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Authors
Zhu, Bi
Chen, Chuansheng
Loftus, Elizabeth F
et al.

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Treat and Trick: A New Way to Increase False Memory

BI ZHU[1,2], CHUANSHENG CHEN[2], ELIZABETH F. LOFTUS[2]*, CHONGDE LIN[1] and QI DONG[1]

[1]*State Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University, Beijing, China*
[2]*Department of Psychology and Social Behavior, University of California, Irvine, CA, USA*

SUMMARY

This paper reports a new experimental manipulation that increased false memories 1 month after the manipulation. Mirroring the standard three-stage misinformation paradigm (original event, misinformation, and test), subjects in the experimental group were first given a colour-slide presentation of two stories (events), then given an *accurate* account (instead of misinformation) of the events in narrations, and finally tested for their memory of the original events. One month later, they underwent the standard misinformation paradigm with two new events. The comparison group was given the standard misinformation tasks at both time points. Results showed that the experimental group produced more false memories in the subsequent misinformation paradigm than did the comparison group. We focus on trust and credibility as possible mechanisms underlying this effect. Copyright © 2009 John Wiley & Sons, Ltd.

The Misinformation Effect refers to the phenomenon that a person's memory reports of a witnessed event can be altered by exposure to misinformation about the event (Loftus & Hoffman, 1989). In the classic misinformation paradigm, there are three standard stages. First, subjects experience an event (e.g. by watching a film or having a 'live' experience). Second, they receive misinformation about the event (e.g. by reading narratives or hearing from others). Finally, they are tested for their memory of the original event.

In the past 30 years, researchers have discovered many factors that influence the misinformation effect (Loftus, 2003, 2005). Two such factors are the timing of information and source credibility (Frost, 2000; Frost, Ingraham, & Wilson, 2002; Underwood & Pezdek, 1998). The earliest study about the role of time intervals in the misinformation effect was conducted by Loftus, Miller, and Burns (1978). They varied the timing of the misinformation stage and found that misleading information had a larger impact if it was presented just prior to the final test rather than immediately after the initial event.

In terms of the credibility of the information source, Smith and Ellsworth (1987) found that the misinformation effect was influenced by the subjects' perceptions of the questioner's expertise. Misleading questions led to more false memories when the questioner was assumed by the subjects to be knowledgeable rather than naïve about the topic or event. Ceci, Ross, and Toglia (1987) also found that children were more susceptible to misleading

*Correspondence to: Elizabeth F. Loftus, Psychology and Social Behavior, University of California, Irvine, 2393 Social Ecology II, Irvine, CA 92697, USA. E-mail: eloftus@uci.edu

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questions that were asked by an adult than those by another child. Similarly, the credibility of the post-event misinformation also affects false memory: not surprisingly, the less credible the post-event misinformation, the less false memory (Dodd & Bradshaw, 1980; Underwood & Pezdek, 1998). Specifically, in a study using a traffic accident as the event, Dodd and Bradshaw (1980) found that the misinformation effect was eliminated when the post-event information was attributed to the driver causing the accident rather than to a neutral bystander. Similarly, Underwood and Pezdek (1998) manipulated source credibility by telling subjects that the narrative was made either by a 4-year-old child or by a memory psychologist. They found that, when tested 10 minutes after reading narrations with misinformation, subjects were more susceptible to misinformation provided by the memory psychologist than that by the child. Interestingly, this source credibility effect (or 'warning' effect) disappeared when subjects were tested again 1 month later.

Evidently source credibility can be experimentally manipulated by various means. Dodd and Bradshaw (1980) manipulated credibility by informing their subjects whether the accounts of the accident (the event) came from a bystander (who is generally assumed to be neutral and thus credible) or from the driver (who is assumed to have certain self-interest to misrepresent the event in his favour). Underwood and Pezdek (1998) manipulated source credibility by highlighting the contrast between a 'memory psychologist' and a 4-year-old child. Smith and Ellsworth (1987) differentiated between a knowledgeable questioner and a naïve questioner. Finally, Ceci et al. (1987) used a more subtle approach in which the misleading questions were asked by either children or adults. Results of these studies showed clear evidence of the source credibility effect regardless of how explicitly or implicitly credibility was manipulated.

In the present study, we attempted to use an even more subtle approach to manipulate source credibility by eliciting implicit trust in our experimental paradigm from subjects. Specifically, before subjects underwent the classic 'misinformation' session (i.e. the witnessed events were followed by a narration with misinformation), we gave a 'truth' session (i.e. the witnessed events were followed by an accurate narrations of the events). We called this treatment the 'treat-and-trick' paradigm. We expected that this treatment would lead to increased false memory. To examine whether the treat-and-trick effect would last longer than the 'warning' effect found by Underwood and Pezdek (1998), we separated the two sessions (the 'truth' session and the misinformation session) by 1 month. The comparison group received the standard misinformation session at both time points. To control for repetition effects, two different sets of events and tests were used for the two sessions. Pilot tests ensured that these tests were equivalent in their likelihood of eliciting false memories. We reasoned that holding this initial 'truth' session would enhance trust in the testing procedures, therefore leading to an enhanced misinformation effect on the introduction of misinformation during a second test at a later point in time.

METHOD

Subjects

This study enrolled 133 undergraduates from Beijing Normal University in China (75 males and 58 females; mean age = 20.26 years, $SD = 0.98$). This group was randomly selected from a larger sample involved in a large project studying Chinese college students' cognitive abilities and personality. None of these subjects had prior experience with

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experiments using the misinformation paradigm. Of the 133 subjects, 101 subjects were assigned into the treat-and-trick group and 32 subjects were in the comparison group[1].

Materials

Events

Four stories (events) were obtained from the laboratory of Okado and Stark, who used three of them in their original study (Okado & Stark, 2005). Each event consists of 50 digital colour slides. Two of the events (one about a man breaking into a car and stealing things from it and the other about a girl's wallet being stolen by a seemingly nice man) were used in the first session. The other two events (one about a fight caused by gambling and the other about a girl being kidnapped by strangers) were used for the second session. Pilot testing based on 13 subjects showed that the two sets of events were able to elicit false memories to the same extent. Of the 50 slides that comprised each event, 12 were critical slides that would be inaccurately described in the subsequent narrations (see below). To attain a balanced design, two different images of each critical slide were generated and were counterbalanced across subjects within each session. For example, one subject saw a man put the girl's wallet in his *jacket's outside* pocket and would be misinformed at the second stage that he put it in his *pants'* pocket, whereas another subject saw the man put the girl's wallet in his *pants'* pocket but would be misinformed that he put it in his *jacket's outside* pocket. In both cases, the foil item was '*jacket's inside* pocket'.

Narrations

The narratives consisted of one sentence for each slide image describing the scene depicted in the image. Fifty sentences were presented for each event. As mentioned above, for the misinformation sessions, each event included 12 inaccurate descriptions (misinformation) and 38 accurate descriptions (i.e. they were consistent with the original picture slides). All misinformation descriptions presented details that were contradictory (not supplemental) to the original events.

Recognition test

For the recognition test, 18 questions were asked for each event regarding what was presented 'in the picture slides'. Of these, 12 were critical questions (pertaining to the critical slides) and 6 were control questions. Each question had three possible choices as answers. For the critical questions, choices were either a detail presented in the picture ('original item') or a detail presented in the narrations with misinformation ('misinformation item') or a new foil detail ('foil item'). For example, the subjects would see in the picture slides of a man hiding behind a door after stealing a girl's wallet

[1]Due to a technical error, more subjects were randomly assigned into the treat-and-trick group, resulting in a disproportional distribution of subjects. Fortunately, the smaller comparison group showed the classic misinformation effect during both sessions. To further ensure that our statistical results were not biased due to disproportional sample distribution, we used adjusted t-tests (Welch's t-test) to re-run the analyses (the degree of freedom was calculated by the Welch-Satterthwaite equation). Adjusted t-tests confirmed all of our results. Specifically, in Session 1, the treat-and-trick group's overall true memory (i.e. endorsement of the original items) was significantly higher than that for the comparison group, $t(36) = 8.18$, $p < .001$. False memory in Session 2 was significantly higher for the treat-and-trick group than for the comparison group, $t(87) = 3.56$, $p < .001$, for overall false memory; $t(90) = 2.72$, $p < .01$, for robust false memory, confirming the treat-and-trick effect. Finally, false memory was higher for the treat-and-trick group in Session 2 than the comparison group in Session 1: significant for overall false memory, $t(59) = 2.16$, $p < .05$, and marginally significant for robust false memory, $t(58) = 1.81$, $p = .08$.

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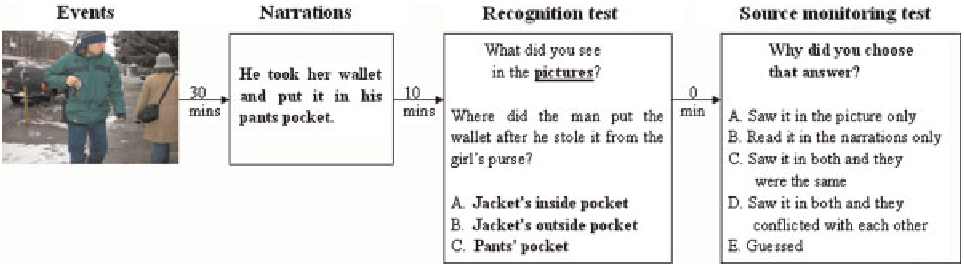

Figure 1. Diagram depicting the procedure of the classic misinformation test (with one example of the critical items for the comparison group in Session 1, with permission from Drs Yoko Okado and Craig Stark). On the sample recognition test above, Option A 'Jacket's inside pocket' was a foil item (which did not appear in either the picture slides or the narrations); Option B 'Jacket's outside pocket' was the original item (which appeared in the picture slides); and Option C 'Pants' pocket' was a misinformation item (which appeared in the narrations) (The photo for Events is printed with permission from Cold Spring Harbor Laboratory Press, publisher of Learning and Memory.)

and would then read the narration that he was hiding behind a tree. For the critical question 'Where was the man hiding after stealing the girl's wallet?', the choices were 'behind the tree' (misinformation item), 'behind the door' (original item) and 'behind the car' (foil). Another set of examples is shown in Figure 1. The endorsement rates of these three types of items were used as the indices of *overall false memory, overall true memory* and *overall foil*, respectively. For control questions, choices were a detail presented both in the picture and the corresponding narration and two new details. For the test of each event, the questions were presented in random order (i.e. not following the chronology of the events depicted in the slides).

Source monitoring test

For the source-monitoring test, subjects were asked from what presentation source they remembered the answers they indicated on the recognition test. Five options were given: 'saw it in the picture only', 'read it in the narrations only', 'saw it in both and they were the same', 'saw it in both and they conflicted with each other', and 'guessed'. Critical details in the pictures that were accurately recognized and further endorsed on the source memory test as 'saw it in the picture only' or 'saw it in both and they conflicted with each other' were considered as *robust true memory.* Critical misinformation details in the narration that were endorsed on the source monitoring test as 'saw it in the picture only' or 'saw it in both and they were the same' were considered *robust false memory.* Finally, *robust foil* included foil items that were further endorsed on the source-monitoring test as 'saw it in the picture only', 'read it in the narrations only' and 'saw it in both and they were the same'.

Narrations of the slides and the recognition and source monitoring tests were translated and adapted by a bilingual researcher from those used in by Okado and Stark (e.g. Okado & Stark, 2005). Another bilingual researcher double-checked the initial translation. The translated narratives and tests were then given to several Chinese graduate students to ensure ease of understanding and accurate descriptions of the slides. Through this process, a few changes were made to accommodate language and cultural differences. For example, because we used Okado and Stark's slides, when a question was asked about the English words that appeared in the slides, the question was modified (e.g. the question 'What is the

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word written on the sign for the café?' was changed into 'What is the colour of the word written on the sign for the café?').

Design and procedure

As mentioned earlier, both the treat-and-trick and the comparison groups participated in two sessions of the study. Two events were used for each session (as described earlier in the Materials section). In each session, the classic misinformation test involved three standard stages (event, narration, and test, see Figure 1 for details). The two groups were shown the same events and given the same tests at both sessions (see Figure 2). The only difference was whether the narrations given between events and tests included misinformation. For the treat-and-trick group, the first session involved accurate information ('treat') but the second session involved misinformation ('trick'). The comparison group was given the classic misinformation paradigm at both sessions.

For each event, 50 pictures were presented. Each picture was shown for 3500 milliseconds with an inter-picture interval of 500 milliseconds. Presentation of the event was followed by 30 minutes of filler tasks[2]. Afterwards, narrations were presented. For each event, 50 sentences were presented, and each sentence was shown for 3500 milliseconds with an interval of 500 milliseconds between sentences. This was done to keep the exposure duration and interval to be the same as for the event stage (see Okado & Stark, 2005), although this amount of time was longer than needed to read the one-sentence narration of each slide. After 10 minutes of a filler task, subjects took the recognition test and then the source-monitoring test.

Session 2 was conducted 1 month after Session 1. The general procedure was the same as in Session 1. The only difference was that, unlike Session 1, in which experimental and comparison groups differed in whether they received misinformation, this time both groups received the same misinformation. All of the tests were self-paced and administrated on computers. A computer program automatically administered the tests and collected the responses. Subjects responded by using the mouse to click the options shown on the screen. Subjects were randomly assigned to either the experimental or the comparison group (but see Footnote 1). Several experimenters were involved in this study. Experimenters' main roles were to explain the procedure, collect the consent forms, unlock the computers and

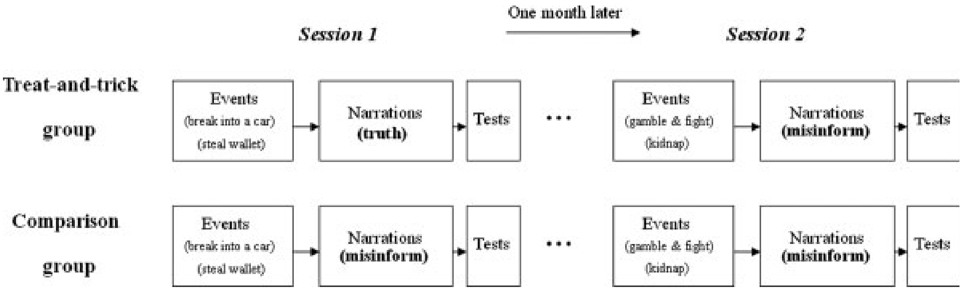

Figure 2. The experimental procedure for the two groups

[2]Filler tasks for both the 30- and 10-minute breaks were portions of intelligence tests (Raven's Advanced Progressive Matrices and subscales of Wechsler Adult Intelligence Scale-Revised (Chinese Version)).

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answer questions subjects had. Rooms and experimenters were not kept constant for each subject across the two sessions.

Finally, the presentation order of the two events within each session was counterbalanced across individuals within each group. Within each event, however, the order of presentation of slides was the same to maintain the event's integrity.

RESULTS

We first examined whether giving accurate narrations (i.e. the 'treat' for the treat-and-trick group) versus misinformation (for the comparison group) in Session 1 affected subjects' performance on the recognition test (see Table 1 for details). The results revealed that the treat-and-trick group on average showed more overall true memory (i.e. correctly recognized 82.1% of the original items) than the comparison group who correctly recognized 57.6% of such items, $F(1, 131) = 131.31$, $p < .001$. In terms of overall false memory, the comparison group endorsed 34.8% of the misinformation items, which was significantly higher than that for the foil items (7.7%), $t(31) = 7.84$, $p < .001$, suggesting that the misinformation paradigm was effective in creating false memory via misinformation (The treat-and-trick group was 'treated' with accurate narrations, thus had no measures of misinformation. These subjects endorsed 7.0% of the foil items.).

False memory induced by misinformation was also evident in Session 2 for both the treat-and-trick (who received misinformation in Session 2 only) and comparison groups. As can be seen in Table 1, the treat-and-trick group's overall false memory was 42.6%, but only 9.7% for overall foil, $t(100) = 13.68$, $p < .001$. Similarly, the comparison group also showed the misinformation effect, with more overall false memory (32.3%) than overall foil (9.4%), $t(31) = 7.64$, $p < .001$. It is worth noting that the above misinformation effect was still strong after source memory was considered. The treat-and-trick group showed 17.4% robust false memory versus 4.2% robust foil, $t(100) = 10.86$, $p < .001$, and the comparison group showed 12.9% robust false memory versus 3.0% robust foil, $t(31) = 6.90$, $p < .001$.

Table 1. Mean percentage (and standard errors) of items endorsed on the recognition tests

		Treat-and-trick group		Comparison group	
		Session 1 (truth)	Session 2 (misinform)	Session 1 (misinform)	Session 2 (misinform)
False memory	Overall false memory	—[a]	42.6 (2.0)	34.8 (3.1)	32.3 (2.1)
	Robust false memory	—	17.4 (1.1)	13.5 (1.8)	12.9 (1.2)
True memory	Overall true memory	82.1 (0.8)	47.7 (1.7)	57.6 (2.9)	58.3 (1.8)
	Robust true memory	73.9 (1.0)	33.6 (1.7)	44.8 (3.6)	43.8 (2.3)
Foil	Overall foil	7.0 (0.5)	9.7 (0.7)	7.7 (0.8)	9.4 (1.3)
	Robust foil	4.6 (0.4)	4.2 (0.4)	3.3 (0.5)	3.0 (0.6)

[a]Because subjects in the 'truth' session did not experience post-event misinformation, these subjects could not have false memories *induced by misinformation*. However, they had memory errors as shown by their endorsement of the foil items. Unique to this group, however, in addition to the foil items that were common to both groups, subjects in the 'truth' session could show additional memory errors by endorsing items that were 'misinformation' items for the misinformation group, but were merely 'other' or foil-like items for the 'truth' group (because they did not receive post-event information consistent with those items). The endorsement rate of the 'other' items was 10.9%, which was similar to the rate for the overall foil items.

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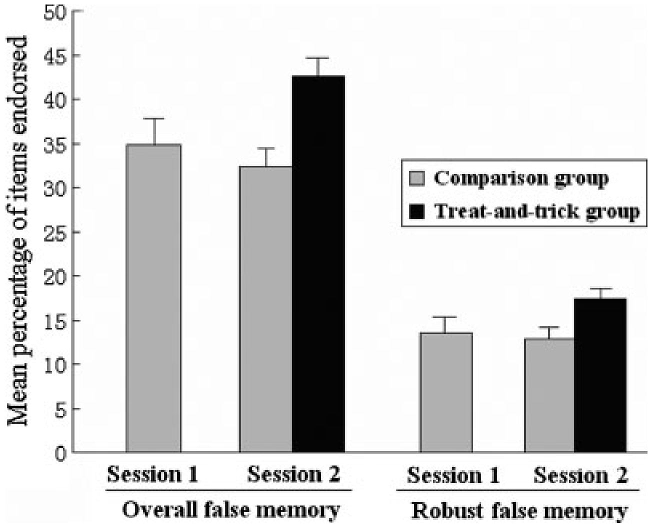

Figure 3. Mean levels (and standard errors) of false memories by the two groups of subjects and by the two sessions

To investigate the treat-and-trick effect, we compared the false memory for the two groups in Session 2 (see Table 1 and Figure 3). As expected, false memory was significantly higher for the treat-and-trick group than for the comparison group, $F(1, 131) = 7.74$, $p < .01$, for overall false memory; $F(1, 131) = 4.44$, $p < .05$, for robust false memory. We should also note that the data in Figure 3 revealed that false memory occurred equally often in Sessions 1 and 2 for the comparison group (who received misinformation both times), ($t(31) = .80$, $p = .43$, for overall false memory, and $t(31) = .31$, $p = .76$, for robust false memory). Moreover, there were no significant differences between these two sessions in other indices of memory (overall true memory, robust true memory, overall foil and robust foil), all t's < 1.0 and p's $> .05$.

Another way to see the treat-and-trick effect in this study is to compare Session 2 data of the treat-and-trick group with those of Session 1 of the comparison group. (This comparison would eliminate the potential 'warning' effect that might have been present in the above comparison of only Session 2 data because the comparison group had two misinformation sessions.) False memory was higher for the treat-and-trick group in Session 2 than the comparison group in Session 1, in terms of overall false memory, $F(1, 131) = 4.02$, $p < .05$, and robust false memory (marginally), $F(1, 131) = 2.90$, $p = .09$.

DISCUSSION

This study demonstrated a new way to increase false memories induced by the misinformation paradigm. Compared to those in the standard misinformation paradigm, subjects who were given a 'treat' (receiving post-event information in Session 1 that was completely accurate) were more likely to endorse false memory items in the subsequent misinformation test.

In real life, post-event misinformation comes from many sources, such as other people who witnessed the same event, the media, and interrogators (Loftus, 1991). Previous

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research has shown the effect of misinformation on false memories as well as factors that moderate such effects. Source credibility is one such factor that can directly influence the misinformation effect (Smith & Ellsworth, 1987; Underwood & Pezdek, 1998). The difference between the present study and previous research is that previous research was typically explicit in informing the subjects about source credibility by telling them that the questions (including misleading questions) came from knowledgeable rather than naïve questioners (Smith & Ellsworth, 1987) or by 'warning' them that the misinformation came from children rather than adults (Ceci et al., 1987; Underwood & Pezdek, 1989). The present study did not directly present any explicit information to the subjects about source credibility. Subjects had to derive such information and made judgment about sources of information from their impressions and experience with the experiments. It appears that the initial 'treat' (in Session 1 for the treat-and-trick group) led the subjects to consider the source of information as credible. Once such credibility is established, the subjects are more likely to believe the source (Fragale & Heath, 2004). Instead of expertise as the factor in source credibility, our manipulation seems to tap trust. In fact, it is plausible that the expertise effect is merely one form of the trust effect. The more the subjects trust the source, the more likely they would be subject to the influence of that source. In our study, we tried to elevate subjects' trust by giving a 'truth' session before they underwent the classic 'misinformation' session.

One process through which trust in information source can affect false memory is meta-cognitive monitoring and associated response criterion. For example, using signal detection analysis, Scoboria, Mazzoni, and Kirsch (2006) found that misleading questioning produced decreased discrimination sensitivity accompanied by higher response bias. In our study, subjects in the treat-and-trick group might have developed 'lax' monitoring and a more liberal response bias during the first session (the 'truth' session), which was extended to the second session (the misinformation session).

It is especially worth noting that this treat-and-trick effect is not just temporary and short-lived. In this study, we showed that its effect is evident one month later (and on different stories or events). Furthermore, both overall and robust false memory was stronger for the treat-and-trick group as compared to the comparison group. This result suggests that it was not just the quantity of false memory (overall), but the quality of false memory (robust) was also increased by the manipulation (Frost, 2000). In real life, where there are more opportunities for 'treats', it is likely that the effect might be even stronger and can last for a considerable period of time. Of course, it should be kept in mind that our results came from computer-administrated setting. It is unknown whether real-life interpersonal interactions would generate greater or smaller treat-and-trick effects. Future research should directly compare the two settings.

Our finding of the treat-and-trick effect over one-month period appears to contradict Underwood and Pezdek's (1998) result that the source credibility effect through explicit 'warnings' disappeared 1 month later. There are two possible explanations for this apparent inconsistency. First, the two studies tested different types of long-term effects. Underwood and Pezdek (1998) tested the memory of the original event presented one month earlier. Even if subjects remembered the 'warnings' about source credibility, they could no longer be sure from which source they got the (mis)information. In our study, however, the subjects only needed to remember the source credibility over 1-month period. Information and misinformation about the actual events were presented within the same session. Another possible explanation is that implicit source credibility judgment might have a longer effect than explicit warnings, perhaps because explicit warnings come from an

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external source whereas implicit source credibility judgment is internally derived. Future research should further investigate the mechanisms involved.

Our findings have important implications for situations where false memories are relevant (e.g. eyewitness testimony). The treat-and-trick effect implies that if certain information source (such as the media or particular people) had been considered as good sources of accurate information (i.e. a high level of trust), people will experience a greater misinformation effect from such sources and such effects may last longer than would occur in the absence of such conditions. Moreover, it is likely the multiple and repeated 'treats' (receiving true information from the same sources over time), which are likely to happen for sources such as the major media and close friends, may further increase the treat-and-trick effect. Future research is needed to examine the extent of such effects and factors that may mitigate them.

Finally, although this study was not set out to test a potential implicit 'warning' effect (i.e. experiencing the misinformation paradigm in the first session may alert subjects when they went through it again in the second session), it is worth noting the implications of our results related to that effect. Our results showed that the misinformation effect[3] was not significantly smaller during the second session (1 month later) than during the first session, although the direction of the non-significant difference was as would have been expected. It appears that, contrary to the warning effect or the meta-cognitive monitoring perspective (Scoboria, Mazzoni, & Kirsch, 2006), subjects in the comparison group did not become more suspicious, monitored their memory more carefully, and/or adopted a more conservative response set as a result of their experience of misinformation or 'trick' in the first session. One explanation is that the 'warning' effect is too small for implicit source judgment. In fact, Scoboria, Mazzoni, and Kirsch (2008) also failed to replicate their earlier finding (Scoboria et al., 2006) regarding the negative impact of misinformation. Another explanation is that warning effects may not last for a month. This may be true for both explicit warning as in the study by Underwood and Pezdek (1998) and implicit warning in our study. Further research is needed to examine the various factors that may impact the warning effect.

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[3]It should be noted that the misinformation effect in our study was assessed relative to foils and to the comparison group. Another way to assess the absolute magnitude of the misinformation effect is to include a control group that does not receive either misinformation or 'truth'. The number of misinformation items endorsed by such a group can be used as the baseline to estimate the absolute level of misinformation effect.

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