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How does imagery in interactive consumption lead to false memory? A reconstructive memory perspective

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Abstract

Consumers are often exposed to information that may contradict their consumption experience, leading to "false memory" for aspects of the consumption. We develop a theory suggesting why false memory may be heightened due to imagery processing. We subject this theory to a rigorous test in three experiments. We find that post-consumption imagery makes it more difficult to discern between consumption and misleading information thereby boosting false recall. Yet, imagery that is more consumption-based helps reduce consumers' susceptibility to false memory. Consistent with this notion, we explicate the role that attention plays at different stages of consumption in affecting false memory.

Consumers often encounter information that contradicts their consumption experience. Contradictory information may be seen while answering surveys or participating in message boards, online discussion groups and/or social networking sites. Even conversations with other consumers or salespeople may expose us to misleading information. Conventional wisdom suggests that consumption experiences lead to lasting impressions that are impervious to misinformation. Yet, anecdotal evidence offers evidence to the contrary. The commotion surrounding "unpatchable" flaws in the Firefox browser during an industry conference highlights this problem (Lyman, 2006). Although untrue, the speed with which news about this "problem" spread and the outpouring of concern among users—even after retraction of the report—underlines the potential effect of post-consumption misinformation on consumer memory.

Academic research demonstrates that exposure to misleading information leads to a post-consumption misinformation effect (Braun, 1999). Findings suggest that while evaluations are susceptible to misinformation, facts—especially those central to the consumption—may be immune (Braun, 1999; Cowley & Janus, 2004). However, conclusions about the immunity of facts centrally related to consumption are based on two implicit premises that may not generalize to a significant chunk of modern consumption. The first premise is that consumption is largely underpinned by reasoning-based or "discursive" information processing (e.g., ELM, Petty & Cacioppo, 1986; Schlosser, 2003, p. 184). The second, stemming from the first premise, is that when facts are judgments about the product, the centrality of a fact might even sharpen memory—possibly due to greater thought (e.g., Cowley & Janus, 2004).

Both these premises are subject to challenge when consumption-related information processing is seen from a broader, more inclusive viewpoint. Modern consumption spans both products that may be viewed from a discursive processing lens (such as food products, financial services, and consumer durables) and those that implicate imagery processing (e.g., Green & Brock, 2002; Wyer, Hung & Jiang, 2008) such as movies, video games, leisure parks and many forms of internet usage. With such products, imagery is not only an integral part of the consumption, but is also intertwined in various post-consumption behaviors. For instance, narrating the experience to a friend, posting on blogs, or responding to market research in these contexts would involve imagery. Indeed, previous research on web-based consumption suggests that inferences using a discursive lens may not readily generalize to imagery-rich environments (Schlosser, 2003). When consumption involves imagery, the centrality of a fact may not accord it any particular benefit (in terms of greater thought). This raises the question of memory resilience in such environments.

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In this paper we investigate the false memory problem using the misinformation experimental paradigm with interactive consumption as the imagery-based consumption context. We find that key facets of consumption may not only be susceptible to false memory, but—when post-consumption imagery is explicitly encouraged—also be heightened because it is difficult to monitor the true memory of consumption versus the images generated via imagery. Yet, imagery that is more focused on the consumption itself may help reduce consumers' susceptibility to false memory due to additional opportunities to discern between competing sources of information. Consistent with this notion, we find that attention devoted to the consumption at retrieval may help reduce false memory. Fig. 1 summarizes our conceptual model.

Reconstructive memory and the role of source monitoring

The broad theoretical framework guiding false memory research is the idea of reconstructive memory (Bartlett, 1932). This framework suggests that we do not necessarily retrieve our memories about previous events in a manner similar to replaying a video recording. Rather, our seemingly veridical memories are *reconstructed* from different pieces of information accessed on the basis of retrieval cues. Thus it might include pieces of the picture that have been inferred from the rest of the information available to us. The false memory effect is one specific manifestation of this process whereby post-consumption stimulus information is integrated into the memory for the consumption event during (a later) reconstructive process.

Source monitoring theory (Johnson, Hashtroudi, & Lindsay, 1993) may help explain how misinformation seen after consumption becomes integrated with consumption memory. This framework has been used to explain misidentification of event sponsors or brands in advertisements (Johar & Pham, 1999; Pham & Johar, 1997). Johnson et al. (1993) define source monitoring as the set of processes involved in making attributions about the origins of memories, knowledge and beliefs. A failure in source monitoring leads to misattribution between information remembered from a consumption episode versus post-consumption information (such as ads, word of mouth or even erroneous questions). This, in turn leads to the merging of post-consumption information into consumption memory leading to the misinformation effect. Thus, the mix-up between post-consumption information and memory for the consumption occurs because of failure to accurately monitor the *source* of each piece of information.

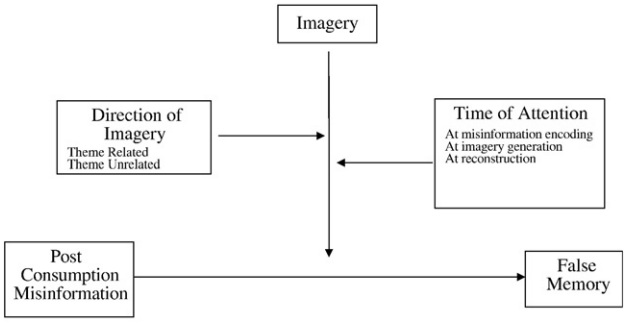

Fig. 1. Conceptual Model.

Experiment 1: Imagery processing and reconstructive memory

Imagery-based consumption and source monitoring

Mental imagery has been the subject of inquiry in numerous consumer contexts. A core finding is that imagery enables consumers to generate, interpret and manipulate information through spatial representation (Dahl, Chattopadhyay, & Gorn, 1999). According to Dahl et al. (1999), mental images can stem from past experience or from our imagination. Given that the experienced and the imagined share high levels of perceptual detail, imagined experiences may appear as real as true ones (Dahl et al., 1999; Mitchell & Johnson, 2000). Further, the presence of mental images sharing a high level of similar perceptual detail should enhance the likelihood of source misattribution (Schacter, 1996).

In most consumption, discursive and imagery processing occur in parallel (Epstein, 1991). However, in non-interactive consumption, discursive processing may be expected to dominate (Schlosser, 2003). In such situations, a central either/or fact—for example, whether a juice is grapefruit or orange—is salient and easy to monitor while less tangible observations (such as how sweet or "orangey" a juice was) are more difficult to pin down. When customers encounter contradicting information after consumption, source misattribution is less likely for the fact. Indeed, presentation of misinformation may in fact, lead to a sharpening of memory—a pattern found by Cowley and Janus (2004).

This situation, however, changes quite dramatically when processing is imagery-based as in many interactive contexts (e.g., Holbrook & Hirschmann, 1982) or evaluation of new products (e.g., Zhao, Hoeffler, & Dahl, 2009). In such contexts, consumers generate vivid mental images during consumption. When new target relevant (albeit misleading) information is presented afterwards, the availability of a vivid and embellished mental record of the consumption episode allows for easy integration of this new information with the experience (Jacoby, Hessels, & Bopp, 2001). This integration is the basis for possible source attribution errors during recall (see Fig. 2). Further, the eyewitness testimony literature suggests that in situations where the memory of an imagined event contains a wealth of detail about the context, individuals are more likely to believe that it is a real memory of a true event (Schacter, 1996, p. 116). Thus, source monitoring errors are more likely in richer, more embellished, rather than impoverished contexts since it is easier to "fill in" missing pieces (Bartlett, 1932). Combining the above:

H1a. In imagery-rich consumption contexts, exposure (versus no exposure) to misinformation leads to higher false recall of consumption-related facts.

Extended imagery and source monitoring

Consider now when imagery processing is explicitly encouraged after consumption. The process of generating

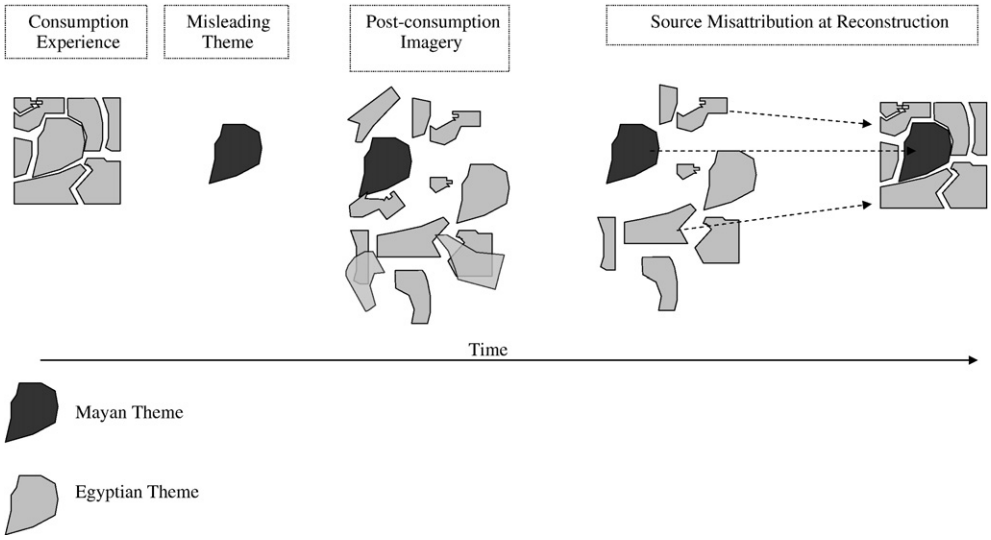

Fig. 2. Conceptual overview of process.

imagery after consumption involves the use of a consumption-related locus that is accessed from short-term memory. Further, the type of imagery encouraged after consumption may influence the locus chosen. When imagery engenders building a new story involving the product, it is likely that the most recently encountered product-relevant information forms the locus for imagery. Given that the misinformation was most recently seen, it is likely to be more accessible and thus, form the basis for imagery generation.

With misinformation as the locus for imagery, the consumer is focused towards building a new mental narrative that is not as well connected with the initial consumption experience. Greater rehearsal of the misinformation during imagery generation leads to better availability of images associated with it and higher likelihood of these images being used for reconstruction later. We know from past research that imagery draws upon cognitive resources and diminishes their availability for other purposes (Unnava & Burnkrant, 1991; Unnava, Agarwal, & Haugtvedt, 1996). Since source memory is more difficult to maintain and retrieve than episodic memory, source misattribution is more likely under conditions of diminished cognitive resources (e.g., Johnson et al. 1993; Pham & Johar, 1997). This in turn, should heighten false memory. Thus, explicitly engaging imagery processing via extended imagery should lead to more false memory.

In contrast to imagery processing, encouraging discursive processing (say, via cognitive elaboration) has a lower propensity to generate a vivid memory trace of the experience. The relative paucity of vivid images makes the incorporation of misinformation less likely compared to when imagery processing is encouraged. Further, since there is no additional imagery being generated around misinformation, there are fewer misinformation-consistent images to monitor during elaboration and recall. However, since false memory in imagery-rich contexts stems from source confusion between images, encouraging cognitive elaboration after consumption does not by itself lead to better discernment between images. Hence, we expect explicit cognitive elaboration to lead to baseline levels of false memory comparable to groups where such elaboration is not experimentally manipulated. We posit the following hypotheses:

H1b. False recall will be higher for the imagery group compared to both the cognitive elaboration and control (no-elaboration) groups.

H1c. False recall will be equally likely for cognitive elaboration and the control group.

These effects appear similar to imagination inflation (e.g., Garry, Manning, Loftus, & Sherman, 1996) however the process differs in two important ways from the traditional views. First, in the imagination inflation paradigm, imagination is used to create a fictitious event which forms the misinformation. In our studies, imagination revolves around consumption and is not involved in creating the misinformation. This separates imagery as a style of processing versus as a creator of misinformation. The second difference pertains to false memory inflation due to imagination focused upon the misinformation (e.g. Braun, Ellis, & Loftus, 2002) versus imagery as a style of processing that underlies consumption. Braun et al. explicitly instruct participants to engage in imagination focused on the target (misleading) ad during ad exposure. In our procedure, consumption occurs without any such instruction. Imagery is engaged *after* consumption and incidental exposure to misinformation with no explicit focus on the misinformation.

These differences reflect our focus on first, separating imagery from the creation and elaboration on misinformation and second, on mapping onto real-world situations. For instance, in product testing consumers are often asked to draw upon their imagination to identify new uses or features. Alternatively, they may be encouraged to use imagery before product use with consequent effects on evaluations (Zhao et al., 2009). Thus, in practice, imagery processing is more likely to be temporally and conceptually dissociated from the creation of misinformation. Our procedure maps on to this practice as a way of building ecological validity.

Imagery in interactive consumption—process hypothesis

In addition to objective recall measures, we adopt subjective judgments of memory—the Remember/Know/Guess measures adapted from Tulving (1985) and used by Braun (1999) and Cowley and Janus (2004)—to interpret the process. These memory judgments provide clues with regard to the phenomenological aspects of remembering (Tulving, 1985). A "remember" judgment indicates a conscious re-experiencing of the original experience. It indicates that the memory is vivid in detail and extremely close to what the participant believes is her experience. In contrast, the "know" judgment relies on general knowledge gained possibly without consciously accessing the past. It relies more upon the conceptual information gleaned from the experience than the characteristics of the consumption episode. The "guess" option filters out random responses and indicates that participants have little access to the consumption memory.

In imagery-rich environments, cognitive elaboration should lead to more remember judgments compared to no-elaboration. This expectation stems from the notion that remember judgments are based on a re-experiencing of the original experience. Further, since imagery-based elaboration involves more vivid and embellished memory, remember judgments are even more likely (compared to cognitive elaboration). When consumers are subject to misinformation, greater familiarity of the misleading theme emerges due to its relative recency compared to the original theme encountered during consumption. This subjective feeling of familiarity is exacerbated due to elaboration and imagery which should lead to more remember judgments. In particular, the remember judgments should be the highest for imagery-based elaboration, followed by cognitive elaboration and then the no-elaboration condition. Thus, ironically, consumers are expected to report more veridical memory when they are most in error. Formally,

H2a. The likelihood of remember judgments will be highest when imagery-based elaboration is engaged and least when there is no-elaboration.

H2b. These likelihoods will be further heightened when consumers are exposed to misinformation (than when not) such that the greatest inflation will be when imagery is engaged and least when there is no-elaboration.

Methodology

Experimental paradigm

We articulated three criteria in designing Experiment 1 to test H1 and H2. First, the consumption context had to possess at least one factual aspect that was relevant to the consumption and could be misinformed. Second, it needed to allow for the possibility of presenting misinformation that was not evaluatively tinged (good/bad). Third, the consumption needed to map onto imagery-based information processing.

Based on a survey ($n=35$) and a pilot study ($n=97$), we narrowed down our experimental product to a puzzle/arcade computer game—Jewel Quest. To rule out involvement with the product category as an alternative explanation we used Novak, Hoffman, and Yung's (2000) scales for computer-mediated environments to measure interactivity and involvement (Likert ratings anchored at 1 = strongly disagree and 7 = strongly agree). The mean interactivity ratings were significantly higher than the scale mid-point ($M_{\text{interactivity}}=5.05$; t (96) = 9.03, $p<.00$) while involvement ratings were not ($M_{\text{involvement}}=3.92$; t (96) = .477, $p>.63$). Also, because this was a commercially available game we tested for prior exposure and found that a relatively low percentage of participants (<17%) had played the game.

Germane to our research, this product represents a popular form of leisure among younger consumers (the population from which we draw our sample) and with over $7 billion spent annually (ESA, 2007) offers an externally relevant context for this study. Prior research shows that for games, the theme plays a central role in consumption by helping consumers realize an immersive and imagery-rich experience (Martin, 2004). Jewel Quest possessed the attribute of having a central theme (a Mayan theme/storyline) that could be misinformed without inserting evaluative information. Further, because players are required to manipulate different kinds of icons and images to engage in game play, consumption was essentially imagery-based.

Design and procedure

The experimental design was a 2 (post-consumption misinformation: present, absent) × 3 (elaboration: no-elaboration, imagery, cognitive elaboration) between-subjects factorial administered to participants via a computer interface, MediaLab (Jarvis, 2006). To minimize demand, the cover story disguised the experiment as a product assessment study. Participants were informed that they would be trying out a gaming product, and subsequently asked for their reactions. Analyses indicated that none of the participants guessed the true intent of the study. Following a brief on-screen description of the game participants were directed to a screen containing the trial version of the game, which they played for four min. After an unrelated filler task, consonant with the cover story they were asked to assess the game. Unknown to them, this first set of questions was worded to include (not include) misleading information for the misinformation-present (absent) group.

Post-consumption misinformation

Consistent with our research objectives, we embedded misinformation on the central aspect related to the game—the theme—by appropriately wording the questions. Results from a pretest ($n=46$) confirmed that most participants (over 93%) were able to encode the theme (e.g., McCloskey & Zaragoza, 1985) and identify it correctly when asked to do so later. For the manipulation the theme was contradicted by indicating that the Egyptian civilization formed the backdrop for the play (as opposed to the actual Mayan civilization theme) via the question—"This Egyptian (Mayan) civilization themed game prompts you to uncover hidden treasures by matching icons—strongly disagree (1)/strongly agree (7)".

Elaboration manipulations

Following a filler task, one-third of the participants were instructed to picture themselves in a game tournament. In order

to engage participants' imagery we provided a narrative (see "transportation-imagery model", Green & Brock, 2000; Green & Brock, 2002) leading them via a set of statements into a fictitious tournament situation. They stepped through these statements at a self determined pace and were asked to complete the narrative using vivid images in their descriptions. Responses were coded for evidence of a self-referenced completion of the narrative implying mental imagery. Presence of first person accounts (such as "I did…." or, "I then moved the icons …."), and words indicating visual images (e.g. "I visualized myself as…." or, "…picture the scenario in my mind…") were coded as indications of engagement of imagery processing. More than 95% of the participants in this condition were found to have engaged in imagery processing.

In the cognitive elaboration condition, participants were asked to "reflect upon" the game they played. To encourage elaboration and to equate the time spent with the imagery condition, they were also asked to write down their thoughts about the game. Their responses were coded for presence of words indicating assessment of the game or the particular play episode, as well as judgments or descriptions of the game evidencing elaboration on the gaming experience. More than 95% of participants in this condition engaged in some form of cognitive elaboration.

Measures

The core memory measure was a free recall listing (adapted from Braun, 1999). Participants typed out single-word responses of what they remembered from the game playing experience. Two independent judges coded the responses for presence of the key word "Egyptian" (alpha = .93). Words/phrases that were variants, such as "Egypt", were also included. Disagreements were resolved by discussion. After free recall, all participants were shown the two themes—the misinformed, Egyptian theme and the original, Mayan theme—one by one and asked whether they recognized it as the game's theme (Y/N). After each response, they were asked to indicate their subjective judgment of memory—i.e., whether they remembered (R), knew (K) or were guessing (G).

Results

Recall

One hundred and ninety one ($n = 191$) students participated in the experiment in exchange for course credit. Since manipulations (presence vs. absence of contradictions; type of elaboration: no, imagery, cognitive) and dependent measures (presence of key theme words) are dichotomous variables, a categorical model was estimated on the data. Self reported gaming knowledge and gender were also modeled as control variables. A significant main effect for the misinformation factor lent support for H1a; false recall was higher among those exposed (35%) versus not exposed (3%) to the misleading Egyptian theme (Wald $\chi^2 = 41.8$, $p < .0001$).

Elaboration did not lead to a main effect (Wald $\chi^2 = 3.06$, $p > .21$). A significant interaction qualified the main effect of misinformation on recall (Wald $\chi^2 = 6.42$, $p < .04$). Planned contrasts show that, when misinformation was present, 51% of participants in the imagery condition falsely recalled the Egyptian theme compared to 29% in the no-elaboration (Wald $\chi^2 = 6.58$, $p < .01$) and 27% in the cognitive elaboration group (Wald $\chi^2 = 7.28$, $p < .01$). This result supports H1b. Consistent with H1c, there were no significant differences in false recall between the no-elaboration (29%) and cognitive elaboration groups (27%, Wald $\chi^2 = .05$, $p > .82$). As expected, there were no differences in false recall within the no-misinformation condition ($p > .20$).

Analyses conducted on participants' recall of the accurate Mayan theme are mostly consistent with false recall patterns. We observed a significant effect for the misinformation factor (Wald $\chi^2 = 15.97$, $p < .01$) such that participants exposed to the misinformation were less likely to recall the correct theme of the game (11% vs. 35%). The main effect for elaboration (Wald $\chi^2 = 3.28$, $p > .19$) and the interaction factor were not significant (Wald $\chi^2 = .54$, $p > .75$). The lack of a 'mirror-image' interaction observed for the misinformed theme is surprising, but could be because all participants had exposure to the accurate theme (Mayan) whereas only a subset of these were then exposed to the misleading information. This result is consistent with the co-existence hypothesis (e.g., Cowley & Janus, 2004) that these two competing themes are both encoded but imagery processing makes the more recent Egyptian theme more accessible and enhances availability at reconstruction.

To test whether imagery inflated recall and thus greater false reporting of the Egyptian theme, we conducted a two-factor categorical model to ascertain differences in overall recall (both accurate and inaccurate). The main effects and interaction were not significant ($ps > .20$). Participants were equally likely to recall a theme (Mayan/Egyptian) irrespective of the type of elaboration. Overall, 45% of participants in the no-elaboration group, 40% in the imagery group and 40% in the cognitive elaboration group reported a theme in free recall. As our earlier results show, which theme they recall is affected by the misinformation and elaboration factors (Table 1).

Recognition

The recognition patterns are consistent with the free recall results. More participants in the misinformation condition (falsely) recognized the Egyptian theme as the game's theme (80% vs. 25%; Wald $\chi^2 = 84.68$, $p < .001$). The elaboration factor was also marginally significant (Wald $\chi^2 = 4.06$, $p < .08$)

Table 1
Memory for misinformed theme in Study 1.

		No-elaboration	Imagination	Cognitive elaboration
Free recall	No misinformation	$.04_{a,A}$	$.00_{a,A}$	$.04_{a,A}$
	Misinformation	$.29_{b,B}$	$.51_{c,C}$	$.27_{b,B}$
Recognition	No misinformation	$.25_{k,K}$	$.18_{k,K}$	$.33_{k,K}$
	Misinformation	$.63_{l,L}$	$.92_{m,M}$	$.85_{m,M}$
Remember judgments	No misinformation	$.38_{r,R}$	$.25_{r,R}$	$.17_{r,R}$
	Misinformation	$.17_{r,R}$	$.59_{s,S}$	$.43_{s,S}$

Note. Lowercase letters different from each other represent comparisons across rows that are significantly different at the .05 level or less. Capital letters that are different represent comparisons across columns that are different at the .05 level or less.

as was the two-way interaction (Wald $\chi^2=5.43$, $p<.07$). Given misinformation, the imagery condition had the greatest likelihood of false recognition (92% of this group identified the Egyptian theme); followed by cognitive elaboration (85%) and the no-elaboration group (63%).

Later, when participants were exposed to the Mayan theme and asked the identification question again, those in the no-misinformation condition had little trouble in identifying the Mayan theme as the correct theme (over 85%) whereas those in the misinformation condition were significantly worse in identifying it (overall less than 60%; Wald $\chi^2=18.83$, $p<.001$). Further, within the misinformation group, correct identification of the Mayan theme was significantly lower for the imagery group vis-à-vis both the cognitive elaboration (40% vs. 63%; Wald $\chi^2=4.39$, $p<.04$) as well as the no-elaboration group (40% vs. 73%; Wald $\chi^2=9.91$, $p<.01$). The difference in recognition between the cognitive and no-elaboration groups was not significant (63% vs. 73%; Wald $\chi^2=1.06$, $p>.30$).

Memory judgments

To test H2 we estimated a categorical model on the remember judgments for the misleading theme, with the two manipulations as factors. Supporting H2a, we observed a main effect for the elaboration factor (Wald $\chi^2=7.97$, $p<.02$). On average, 27% of the participants in the no-elaboration condition, 42% in the imagery condition, and 30% in the cognitive elaboration condition indicated a remember judgment. The interaction statistic was also significant (Wald $\chi^2=22.10$, $p<.001$). In the no-misinformation condition, there were no differences between the participants (all Wald $\chi^2<1.5$, $ps>.23$) but in the misinformation condition, participants in the imagery and cognitive elaboration groups were more likely to indicate the remember judgment compared to the no-elaboration group (both Wald χ^2s>17, $ps<.001$). Directionally the imagery group reported a greater proportion of remember judgments than the cognitive elaboration group but this difference was not statistically significant ($p>.25$). H2b is therefore partially supported. Elaboration—both imagery-based as well as cognitive—led to greater familiarity and hence more remember judgments than the no-elaboration group.

Discussion

Experiment 1 results suggest that engagement of imagery heightens false recall as well as false recognition. Further, false recall is accompanied by greater likelihood of consumers judging their memories to have been remembered. Comparing false recall across three groups provides insight into the effect that different forms of information processing have upon memory in imagery-rich environments. Doing so adds to the growing literature contrasting the effect of imagery versus other styles of processing on judgment and affect (e.g., Schlosser, 2003; Wyer et al., 2008) by incorporating its impact on one important upstream variable—memory accuracy.

This study also extends prior research on imagination-driven false memory beyond the realm of autobiographical memory such as childhood experiences or life events (e.g., Garry et al., 1996; Mazzoni & Memon, 2003; Wade, Garry, Read, & Lindsay, 2002) to more common consumption contexts and more importantly, shorter time-spans. Further, given that consumption offers a variety of directions in which imagery may be engaged in—some involving the facet under attack—it is important to uncover how directed imagery affects false memory. The following section contrasts two types of imagery—theme-unrelated (as in Experiment 1) versus theme-related imagery—to investigate how directed imagery affects source monitoring and false memory.

Experiment 2: Mitigating false memory in imagery-rich environments

In imagery-rich environments, retrieved images may originate from experience or from imagination (Dahl et al., 1999). When post-consumption imagery is encouraged via the story completion scenario, the individual is focused upon creating a narrative with the product as its central element. The individual must pick the theme for developing this narrative. When the direction of imagery is theme-unrelated (as in Experiment 1), participants' focus on building a new story leads them to pick the most salient theme as the locus. In this regard, the misleading theme (embedded in the post-consumption survey) is more likely to be picked on account of its recency. Once picked, firstly, there is greater automatic rehearsal during imagery generation and secondly, more images associated with the false theme are generated, and thus made available for recall. Reliance on imagery also reduces availability of resources for source monitoring. At retrieval, consumers are likely to make source attributions consistent with the misinformation embedded in their narrative (Green & Brock, 2000) rather than the consumption episode.

In contrast, when imagery generation involves developing a narrative with the theme as the primary locus (i.e., imagery is theme-related), in addition to the misinformation, the game-consumption episode is also likely to be brought to mind as a source of theme information for building the narrative. Because the consumption episode is more likely to be brought to mind it is relatively more likely for the theme encountered in the consumption episode to be used for imagery generation. Further, due to the generation of images that are consumption-related, the original game experience is more likely to be integrated with post-consumption imagery, an integration that does not occur when imagery generation is theme-unrelated. In turn, this reduces the likelihood of the misinformed theme being used for imagery and consequently, reduces false memory. In this sense, direction of imagery automatically induces additional source monitoring—between the theme encountered during the game play and that encountered via the misleading questions (see Fig. 3). Thus the direction of post-consumption imagery may mitigate false memory by providing an additional source monitoring opportunity. Combining the above:

H3. Given post-consumption misinformation, false recall is mitigated when imagery is engaged in a theme-related direction (versus a theme-unrelated direction).

The above account does not assume or require that the new misinformed theme somehow erases, overwrites or biases the

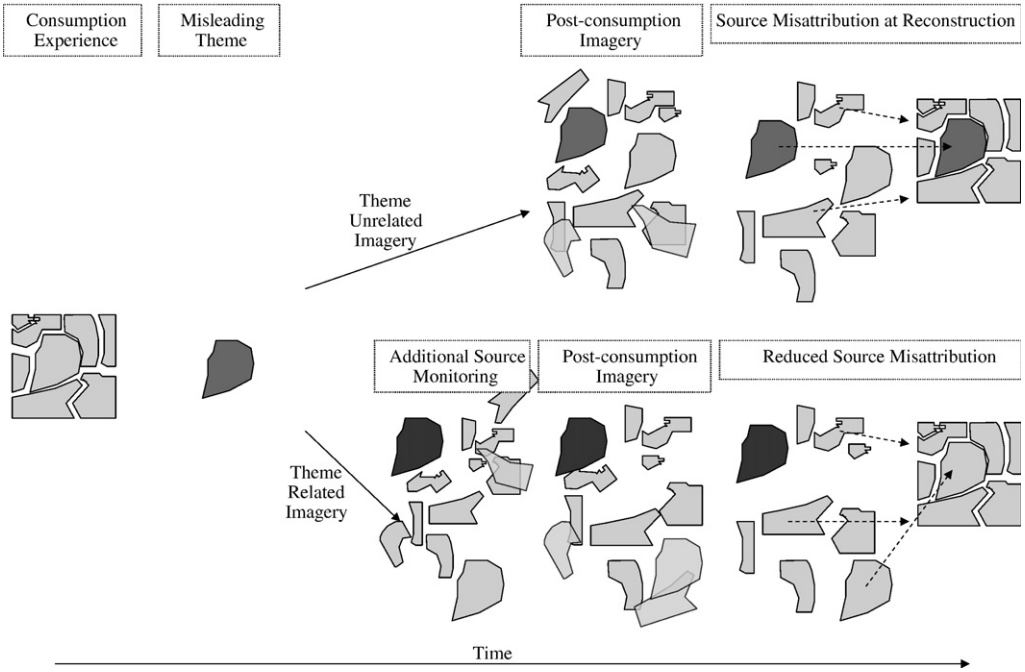

Fig. 3. Direction of Imagery.

accurate theme. Both the accurate and the misinformed themes are encoded and remain available in memory. Which of these has greater accessibility during reconstruction is driven by the direction in which imagery is generated.

Methodology

Experiment 2 employed a 2 (misinformation: present, absent) × 2 (imagery: theme-related, theme-unrelated) factorial design. The procedure, recall measure and coding protocols followed Experiment 1 except that imagery was manipulated in two ways. Participants were instructed to imagine themselves either "as explorers digging for artifacts in the ruins of an ancient civilization" (theme-related imagery) or in "a game tournament" (theme-unrelated imagery, as used in Experiment 1). They then stepped through a narrative and completed the fictitious story in their own words. In both imagery conditions, we avoided all references to any particular theme. Inter-rater reliability (alpha) for the recall measure was .93.

Results

A categorical model on false recall of the misleading theme was estimated across the four conditions ($n = 158$). Since the data exhibited quasi-complete separation for the misinformation factor (Allison, 1999), hypothesis testing used planned contrasts. Analyses revealed a significant effect for misinformation (Wald $\chi^2 = 22.92$, $p < .0001$). False recall was higher for participants exposed (23%) versus not exposed (0%) to the misleading theme, replicating Experiment 1 (Table 2). The main effect for direction of imagery was not significant (Wald $\chi^2 = 1.51$, $p > .22$). In support of H3, among those exposed to misinformation, fewer participants exhibited false recall in theme-related (17%) than theme-unrelated imagery (29%, Wald $\chi^2 = 3.33$, $p < .067$). Imagery did not affect false recall in the no-misinformation condition (Wald $\chi^2 = .00$, $p = 1$).

We also conducted a similar analysis on accurate recall of the correct Mayan theme. There was a main effect for misinformation (Wald $\chi^2 = 37.01$, $p < .001$) such that 43% of participants not exposed but only 5% of those exposed to the misinformation recalled the correct theme. The main effect for imagery was not significant (Wald $\chi^2 = 2.18$, $p > .14$); direction of imagery did not appear to differentially affect accurate recall in the theme-related (20%) versus theme-unrelated condition (28%). Among those not exposed to misinformation, recall was high within the two imagery conditions (40% and 47% recalled the accurate theme). In contrast, among those exposed to misinformation recall was low (1% and 9%) (Wald χ^2s < 2, $p > .25$).[1]

Table 2
Mean free recall of misinformed theme in Study 2.

	Theme-unrelated imagination	Theme-related imagination
No misinformation	$.00_a$	$.00_a$
Misinformation	$.29_b$	$.17_c$

Note. Different letters represent mean recall that is significantly different at the .05 level or less.

[1] To rule out the possibility that differences in game-related thought lead to these effects, we coded thought protocols on the incidence of game-related and theme-related thoughts. In particular, we find that within each condition (theme-related and theme-unrelated), incidence of game- and theme-related statements were not significantly different (ps > .2). Also, the incidence of game-related thought was not significantly different between the theme-related and theme-unrelated imagery conditions ($p > .25$) thereby ruling out the alternative explanation that greater game-related thought in the theme-unrelated condition led to the false memory effects.

Discussion

Experiment 2 results support our hypothesis that the direction of imagery suppresses the vulnerability of consumption memory to misinformation. These results are significant in that they show how imagery processing (as opposed to reasoning-based, discursive processing) can mitigate false memory in interactive environments. Conventional wisdom suggests that cognitive elaboration ("careful thinking") inhibits false memory. But for both marketers of interactive products as well as hedonic or leisure products, the nature of consumption might preclude careful thought. Our results show that directed imagery can help achieve similar results.

Past research has outlined how greater availability of attentional resources during the encoding of misleading information may mitigate false memory (e.g., Zaragoza & Lane, 1998). In our investigation, directed imagery took place *after* both the consumption as well as the misinformation stimulus (see Figs. 2 and 3). Thus Experiment 2 provides initial evidence for the role of *locus* of attention during imagery processing in the mitigation of false memories (as opposed to the *amount* of attention). Experiment 2 also contributes to imagination inflation research. The imagination inflation paradigm suggests that elaborating (imagery-based) on the key facet under attack by misleading information inflates false recall (e.g., Braun, Ellis & Loftus, 2002; Garry et al., 1996; Mazzoni & Memon, 2003; Wade et al., 2002). Results from Experiment 2 show situations where this traditionally accepted pattern may reverse. We show that imagery generating activity may, in some situations, lead to better source memory and a reduction in false recall. Interestingly, this happens in precisely those conditions where the imagination inflation paradigm predicts greater false recall—namely, when imagery is directed towards the theme.

Experiment 2 demonstrates novel results and a clear theoretical contribution with respect to the effect of imagery on false memory. These findings provide a roadmap for Experiment 3 which probes *when* in the consumption process changing the *amount* of attention helps mitigate false memory. For Experiment 3 we focus on theme-unrelated imagery because this led to higher levels of false memory in Experiment 2.

Experiment 3: When does the amount of attention reduce false memory—at learning, imagery generation, or reconstruction?

Attentional resources have been shown to be critical in decision-making (e.g., Baumeister, Sparks, Stillman, & Vohs, 2008; Johnson, 2008) as well as source monitoring and recall (e.g., Zaragoza & Lane, 1998). Because encoding and retrieving source-relevant information is an effortful and attention-demanding process (Johnson et al., 1993), reduced attentional resources may be expected to detrimentally affect the source memory for an item more than its content. Further, the content of memory is relatively easier to retrieve due to increased familiarity from prior exposure. Thus, the amount of attention available during the consumption process may be viewed as a moderator of false memory. Yet, past research is agnostic as to which component of the consumption process is likely to be most sensitive to attention. Given the potential role that attentional resources may play during learning versus generation of imagery versus reconstruction, we do not know its effects on false memory. The following section presents our expectations in this regard.

Greater attention to consumption memory prior to the encoding of misinformation should, if anything, reduce attention paid to the misinformation contained in the stimuli (in our case, questions from a web-survey). Because of this lack of monitoring, increased attention to consumption during the encoding of misinformation should not lead to any mitigation of false memory; it is even possible to expect higher levels of false memory. Misinformation, in a sense, is like a Trojan horse that enters the system unnoticed.

Increasing the amount of attentional resources at imagery is akin to closing the stable door after the horse has bolted because the misinformation has already slipped in. Because of the nature of the task, resources are primarily engaged towards generating imagery in a theme-unrelated direction. Additional resources on account of increased attention will continue to be deployed in a theme-unrelated direction rather than towards monitoring the source. Thus, greater resources at imagery are less likely to mitigate false memory.

From the reconstructive memory standpoint, false memory is a manifestation of source monitoring errors during the retrieval process. Exposure to the correct theme as well as the misinformed theme makes both equally 'available' to be used as the locus of memory. However in contrast to the other situations, the recall task does not involve a competing activity. The nature of the task itself focuses on a recall of consumption and therefore, additional resources are likely to be directed towards discriminating between sources. Greater separation is achieved between the original consumption and misinformation, which should lead to better source memory, and lowered false recall (see Fig. 4). Formally,

H4. Greater attention-at-recall (but not at encoding or imagery) should lead to mitigation of false memory.

Methodology

Experiment 3 used a single-factor design with four attention conditions: attention-at-encoding, attention-at-imagery generation, attention-at-retrieval, and no attention (control). The procedure, recall measure and coding protocol generally follows that of Experiments 1 and 2 except that all conditions receive misinformation in this study. Post-experiment measures indicated that none of the participants guessed the true intent of the study. Inter-rater reliability (two judges) on the coded recall measure—presence of false theme—was high (alpha = .98).

For the attention-at-encoding group, participants were encouraged to think carefully about their game experience immediately after the gaming episode and before the presentation of the misinformation stimulus questions. The attention-at-

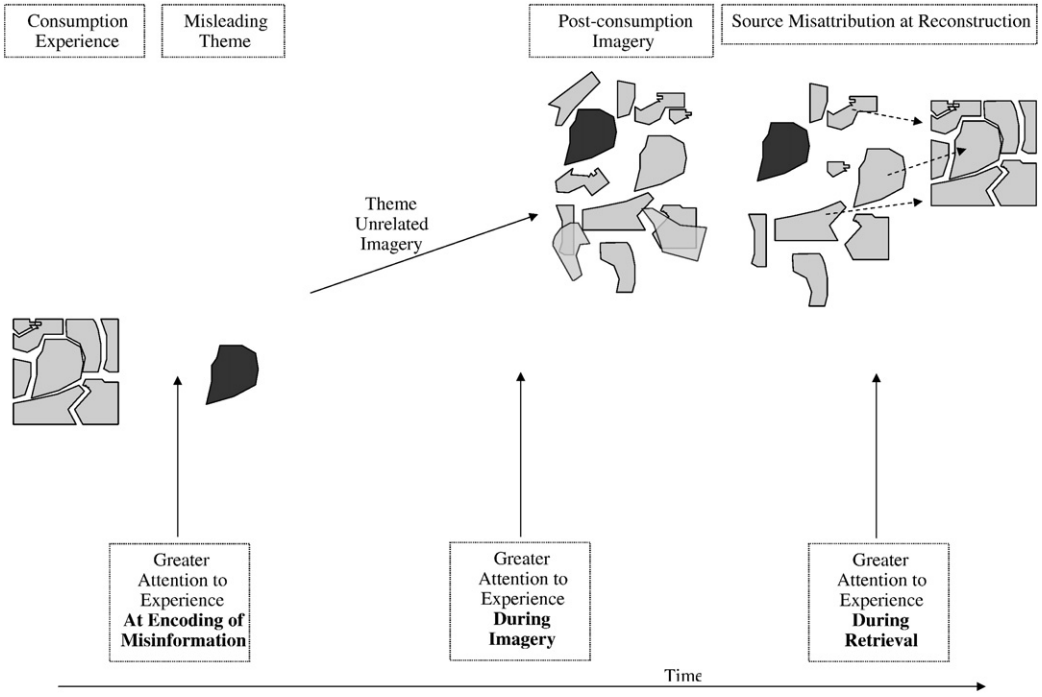

Fig. 4. Time of Attention.

imagery group was asked to think carefully about their game experience while completing the imaginary game tournament scenario. The attention-at-recall group received instructions to think carefully about their game experience immediately before the recall measures.[2]

Results

One hundred and seven students at a large Midwestern university participated in exchange for course credit. We first tested for differences in response times for the recall question to assess whether any one group was differentially motivated to monitor accuracy ('try harder'). Response times were not significantly different across the groups (all $ps > .2$), which rules out this alternative explanation.

Recall

A single-factor categorical model was estimated on false recall and hypothesis testing was conducted using planned contrasts. Consistent with our expectations, we observed a main effect for the attention factor (Wald $\chi^2 = 8.67$, $p < .034$). Specifically, all conditions with the exception of the attention-at-recall group exhibited false recall for the theme. Compared to zero, significantly more participants in the no-attention group (36%; Wald $\chi^2 = 16.47$, $p < .001$), the attention-at-encoding group (43%; Wald $\chi^2 = 22.3$, $p < .001$) and the attention-at-imagery group (33%; Wald $\chi^2 = 14.04$, $p < .001$) exhibited false recall while the attention-at-recall group (8%; Wald $\chi^2 = .75$, $p > .38$) did not (Table 3). Further, false recall for the attention-at-recall group was significantly lower than each of the other groups (all $ps < .04$) as well as the combined average of these groups (Wald $\chi^2 = 7.75$, $p < .005$).

We estimated a similar model for recall of the accurate (Mayan) theme across these four conditions. The attention-at-recall group exhibited the greatest frequency of true recall (29%) followed by the attention-at-imagery group (23%), the no-attention control (13%) and attention-at-encoding group (0%). Overall, accurate recall was significantly higher for the attention-at-recall group than the other three groups (Wald $\chi^2 = 3.39$, $p < .07$).

Similar to earlier studies, we computed a measure for overall recall of the theme by combining the theme words recalled (both accurate and inaccurate) and found no significant differences in recall across conditions (main effect Wald $\chi^2 = 2.14$, $p > .5$) suggesting that attention at different stages did not inflate/deflate recall to lead to the above pattern.

Table 3
Mean free recall of misinformed theme in Study 3.

	Attention-at-encoding	Attention-at-imagery	Attention-at-reconstruction	No-attention
Misinformation	$.43_a$	$.33_a$	$.08_b$	$.36_a$

Note. Different letters represent mean recall that is significantly different at the .05 level or less.

[2] We changed the misinformation stimulus to test for and rule out experimental demand. Instead of presenting the misleading questions as part of the study, we presented them as questions taken from an unrelated website survey. We also included a secondary control group that was shown the original stimulus. A one-way categorical analysis across the two control groups—the web survey and the original misinformation stimulus group—revealed no differences in false recall, recognition or judgment of memory (all $ps > .60$) suggesting that demand did not play a part in our results. In subsequent analyses the web-survey misinformed group is used as the control.

Recognition and judgment of memory

We assessed false recognition of the Egyptian theme via a single-factor categorical model and found a main effect (Wald $\chi^2=7.67$, $p<.05$). False identification was highest in the attention-at-encoding group (90%), followed by the no-attention group (85%), the attention-at-imagery group (76%), and the attention-at-recall group (56%). False identification was greater than chance for all groups except the attention-at-recall group (contrast Wald $\chi^2=5.89$, $p<.015$). Subsequently, when the correct, Mayan theme was shown to participants, the attention-at-recall group had higher correct identification (85%) compared to the other groups (61%, contrast Wald $\chi^2=4.82$, $p<.03$). Judgments of memory measures did not reveal any significant differences across conditions (Wald $\chi^2=1.84$, $p>.6$).

General discussion

Theoretical contributions

A large body of consumer research has underscored the importance of memory in preference construction. Yet, the resilience of memory, in particular, memory for consumption, has been under-researched. Recent studies in consumer psychology suggest that false memory for observations may be less likely (Cowley & Janus, 2004). Our first contribution is in showing that memory for observations may in fact be highly susceptible to misinformation in imagery-rich environments. In Experiment 1 the impact of misleading questions on false memory of the game's theme is greater when imagery is explicitly engaged.

In past research, imagination either creates and/or actively builds upon misinformation to make false memory effects stronger (e.g., Braun et al., 2002; Garry et al., 1996; Wade et al., 2002). In our studies, we simply elicit imagery processing rather than using it to create misinformation. We show that, even in this context, the likelihood of false memory increases. Thus our second contribution is in showing that imagery, as a style of thinking, causes false memory to become more likely rather than the narrower view embedded in past research that imagination is necessary for/inflates false memory (e.g., Thomas & Loftus, 2002).

This subtle difference holds powerful theoretical ramifications. One direct implication is that imagery-driven consumption contexts are more likely to exhibit false memory. Further, traditional views of imagination inflation suggest that false memory is likely only when imagination is explicitly triggered on the dimension that is contradicted (e.g., Mazzoni & Memon, 2003; Thomas & Loftus, 2002). Findings from Experiment 2 support our theory that when imagery is directed along the facet that is contradicted, false memory actually decreases. Our third contribution is in specifying that additional source monitoring in these imagery conditions might mitigate false memory—a process not readily apparent from the imagination inflation perspective.

Our fourth contribution is in explicitly outlining and testing conditions where greater attentional resources may mitigate false memory (Experiment 3). We demonstrate that even though false information is encoded and otherwise elaborated upon, attention to the consumption episode during retrieval allows for a correction to occur via better source monitoring. By explicitly testing the effect of mental resources at different stages of consumption, this research argues that greater resources at recall have the best chances of reducing false memory.

Substantive implications

The proliferation of web-based communication between consumers (via blogs and message rooms) as well as between firms and consumers (via online surveys, feedback forms), has led to an increased reliance on the electronically printed word. Our research finds that incidental exposure to such printed words that contradict experience not only has the potential to significantly alter what is remembered, but that the effect is heightened in imagery-rich environments—the precise context where consumers are likely to come upon such information. In addition to cautionary implications for online market research, these findings imply that firms need to consider the impact of online information clutter on consumer memory. That measuring consumers' intentions changes their behavior has been demonstrated in the mere-measurement literature (e.g., Fitzsimons & Moore, 2008; Morwitz, Johnson, & Schmittlein, 1993). Our findings supplement this research and show the potency of questions in altering memory of the consumption experience.

Further, the ease with which information is brought to mind has a strong bearing on the confidence and construction of judgments (e.g., Cho & Schwarz, 2008; Schwarz, 2004; Song & Schwarz, 2008). Experiment 1 provides evidence of how misinformation-driven judgments might be accompanied by greater confidence. If misinformation makes memory appear more veridical (Experiment 1), it is likely that consumers use this metacognitive experience of 'ease-of-retrieval' as a cue in their downstream decisions based on erroneous information.

In a different arena, practices in political marketing such as "push-polling" have seen a considerable rise in recent years. Wording questions that imply an undesirable position on opposition candidates have had a huge impact on past elections. The question facing companies is what happens if, say, a consumer advocacy group or a competitor utilizes these methods? While such practices border on the unethical, the fact that these are not yet clearly illegal makes protecting consumers' memories more difficult. While encouraging careful thought and focus might alleviate source monitoring problems in many situations, a lot of consumption is by its very nature not amenable to such information processing. For instance, hedonic consumption largely involves imagery processing and often precludes the possibility of careful thought during or after consumption. A useful approach would be to structure consumption in a way that encourages imagery to build from the foundation of what consumers learned during consumption (Experiment 2). Further, even if consumers have encountered

contradictions, drawing attention during the reconstruction stage can help inhibit false recall (Experiment 3).

Our research also provides avenues for investigating how individual differences in the propensity to use imagery might affect susceptibility to false memory. Individuals have been shown to differ substantially in their reliance on imagery which points towards substantial differences in decision-making and behavior (Cohen, Belyavsky & Silk, 2008; Marks, 1995). Consumers high on reliance in imagery might find it difficult to devote attentional resources to source monitoring. Alternatively, owing to their experience in using imagery, these individuals may be better at monitoring between different experiences. An examination of 'hard-wired' differences in imagery processing offers a rich avenue for research on false memory.[3]

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