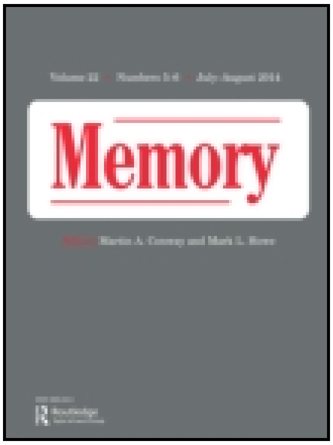

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Learning misinformation from fictional sources: Understanding the contributions of transportation and item-specific processing

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Learning misinformation from fictional sources: Understanding the contributions of transportation and item-specific processing

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People often pick up incorrect information about the world from movies, novels and other fictional sources. The question asked here is whether such sources are a particularly potent source of misinformation. On the one hand, story-reading involves transportation into a fictional world, with a possible reduction in access to one's prior knowledge (likely reducing the chances that the reader will notice errors). On the other hand, stories encourage relational processing as readers create mental models, decreasing the likelihood that they will encode and remember more peripheral details like erroneous facts. To test these ideas, we examined suggestibility after readers were exposed to misleading references embedded in stories and lists that were matched on a number of dimensions. In two experiments, suggestibility was greater following exposure to misinformation in a list of sentences rather than a coherent story, even though the story was rated as more engaging than the list. Furthermore, processing the story with an item-specific processing task (inserting missing letters) increased later suggestibility, whereas this task had no impact on suggestibility when misinformation was presented within a list. The type of processing used when reading a text affects suggestibility more than engagement with the text.

Keywords: Misinformation; Fiction; Item-specific processing; Suggestibility.

Movies, novels and other fictional sources can serve as sources of misinformation about the world. For example, reading stories that contain errors such as "the Atlantic is the largest ocean" increases the likelihood that readers will answer later general knowledge questions with those specific errors (e.g., Fazio, Barber, Rajaram, Ornstein, & Marsh, 2013; Marsh, Meade, & Roediger, 2003). Stories that develop wrong ideas such as "mental illnesses are contagious" influence readers' later attitudes (e.g., Gerrig & Prentice, 1991; Prentice, Gerrig, & Bailis, 1997; Rapp, Hinze, Kohlhepp, & Ryskin, 2013). Watching a historically inaccurate film clip (e.g., from the movie *The Last Samurai*) misleads viewers, even if they had previously read a historically accurate text containing the correct information (Butler, Zaromb, Lyle, & Roediger, 2009).

The question addressed here is what, if anything, might be special about fictional sources, and whether they are a particularly potent vehicle for

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misinformation. That is, it is known that people can pick up misinformation about the world from a wide variety of sources, including (but not limited to) textbooks (e.g., Cho, Kahle, & Nordland, 1985), other people (e.g., Landau & Bavaria, 2003) and the mainstream media (e.g., Lewandowsky, Stritzke, Oberauer, & Morales, 2005). All of these situations parallel the situation faced by the reader of a novel or the viewer of a movie; people encounter information that contradicts the true state of the world, and yet later rely on the misinformation.

One distinction between many materials and fictional sources is that consumers of fiction "transport" themselves in fictional worlds (Gerrig, 1993). That is, an involved reader is mentally transported to a story world and as such accepts the parameters of the story world (Coleridge's 1817/1906 concept of "willing suspension of disbelief", p. 161). Transported readers visualise story events, connect emotionally with the story characters, are less aware of non-story events (e.g., other things in the room where one is reading), and have preferences about story outcomes (e.g., Green & Brock, 2000; Jacovina & Gerrig, 2010). The issue is that being transported to the story world may affect access to one's general knowledge. For example, consider a study in which people were asked to verify well-known facts such as "George Washington was elected first president of the United States" (Gerrig, 1989). Depending on experimental condition, readers read different narratives prior to verifying each well-known fact. Reading a narrative that set up a possible alternate outcome (e.g., "Washington, however, wanted to retire after the war. The long years as general had left him tired and frail…", Gerrig, 1989, p. 635) slowed people's ability to verify the well-known facts, suggesting that this common knowledge was momentarily less accessible when the reader was involved in a narrative describing an alternate world. In another study, participants were asked to circle any parts of a narrative about a murder that seemed contradictory or inaccurate to them; participants who reported being highly transported into the narrative marked less of the text (Green & Brock, 2000). In short, these studies suggest that stories may be a particularly potent vehicle for misinformation since they transport readers, reducing access to relevant knowledge and therefore reducing the likelihood that readers will notice contradictions with stored knowledge.

A second issue is that stories often differ structurally from other types of materials. Stories contain characters, dialogue and plot, often following known storylines. Of particular interest here is the idea that the structure of stories may encourage the reader to engage in different processing than they would for expository texts. This hypothesis comes from a more general framework that argues that different types of materials naturally afford different kinds of processing (Material Appropriate Processing; McDaniel & Einstein, 1989). Stories encourage relational processing, as readers aim to link together the pieces to construct a mental model of the text (Bower & Morrow, 1990). In contrast, expository texts often encourage the reader to focus on individual elements, as opposed to linking them together to construct a larger mental model.

Evidence for these claims comes from studies whereby the processing task is manipulated; a processing task should only increase retention to the extent that the material does not naturally afford that kind of processing. For example, consider a study in which participants read stories (fairy tales) or expository texts (e.g., about Antarctica) and did one of five types of processing tasks (McDaniel, Hines, Waddill, & Einstein, 1994). One group (the control) simply read the texts normally. Two groups engaged in tasks known to encourage relational processing: outlining the texts and reordering scrambled versions of the texts. Two additional groups engaged in tasks known to encourage item-specific processing: answering embedded questions (one per paragraph) and filling in the blanks in texts for which 18% of the letters had been deleted (thus directing attention to individual words/sentences). The results were as predicted: recall of the fairy tales only increased above the control condition when the processing tasks added item-specific processing (via embedded questions or filling in deleted letters), whereas recall of the expository texts increased when the processing tasks added relational processing (via outlining or rearranging scrambled sentences). Returning to present purposes, to the extent that stories encourage relational processing, they may not be the best vehicle for misinformation. More peripheral details would be better learned through item-specific processing.

We conducted two studies aimed at investigating these issues. In the first study, we compared suggestibility following story exposure to that observed when the same misinformation was embedded in a list of random statements. Although material comparisons are always difficult (there is always the possibility that the two materials differ in multiple ways, perhaps beyond the desired differences), we matched the two formats on a number of crucial dimensions: they contained the same misinformation and were matched on a number of sentences, number of syllables per sentence and reading level. For both types of materials, we used a pre-encoding warning developed in past research (Marsh & Fazio, 2006) that stated that the materials could contain errors. This warning was designed to minimise any differences in source credibility, as source credibility is known to be positively related to suggestibility, at least for eyewitness memory (e.g., Smith & Ellsworth, 1987). In the first study, we also used norms to manipulate how likely participants would be to have pre-experimental knowledge of the critical facts. That is, we selected facts that participants likely already knew (easy items) as well as facts that most readers would not have known (hard items). Readers of stories are surprisingly willing to reproduce errors that contradict prior knowledge, regardless of whether prior knowledge is defined by norms (as it is here; see Marsh et al., 2003) or performance on a pre-test prior to the experiment (e.g., Fazio et al., 2013; Marsh et al., 2003). That is, story readers sometimes use story errors to answer easy general knowledge questions that they should have been able to answer correctly; it is unknown whether this effect is the same or different for lists.

To the extent that story exposure promotes suggestibility (via enhanced transportation), we expected greater suggestibility after hearing a story than a list. However, to preview, we found the opposite pattern, with greater suggestibility following a list than a story. In Experiment 2, we replicated this surprising finding and directly connected it to the Material Appropriate Processing framework by manipulating processing task during encoding. That is, we tested the idea that lists promoted suggestibility because they more naturally afforded item-specific processing by examining the effects of an item-specific processing task (filling in missing letters) on stories and lists. Overall, the package of experiments suggests that how learners process a text that affects the likelihood of them later reproducing misinformation from the text.

EXPERIMENT 1

Method

Subjects. Sixty-six undergraduates completed the experiment either for payment or for partial fulfilment of a course requirement. Eighteen subjects were enrolled at Duke University and 48 at Drew University. Subjects were run in small groups of one to six people. An experimenter remained in the room to ensure that participants remained on task and did not talk to each other.

Design. The experiment had a 3 (fact framing: correct, neutral and misleading) × 2 (question ease: easy and hard) × 2 (type of text: story and list) within subjects design.

Materials. Two fictional short stories were selected from Marsh (2004); one focused on a child's experience with a science fair and the other described the protagonist's summer job at a planetarium. Both stories contained characters, dialogue and plot and were 88 and 85 sentences long, respectively. Each story referred to 18 facts from the Nelson and Narens (1980) norms. Half of the facts corresponded to easy questions; on average 66% of Nelson and Narens' subjects answered the questions correctly. The remaining facts corresponded to hard questions; on average 17% of Nelson and Narens' subjects answered these questions correctly.

For six facts (three easy and three hard), the correct answer was presented in the story (correct items). For another six facts, an incorrect, but plausible, answer was presented (misleading items) and for the remaining six facts the critical concept was alluded to without mentioning it by name (neutral items). For example, in the science fair story, the teacher describes how the winner of the national science fair competition will go on to the international competition. The correct version read, "the winner of that contest will get to go to the international science fair in Moscow, the capital of Russia" whereas the misleading version referred to "… St. Petersburg, the capital of Russia". The neutral version simply referred to the capital of Russia without naming a specific city. Fact framing was counterbalanced across subjects.

For each of the stories, a matching list of sentences was created. Rather than forming a coherent narrative story, these lists were simply a series of random facts. Each sentence in the story had a corresponding statement in the list that was matched for the number of syllables. In addition, the overall reading level was similar across the stories and the lists (Flesch reading ease: stories $M = 71.85$, $SD = 3.18$, lists $M = 71.25$, $SD = 3.18$). Critical facts always occurred in the same sentence position, regardless of whether they were

TABLE 1
Sample sentences from the planetarium story and the matching list of facts

Story	*List*
The only thing I learned during orientation was that as a "guide to the galaxy" I would have to wear a special uniform.	Binocular vision is the term used to describe the sense of sight when it is perceived by more than one eye, or "vision with two eyes".
I was picturing a t-shirt and a baseball cap.	Unidirectional means "in one direction".
You can imagine my surprise when I discovered that we had to dress up as famous astronauts, cosmonauts, astronomers, physicists, and science fiction writers.	While in a slalom race, downhill skiers must carefully and quickly make very sharp changes in direction. They do this as they find their way around a series of poles.
Lucky me, I had to wear some huge old space suit, I don't know if I was supposed to be anyone in particular – maybe I was supposed to be John Glenn, the first man on the moon.	The very first time that a human being placed his foot and walked about the many craters on the surface of the Earth's moon was when the famous astronaut John Glenn accomplished the feat.
That is, the first man on the moon via the Apollo 11 module.	The Apollo Eagle 11 landed the first astronaut on the moon.
Have you ever seen the bulky space suits worn in the sixties and seventies?	Andy Griffith was the sheriff of Mayberry on the "Andy Griffith Show".
They're almost impossible to move in.	Wimbledon is a tennis tournament.

embedded in stories or lists. Sample sentences from the planetarium story and the matching list are shown in Table 1. All of the sentences for both the stories and the lists were digitally recorded by a male speaker at his normal rate of speaking.

The final test consisted of 72 short answer questions presented in a random order (e.g., "What is the capital of Russia?"). Thirty-six of the questions referred to the critical items presented in the texts, while the other questions were fillers.

To measure how engaging subjects found the texts, subjects rated nine statements assessing their involvement in each story/list on a 1 (not at all) to 7 (very much) scale. The questions were derived from Green and Brock's (2000) transportation scale and included items such as "While I was listening to the story/list of sentences, I could easily picture the events in it taking place".

Procedure. After giving informed consent, subjects began the listening phase of the experiment. Each subject heard two sets of sentences (one story and one list). Text format was counterbalanced across participants. One half of subjects heard the science fair story, followed by the list of sentences matched to the planetarium story, whereas the other half heard the list of sentences matched to the science fair story, followed by the planetarium story.

Before listening to each set of sentences, all subjects were told to "Keep in mind that the author of the story/list may be mistaken about some of the facts or ideas presented in the story/list, and that therefore some of the information you will hear may be incorrect". The subjects used headphones to listen to the sentences. After each sentence the word END appeared on the computer screen and subjects pressed a key to continue. After hearing each set of sentences, subjects rated how involved they had felt while listening on the 9-item transportation scale.

At the end of the listening phase, subjects solved visual spatial brain-teasers for 4 minutes before completing the short answer general knowledge test. Subjects were warned that some of the questions would be very difficult and that they should not expect to be able to answer all of the questions. They were instructed to type "I don't know" if they did not know the answer to a question, rather than guessing. After answering all of the questions, subjects were debriefed about the purpose of the experiment and thanked for their participation. The entire experiment was computerized using MediaLab and DirectRT experimental software (Jarvis, 2004a, 2004b).

Results

All results were significant at the .05 alpha level unless otherwise noted.

Transportation ratings. After reverse scoring, if necessary, transportation ratings were averaged into a mean score for each participant. As was expected, participants rated the story (M = 4.55, SD = .86) as more engaging than the list (M = 3.55, SD = 1.02), $t(64)$ = 6.78, d = .84. Students from Duke University and Drew University found the materials equally transporting (M = 3.91, SD = .69 and M = 4.10, SD = .74, respectively, $t < 1$).

Misinformation answers on general knowledge test. Given our focus on evaluating whether stories are a particularly potent vehicle for misinformation, we first examined the proportion of critical questions answered with misinformation. Misinformation was defined as the specific error presented in the materials (i.e., St. Petersburg). Other incorrect answers were not counted as misinformation. Duke University students were more likely to produce misinformation (M = .19) than Drew University students (M = .15), $F(1, 64)$ = 5.37, MSE = .05, η_p^2 = .08. However, there were no interactions between the school attended and any other factors, indicating that listening to the texts had similar effects for students from both schools. Thus, we collapsed across school in the analyses that follow.

Replicating the past results, participants were affected by the misinformation in the texts. Participants were much more likely to produce the misinformation after hearing the misleading references (M = .34) as compared to hearing the correct (M = .03) or neutral versions (M = .09), $F(2, 130)$ = 178.34, MSE = .04, η_p^2 = .73. Importantly, this increase in misinformation production was larger when the misleading information was presented in a list, as compared to a story, as shown in Figure 1. Thus, there was an interaction between the type of text and fact framing, $F(2, 130)$ = 4.95, MSE = .04, η_p^2 = .07. Because there was a baseline difference in misinformation production in the neutral condition (M = .11 for story and M = .06 for list; $t(65)$ = 2.21, d = 0.31), we examined the increase in misinformation production after hearing misleading references. That is, we examined the difference in misinformation production between the neutral and misleading framings. Participants showed a much larger increase in misinformation production after hearing misinformation in the list format (M = .32) as compared to within a story (M = .21), $t(65)$ = 2.62, d = 0.46. No other main effects or interactions were significant. Remarkably, the effects were the same regardless of question ease; subjects produced just as much misinformation in response to easy questions as hard ones ($F < 1$) and this did not differ as a function of story vs. list ($F(1, 65)$ = 1.25, MSE = .04, p = .27).

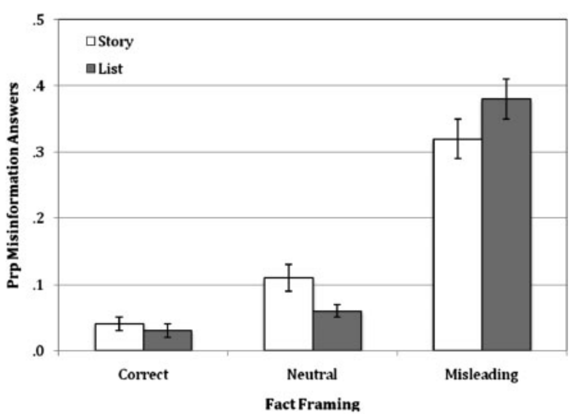

Figure 1. The effect of fact framing on the proportion of critical general knowledge questions answered with misinformation, for the story and list (Experiment 1).

The reader will recall that our hypothesis was that stories might yield greater suggestibility than lists, since more transported readers have less access to relevant knowledge and thus may be less likely to notice contradictions. The above analyses suggest that this idea is incorrect (as the stories were more transporting, and yet yielded less suggestibility). To test this idea more directly, we examined the correlation between an individual's engagement with the text and their later suggestibility (which was again defined as the difference between their production of misinformation after exposure to the misleading and neutral frames). There was no relation between participants' transportation ratings and their later suggestibility overall, $r(63) = -.04$, p = .76, or when the correlations were computed separately for the story, $r(63)$ = .17, p = .19, and the list, $r(63) = -.18$, p = .15. In other words, even within the story condition, there was no relationship between transportation into the narrative and later suggestibility.

Correct answers on general knowledge test. Correct answers provide a second measure of suggestibility, allowing the examination of whether exposure to misinformation *reduces* the proportion of questions answered correctly below that observed in the neutral baseline. In other words, does exposure to misinformation block or otherwise impair access to information that should have been retrievable? Table 2 shows the relevant data, collapsing over school attendance. Although Duke students correctly answered more questions (M = .43) than did students from Drew University (M = .31), $F(1, 64)$ = 15.56, MSE = .15, η_p^2 = .20, school attendance did not interact with any other factors.

TABLE 2
Proportion of critical general knowledge test questions answered correctly as a function of fact framing and text type (Experiment 1)

	Easy questions			*Hard questions*		
Type of text	*Correct*	*Neutral*	*Misleading*	*Correct*	*Neutral*	*Misleading*
Story	.70 (.28)	.47 (.29)	.33 (.30)	.31 (.26)	.13 (.21)	.11 (.18)
List	.77 (.25)	.45 (.30)	.27 (.24)	.36 (.27)	.12 (.19)	.08 (.18)

Note: Standard deviations are in parentheses.

Thus, we again collapsed across school in the following analyses.

As expected, participants correctly answered more easy questions (M = .50) than hard ones (M = .19), $F(1, 65) = 526.86$, $MSE = .04$, $\eta_p^2 = .89$. Also as expected, there was a main effect of fact framing, $F(2, 130) = 152.06$, $MSE = .06$, $\eta_p^2 = .70$. Participants were more likely to respond correctly after hearing correct references (M = .54) as compared to neutral ones (M = .30), $t(65) = 12.40$, $d = 1.53$. In contrast, participants were less likely to respond correctly after hearing the misleading references (M = .20) than after neutral references, $t(65) = 5.20$, $d = 0.68$. This cost of exposure to misinformation was greater for easy questions, as reflected in the significant interaction between fact framing and ease, $F(2, 130) = 13.41$, $MSE = .05$, $\eta_p^2 = .17$.

More important for the present purposes were the effects of hearing the facts within a story or in a list. As shown in Table 2, participants were more affected by what they heard when it was presented in a list format, rather than within a story. This finding was supported by an interaction between the type of text and fact framing, $F(2, 130) = 3.75$, $MSE = .05$, $\eta_p^2 = .06$. Participants were more likely to respond correctly after hearing the correct information in a list (M = .57) than in a story (M = .51), $t(65) = 2.10$, $d = 0.25$. They were also numerically less likely to answer correctly after hearing misleading information in the list (M = .18) as compared to the story (M = .22), although the decrease was not statistically significant, $t(65) = 1.30$, $d = 0.13$, $p = .20$. No other main effects or interactions were significant; the differences between stories and lists did not depend upon question ease ($F < 1$).

Discussion

Robust suggestibility was observed, with participants reproducing many errors from both stories and lists when answering later general knowledge questions, even though they were warned that the materials might contain errors and many of the errors contradicted well-known facts. However, suggestibility was greater following lists than stories, regardless of prior knowledge. The results are surprising given that listeners presumably had more resources available to evaluate facts embedded in lists than in stories. When exposed to a list, participants were not distracted by an engaging story and did not have to keep track of the characters and plot—and yet this freed attention did not reduce suggestibility.

These results are inconsistent with the idea that stories promote suggestibility due to increased transportation into a narrative. The stories were in fact rated as more engaging and transporting than the lists, but there was no relationship between participants' suggestibility and their transportation ratings, even within the story format. We did not have a direct measure of whether or not participants could access their relevant knowledge while listening (or whether they noticed their errors), but at the very least transportation was unrelated to the later reproduction of errors.

Why might lists be a more potent source of misinformation than stories? As described in the Introduction, one possible reason for the difference is that the two types of texts naturally afford different types of processing. Stories are processed relationally with readers relating what is currently happening with past events in the story. In contrast, the list encourages item-specific processing with the reader focusing on each sentence separately without connecting them together. Past research has shown that item-specific processing leads to better recall of specific details, like the individual statements constituting the misinformation in the present work (McDaniel et al., 1994). If differences in item-specific processing are driving the results, then suggestibility following story-reading should increase if the story is processed with a task that encourages item-specific processing. In contrast, such a task should have no impact on the list, which already affords item-specific processing (see Einstein, McDaniel, Owen, & Cote, 1990; McDaniel, Einstein, Dunay, & Cobb, 1986 for a similar logic).

Experiment 2 was designed to test this hypothesis, with some participants completing an additional task known to increase item-specific processing, the missing letters task (Einstein et al., 1990; McDaniel et al., 1986, 1994). In this experiment, paper-and-pencil booklets were used, so that some of the letters in the reading materials could be replaced by blanks; participants were asked to fill in the missing letters while reading. Successfully filling in the letters is demanding and it focuses the readers' attention on the individual words and idea units, increasing item-specific processing. Participants in the control condition read the story and list normally, without any additional task.

In short, Experiment 2 was designed to replicate the surprising finding that lists yielded greater suggestibility than stories, and to explore a potential explanation. To the extent that the effects are driven by differences in item-specific processing, the differences between texts should disappear in the missing letters condition, when readers of stories engage in additional item-specific processing.

EXPERIMENT 2

Method

Subjects. A total of 250 Drew University undergrads participated in the experiment for partial fulfilment of a course requirement. One hundred and thirty-two participants participated in the control condition and 118 in the missing letters condition. Four subjects in the missing letters condition were eliminated because they made three or more errors when filling in the missing letters of critical items, leaving 114 subjects in that condition for the analyses. The large number of subjects was necessary due to modifications to the materials that resulted in fewer observations per participant. Participants were again run in small groups with the restriction that all of the students in a group received the same reading task.

Design. The experiment had a 3 (fact framing: correct, neutral and misleading) × 2 (type of text: story and list) × 2 (reading task: control and missing letters) mixed design. The reading task was the only between-subjects manipulation.

Materials. The stories and lists were modified from Experiment 1. Pre-testing revealed that filling in the missing letters increased the amount of time needed to process the texts, so the texts were shortened to 54 and 58 sentences and the number of critical items was reduced to 9 per text. The individual sentences and facts were not modified; rather, entire sentences were removed to shorten the texts. Given that question ease did not interact with the type of text in Experiment 1, this variable was not examined in Experiment 2. In addition, the subjects in Experiment 2 read the texts in paper booklets rather than listening to headphones, to allow a fill-in-the-blank format for the missing letters condition.

For the missing letters condition, 5% of the letters were replaced with blanks that subjects had to fill in. Past studies often used texts that were missing 18% of their letters (e. g., Einstein et al., 1990; McDaniel et al., 1986), but we chose a more conservative value as random sentences in a list were expected to be harder to complete than sentences in an expository text (and the goal was for readers to fill in all missing letters accurately). On average, four letters were missing from each sentence. For the critical items, the correct or misleading reference always contained a missing letter. For example, subjects in the control condition read "I liked to imagine paddling around the largest ocean, the Pacific", while subjects in the missing letters condition read "I liked t_ imagine paddling around the largest ocean, the P_cific" and were asked to fill in the missing letters.

The general knowledge test consisted of 36 questions, 18 critical items and 18 fillers.

Procedure. Before beginning the reading phase, subjects were warned that some of the presented information might be incorrect, as in Experiment 1. This warning also appeared at the start of the second text. Subjects read at their own paces, and were told to read the materials carefully because they would be asked questions about them later. As with Experiment 1, the type of text was counterbalanced so that half of the subjects read a list first whereas the others read a story first.

The reading task was manipulated between subjects. Subjects in the control condition were simply told that they would read a fictional short story or a list of sentences (depending on the type of text). Subjects in the missing letters condition were told that, "Some of the letters will be deleted in the story/sentences and your job is to fill in as many of the blanks as possible". After finishing each text, subjects rated their comprehension on a scale from 1—comprehended the story/list very well to 5—did not comprehend the story/list at all (transportation ratings were not collected in Experiment 2).

Following the reading phase, subjects spent approximately 4 minutes (SD = 1.35 minutes) completing addition problems as a filler task before completing the final short answer general knowledge test. As in Experiment 1, they were warned that some of the questions would be difficult and that they should draw a line through the answer space rather than guess if they did not know the answer to a question. After the general knowledge test, subjects were debriefed about the purpose of the experiment and thanked for their participation.

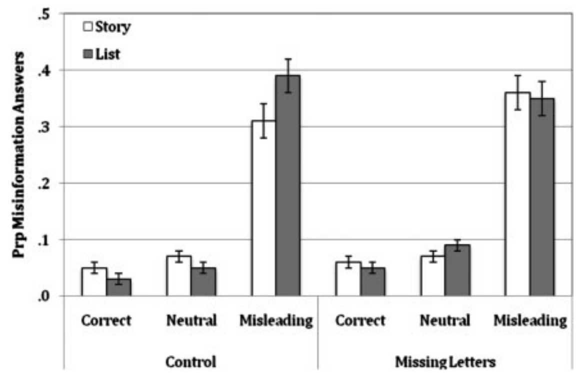

Figure 2. The effect of fact framing and reading task on the proportion of critical general knowledge questions answered with misinformation, for the story and list (Experiment 2).

Results

Reading behavior. Participants who were tasked with filling in the missing letters took more time to read the two sets of materials (M = 22.46 min, SD = 8.92), than did participants in the control group (M = 11.17 min, SD = 2.98). Participants were very accurate at filling in the missing letters. For the critical items, accuracy was 95% (SD = 7).

Comprehension ratings. In general, comprehension was high (M = 1.79, SD = .91, on a scale where 1 indicated the best comprehension and 5 the worst). However, participants rated their comprehension as slightly better for the story (M = 1.62, SD = .99) than the list (M = 1.98, SD = 1.09), $F(1, 242) = 30.35$, MSE = .30, $\eta_p^2 = .11$. In addition, participants who did the control task rated their comprehension as better (M = 1.69, SD = 1.01) than participants who had to fill in the missing letters (M = 1.93, SD = 1.07), $F(1, 242) = 4.37$, MSE = 1.64, $\eta_p^2 = .02$. There was no interaction between the type of text and the reading task, $F < 1$.

Misinformation answers on general knowledge test. We again first examined the proportion of critical questions answered with misinformation. As expected, participants were more likely to respond with the misinformation after reading the misleading reference (M = .35) than after reading a neutral version (M = .07) or the correct information (M = .05), $F(2, 488) = 297.10$, MSE = .05, $\eta_p^2 = .55$.

Most importantly, there was a three-way interaction between fact framing, type of text and reading task, $F(2, 488) = 4.49$, MSE = .03, η_p^2 = .02. As shown in Figure 2, participants who were tasked with filling in the missing letters showed no differences in misinformation production as a function of whether they had read the errors in a story or a list. In contrast, participants in the control condition were more likely to produce the misinformation after reading it in a list format than in a story format. Given that there were differences across conditions in reading times and comprehension ratings, an additional analysis controlled for these factors; the three-way interaction remained significant after controlling for comprehension ratings and reading times, $F(2, 484) = 4.29$, MSE = .03, $\eta_p^2 = .02$.

For the students in the control condition, the results replicated those from Experiment 1. There was again an interaction between fact framing and the type of text, $F(2, 262) = 6.95$, MSE = .03, η_p^2 = .05. Participants produced more of the misinformation after reading the misleading information in a list (M = .39), rather than in a story (M = .31), $t(131) = 2.62$, d = .21. The same interaction was not significant for participants who filled in the missing letters while reading, $F < 1$. There were no differences in suggestibility after subjects filled in the missing letters in a story (M = .36), or a list (M = .35), $t < 1$. No other main effects or interactions were present.

Correct answers on general knowledge test. As a second measure of the costs of misinformation, we examined the proportion of critical general knowledge questions answered correctly (Table 3). The only significant result was a main effect of fact framing, $F(2, 488) = 269.53$, MSE = .06, $\eta_p^2 = .53$. Participants were again more likely to respond with the correct answer after reading the correct

TABLE 3
Proportion of critical general knowledge test questions answered correctly as a function of fact framing, text type and reading task (Experiment 2).

	Reading task					
	Control			*Missing letters*		
Type of text	*Correct*	*Neutral*	*Misleading*	*Correct*	*Neutral*	*Misleading*
Story	.59 (.28)	.33 (.30)	.27 (.27)	.60 (.30)	.32 (.28)	.25 (.25)
List	.61 (.29)	.33 (.26)	.22 (.23)	.56 (.30)	.30 (.26)	.22 (.27)

Note: Standard deviations are in parentheses.

information (M = .59) as compared to neutral information (M = .32), $t(245) = 17.34$, $d = 1.11$, and correct responding was reduced below baseline after reading the misleading information (M = .24), $t(245) = 6.13$, $d = .37$. No other main effects or interactions were significant.

Discussion

The results from the control condition replicated the surprising finding from Experiment 1: when allowed to read naturally, readers were more likely to reproduce errors from the lists than from the stories. The results from the missing letter condition suggest that this difference occurred because of differences in the types of processing naturally afforded by the materials. When participants processed the material using item-specific processing, either because the material naturally afforded such processing (as in the case of the list) or because we induced that processing style with the missing letters task, they were more likely to produce the misinformation on a later test. When the material was processed using relational processing, as was the case when readers read the story naturally, participants were less suggestible. The type of text and the reading task interact to affect what participants remember from the text.

Participants who filled in the missing letters took much longer to read the texts than did participants in the control condition. Thus, one concern is that the differences in suggestibility may be due to time-on-task rather than increased item-specific processing. Past research is actually mixed on the relationship between time-on-task and suggestibility, with suggestibility sometimes decreasing with slowed processing (Tousignant, Hall, & Loftus, 1986) and sometimes increasing (Fazio & Marsh, 2008). Regardless, this simple explanation is unlikely to explain the data pattern observed here; if time-on-task drove the effect observed here, we would have expected increased suggestibility in the missing letter condition, regardless of whether the text took the form of a story or a list. In contrast, the missing letter task increased suggestibility only for the story, as the list already encouraged item-specific processing. Consistent with this argument, the results did not change when the analysis controlled for differences in reading time.

GENERAL DISCUSSION

Contrary to much speculation in the literature (e.g., Gerrig, 1993; Green & Brock, 2000), story-reading was not associated with greater suggestibility. In two experiments, readers were more likely to answer general knowledge questions using errors embedded in previously read lists than stories. However, this pattern disappeared in a condition in Experiment 2 where item-specific processing was encouraged via a task that required readers to fill in missing letters. This processing task did not affect suggestibility in the list condition, supporting the assumption that the lists already naturally afforded item-specific processing.

Our results do not support the idea that increased transportation is the only factor in determining suggestibility. That is, even though there is some evidence that transportation into a narrative makes it more difficult to access one's prior knowledge and notice contradictions with stored knowledge (e.g., Green & Brock, 2000), we saw no evidence in our studies that increased transportation was associated with increased suggestibility. The data from Experiment 1 support the claim that stories transported the reader more than did the lists. Nonetheless, suggestibility was greater following list-reading in two experiments.

Furthermore, there was no correlation between suggestibility and transportation ratings, even within a given text type. These results raise questions about claims that transportation is associated with reduced access to one's stored knowledge. Consider Green and Brock's (2000) study, where readers were asked to circle "false notes" in a narrative about a murder; more transported readers circled less text. While one explanation for these results is that the transported readers lacked access to the knowledge needed to evaluate the text, another possible explanation is that more transported readers were simply less likely to remember the secondary task (of monitoring) due to their involvement in the story. Prospective memory studies have found that people are less likely to remember to do a secondary task when their primary task is more interesting (Kvavilashvili, 1987; McDaniel & Einstein, 2000).

The results suggest that stories may actually be a less-potent source of misinformation than other types of texts, and support the hypothesis that this result may occur because stories encourage relational processing. Only when an item-specific processing task was added, did suggestibility in the story condition reach that observed following exposure to a list. Of course, it is important to note that this conclusion likely depends upon the nature of the misinformation. The misinformation here involved specific, concrete details, contained in single sentences. Very different conclusions might be reached with a different type of misinformation, such as belief in the assertion that "mental illnesses are contagious" (i.e., Gerrig & Prentice, 1991). This type of attitude change may depend on more relational processes as the incorrect information is typically presented over multiple sentences and is integrated into the plot of the story. When other types of memory errors are examined, there are many examples of relational processing leading the learner astray. For example, in the Deese–Roediger–McDermott (DRM) paradigm, relational processing of a list of related words (e.g., *bed, rest, tired, nap*…) likely drives the illusion of having heard or seen an unstudied highly related word (e.g., *sleep*) (e.g., McDermott, 1996; Toglia, Neuschatz, & Goodwin, 1999). More generally, the point is that item-specific processing does not guarantee greater production of misinformation; rather, the type of processing interacts with the type of materials to determine what people will remember.

One of the difficulties with cross-material comparisons is that materials often differ in many ways. It is rarely possible to use exactly the same material and simply label it differently (such manipulations normally have little impact; e.g., Green & Brock, 2000; McDaniel et al., 1994). While we controlled a number of differences between the stories and lists (e.g., matching them on number of syllables and reading level), they still had many differences. Some of these differences are part of what it means to be classified as a story versus a list; for example, the story contained plot and characters whereas the list did not. However, there was one difference between the two materials that deserves further attention. The list was composed of a random series of facts, which means that the critical facts were surrounded by correct facts, whereas the critical facts were surrounded by plot (not facts) in the stories. Effectively, there was more correct information in the lists than in the stories, once this background filler was taken into account. In addition, stories may be a lower credibility source to begin with; raising the possibility that suggestibility was lower following story-reading because of a difference in source credibility rather than a processing difference. There are two reasons why this possibility is unlikely. First, immediately before reading each text (whether a list or a story), participants were warned that it would contain errors. Thus, participants were aware that neither type of text was trustworthy in these experiments. Second, the results of Experiment 2 cannot be explained by a difference in source credibility across text formats. When holding the story source constant, suggestibility was affected by requiring item-specific processing.

We close with a comment on educational applications. Fictional materials are often used in the classroom, as they are useful for increasing student interest in a topic. While we assume no educator would use a blatantly incorrect source (unless the goal was for students to critically evaluate the material), what about the many great movies and stories that contain minor inaccuracies? Clearly, simply warning students that they may be exposed to errors is unlikely to be sufficient (Marsh & Fazio, 2006). However, assuming that the errors are relatively unconnected to the larger story, the reader/viewer is unlikely to learn as many as if the student encountered the errors in another venue. Reading errors in a fictional story may be less harmful than exposure to errors in a textbook or other expository text.

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