replicate this result since low and high typicality items produced similar false alarms rates for the experimental group. This indicates that exposure to post-event misinformation (experimental group), modulates the effects of familiarity (typicality) by increasing the false alarm rate of low typicality items. We will further comment on this result below. Compared to other results ($M = 0.11$ in García-Bajos & Migueles, 2003; $M = 0.23$ in Nakamura et al., 1985), here we found a high incidence of error ($M = 0.47$), mainly due to the performance of the experimental group. This reduces the difference between the effect of typicality on hits and false alarms, and eliminates the better overall performance for low-typicality information.

Presenting post-event misinformation can also have a detrimental effect on memory. The effect of misleading information has been observed in a number of studies conducted under different conditions, suggesting that it is a stable phenomenon (Lindsay, 1990; Lindsay & Johnson, 1989; Loftus et al., 1978). Our findings are no exception. Results from other studies also emphasise the importance of the type of response criterion (Hekkanen & McEvoy, 2002; Luna & Migueles, 2007). In our study, the familiarity with preexposed content may have prompted subjects to adopt a more lenient criterion and more readily accept the misinformation.

The most relevant finding of this study is the interaction between the two sources of error, schemata and post-event information. The participants more readily accepted high-typicality than low-typicality false items, regardless of whether the items had been presented previously. This may be due to the integration of original information and schema-based information. The control group participants accepted the high-typicality information even without previous exposure, possibly because it was part of the schema and could therefore be extracted. In fact, the control and experimental groups equally accepted the high-typicality false information, suggesting that previous exposure to these items did not affect performance. However, Smith & Studebaker (1996, Exp. 1) studied the memory for a burglary and found that subjects were much more likely to accept typical false information if they had been exposed to it previously ($M = 0.50$) than if they had not ($M = 0.22$). The difference in results may be attributed to the time interval between the introduction of the misinformation and the memory task. Smith & Studebaker (1996, Exp. 1) used a 10-minute interval, while ours was 24 hours. Several studies have shown that the negative impact of misleading information is mitigated when the time interval between the misinformation and the memory test is shorter (Higham, 1998; Payne, Toglia, & Anastasi, 1994). In the case of Smith & Studebaker (1996, Exp. 1), the short time interval may have explained why the control group

produced fewer errors. Further supporting this idea, their participants reported better results when there was no misinformation ($M = 0.78$).

Low-typicality information, in contrast, revealed a different response pattern in our study: the experimental group more readily accepted false items than the control group. Several studies have shown that when misinformation is not introduced, low-typicality items generate few false alarms, since they cannot be extracted from the schema (e.g., $M = 0.17$ in Greenberg et al., 1998; $M = 0.11$ in García-Bajos & Migueles, 2003). However, prior exposure to low-typicality false information makes it easier to accept (e.g., $M = 0.09$ with misinformation and $M = 0.01$ without, in Smith & Studebaker, 1996, Exp. 1). Participants in Smith and Studebaker's experimental group extracted this information from their episodic memory, thus increasing the incidence of false alarms. In our study, prior exposure to low-typicality information among the experimental group prompted subjects to more acceptance of this information than the control group. In fact, exposure to low-typicality false information had a greater effect on memory than exposure to high-typicality information. This result was consistent with the finding of Nemeth & Belli (2006), whose study on the memory for rooms showed that misleading information had a greater effect on low-typicality items.

We should point out that, contrary to our predictions, we did not observe the accumulative effect of the two sources of error. The incidence of false alarms in the experimental group was not higher for high-typicality information (two sources of error) than when only one of the sources was activated. Participants seemed to reach the maximum number of false alarms when only one of the sources was activated, although there was no ceiling effect because there was still a margin for false alarms. There was a tendency, however, to generate more false alarms with both sources of error than with only one. Rather than cumulative, the negative effects of schemata and post-event information may actually overlap to a certain degree. Future studies aimed at comparing the two sources of error may provide further information.

Another variable that was manipulated was the type of change introduced by the false information – either true information was changed or new information was added. Our results suggest that there are no differences between the two types of change. Further findings point in the same direction, at least with adult sample populations (Frost, 2000; Exp. 2; Nemeth & Belli, 2006). In contrast, other cases have reported better performance with added information (Gobbo, 2000, Exp. 2) and a greater likelihood of acceptance with changed information (Pezdek & Roe, 1997);

both of these studies were conducted on children. Age-related differences in memory processes might have an influence on the acceptance of changed and added information, but further research aimed at directly comparing the two populations would be required to clarify the matter.

Another variable that might help explain the difference between changing and adding a false element is the typicality of both original and suggested items. Changing low-typicality information to high-typicality information generated more false memories than any other type of change. When low-typicality information was replaced with high-typicality information, the latter was very readily accepted. Manipulating the typicality of both types of information yielded misinformation acceptance scores ranging from 0.38 to 0.70. This wide range might help explain why differences between changed and added information may be observed in some studies, while not in others, depending on the specific item used.

The consequences of these memory errors are particularly grave in the legal context. Eyewitness memory can be seriously impaired by either of the two sources of error discussed: post-event information and the use of schemata and scripts. If witnesses are exposed to misinformation, irrespective of the type, they will incorporate it into memory with relative ease. But even with no exposure our prior knowledge of crimes can alter our memory, especially if the original event entails uncommon elements. Far from being a failure of the system, both sources of error are useful functions of memory which facilitate and simplify the processing of information, but which in certain circumstances can have a negative effect.

RESUMEN

Tipicidad e información engañosa: dos fuentes de distorsión. Se ha estudiado el efecto de dos fuentes de error en la memoria, la exposición a información engañosa y la extracción de contenidos típicos de los esquemas. Los participantes vieron un vídeo sobre un atraco a un banco y recibieron información falsa de tipicidad alta y baja extraída de dos estudios normativos. La información sugerida pudo ser una transformación de contenidos originales del vídeo o una adición de información completamente nueva. En la posterior prueba de reconocimiento la información engañosa produjo deterioro en la memoria. Los participantes utilizaron el esquema subyacente al suceso para extraer información de tipicidad alta que se integró con la información episódica, provocando más aciertos y falsas alarmas con esos contenidos. Sin embargo, el efecto de la exposición de la información falsa fue mayor con elementos de tipicidad baja. No hubo diferencias entre presentar información transformada o añadida, pero hubo más falsas alarmas cuando se transformó un elemento de tipicidad baja por otro de alta.

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APPENDIX

Critical information used in the recognition task

Original information

High typicality	**Low typicality**
There was a *computer* in the bank	*The police were called* after the robbery
The director was wearing a *tie*	There was a *file cabinet* in the bank
The robber was wearing *gloves*	The robber *pulled out his gun before entering* the bank
The robber *deactivated the surveillance cameras and alarms*	The robber was carrying a *sawed-off shotgun*
The robber *drove to the bank*	The robber told the director to *hurry up*
There was *a rope and post system to keep the queues orderly*	The robber *reassured the customers,* telling them they wouldn't be hurt

Suggested information: in the changed information, original items are shown in parentheses

Changed from (high) to high typicality	**Changed from (low) to high typicality**
There was a (*poster*) *clock* on the wall of the bank	The robber was wearing (*army boots*) *training shoes*
The robber *(told them to put it in a bag) took the money*	The robber left the bank (*walking backwards*) *running*
Changed from (high) to low typicality	**Changed from (low) to low typicality**
There were (*a picture*) *some ads* on the wall of the bank	The robber shouted (‘*get away from the counter!*’) ‘*everyone into the corner!*’
There was a (*table with ads*) *coffee machine* in the bank	The robber asked for *(the key) the combination* to the safe deposit room
Added high typicality	**Added low typicality**
There were *plants* next to the door of the bank	There were *radiators* in the bank
The robber shouted ‘*this is a stickup!*’	The robber *closed the door* after going inside

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