MAKING WARNINGS ABOUT MISLEADING ADVERTISING AND PRODUCT RECALLS MORE EFFECTIVE: AN IMPLICIT ATTITUDE PERSPECTIVE

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Six experiments tested whether image-based information is more effective than text in changing implicit attitudes from positive to negative, even when both forms similarly change explicit attitudes. We studied corrective information (i.e., warnings about misleading advertising and product recall notices) because they are common, important efforts to change consumer attitudes. Corrective information in the form of pictures or imagery-provoking text, as well as direct instructions to imagine the scene changed implicit attitudes more than plain, descriptive text—the most common warning method. Image-based stimuli can change implicit attitudes because they stimulate vivid visual mental imagery of counterattitudinal valence (Experiments 1-2; Web Appendices F, O). Conditions that hindered the formation of visual mental imagery blocked implicit attitude change, whereas cognitive busyness did not (Experiment 3; Web Appendix N). In short, imagery-based information changed both explicit and implicit attitudes whereas materials not based on imagery only changed explicit attitudes. Managers and regulators alike who seek to protect consumers from claims and products that could do harm should use image-based campaigns to best convey the message effectively.

Keywords: Misleading Advertising, Product Recall, Implicit Attitudes, Attitude Change, Visual Imagery.
The modern marketplace operates on the basis of voluntary exchanges between firms and consumers. Although firms seek to satisfy customers by providing high-quality goods and services, failures occur regularly, whether due to faulty products or misleading advertising. Both these causes require alerts to consumers, and consumer protection announcements accordingly are issued frequently, whether directly by companies or by regulators such as the U.S. Consumer Product Safety Commission (CPSC) or the Federal Trade Commission (FTC). Reports of product recalls or of misleading advertising typically appear in press releases that contain exclusively text (Darke, Ashworth, and Ritchie 2008; Dawar and Pillutla 2000; Rao and Wang forthcoming). The FTC’s website features 3,120 press releases about misleading advertising (www.ftc.gov; keywords: “false,” “misleading,” “advertising”; search conducted June 13, 2017). Most product recall announcements by companies or by the CPSC also rely on text, often written in a dry, straightforward manner. For instance, the CPSC reported that “Sony [expanded its] recall of VAIO laptop computer battery packs due to burn and fire hazards” (see https://www.cpsc.gov/Recalls/2017/Sony-Expands-Recall-of-VAIO-Laptop-Computer-Battery-Packs, retrieved on June 9, 2017).

The current research investigated the effectiveness of current consumer alert practices. It compared text- vs. image-based information effects on implicit (i.e., spontaneous, unintentional) attitudes using warnings about misleading advertising and product recalls as contexts. In doing so, the present study extends research on implicit attitude change that has primarily examined responses to verbal information (e.g., Cone and Ferguson 2015; Mann and Ferguson 2015; Rydell and McConnell 2006; for a review, see Gawronski and Sritharan 2010). Yet images are a central component of marketing communications. Furthermore, studies on the effectiveness of text- vs. image-based information to change attitudes have been limited to explicit, self-reported attitudes (Wyer, Hung, and Jiang 2008). Given that both
implicit and explicit attitudes independently predict behavior (Rydell and McConnell 2006), neglecting predictors of implicit attitude change means potentially missing a key driver of consumer behavior.

Based on the characteristics of visual imagery and dual-process theories, we expected image-based warnings about misleading advertising or product recalls to be particularly effective in changing implicit attitudes (Epstein and Pacini 1999; Evans 2008; Paivio 2007; Sloman 1996). The current work showed that even when pictures and text lead to equivalent changes in explicit attitudes, warnings about misleading advertising or product recalls that rely on pictures are more effective than text in changing implicit attitudes. This work also established that pictures are superior to text because they produce visual mental images (i.e., visual imagery) of counterattitudinal valence. That is, pictures can produce a representative scene in people's minds, replete with evaluative tags that modify implicit evaluations. Text that creates visual imagery thus is just as effective as pictures in changing implicit attitudes.

**THEORETICAL DEVELOPMENT**

*Implicit Attitude Change from A Dual-Process Perspective*

Explicit attitudes are evaluative judgments about a target, whereas implicit attitudes are evaluative reactions that are automatically activated upon exposure to a target. Implicit attitudes originally were conceived of as overlearned, robust memory structures that resist change (Wilson, Lindsey, and Schooler 2000). It is now clear, however, that implicit attitudes can be modified (Gawronski and Sritharan 2010). Dual process theories suggest that there are two distinct systems of reasoning that drive consumer attitudes: System 1 processes that are automatic, unconscious, and associative that drive implicit attitudes; and System 2 processes that are controlled, conscious, and rule-based that drive explicit attitudes (Evans 2008; Gawronski and Bodenhausen 2006; Rydell and McConnell 2006).
Implicit attitudes reflect System 1 processing and arise from its associative nature (Gawronski and Bodenhausen 2006). They can be modified with procedures in which an attitude object is paired repeatedly with positive or negative stimuli (e.g., Gibson 2008). System 2 processes, such as cognitive dissonance or verbal negation of previous information (e.g., “X is not true”), require rule-based processing and generally do not alter implicit attitudes (Chan and Sengupta 2010; Gawronski and Bodenhausen 2006). One clever prior experiment found that explicit and implicit attitudes toward a single person could simultaneously be formed and changed in opposing directions, in response to subliminal word primes and supraliminal verbal descriptions of opposite valence (Rydell et al. 2006). This result means that System 1 and System 2 can proceed independently of one another. To be sure, the two systems are not mutually exclusive (Gawronski and Bodenhausen 2006). While System 1 processes usually influence System 2 processes, System 2 processes can, at times, influence System 1 processes. Yet in order for information that is mainly processed by System 2 (e.g., text) to substantially modify existing implicit attitudes, it generally needs to be extreme (e.g., learning that a person committed murder) or shown repeatedly (Cone and Ferguson 2015; Mann and Ferguson 2015; Rydell and McConnell 2006).

The Role of Visual Imagery in Changing Implicit Attitudes

The expectation that pictures will alter implicit attitudes more effectively than text is anchored in the characteristics of visual imagery, as well as dual-process theories. Visual imagery involves image-based representations in long-term memory that can be evoked without the original stimulus (Kosslyn, Ganis, and Thompson 2001). Because it depicts specific objects or entities, “visual imagery is inherently concrete” (Amit and Green 2012, p. 862). In particular, image-based representations in memory are more concrete than verbal representations in memory (Amit, Gottlieb, and Green 2014; Paivio 2007).
between concrete and abstract information hinges on whether the meaning of the information depends on human minds to be comprehended: Concrete information (e.g., animals, buildings) does not require human minds, but abstract information (e.g., freedom, truth) relies on human minds, and often language, to establish its veracity (Hale 1988).

Dual-process theories and empirical findings indicate that System 1, which underlies implicit attitudes, is better able to comprehend concrete information than abstract information (Donovan and Epstein 1997; Epstein and Pacini 1999; Sloman 1996). Foroni and Mayr (2005) found that reading a highly detailed, concrete account changes implicit attitudes better than abstract supposition (conjuring up a hypothetical event). The present research extended such work by proposing that visual imagery, as concrete information in memory, drives implicit attitude change. Furthermore, we predicted that counterattitudinal information that triggers visual imagery would be more effective in changing implicit attitudes than information that does not elicit visual imagery. In doing so, this research brought together previously disparate areas (i.e., visual imagery and dual-process theories) to shed light on implicit attitude change mechanisms.

Typically, pictures are more imagery-provoking than text (Wyer, Hung, and Jiang 2008), so they should be more effective than text in influencing visual imagery and, in turn, changing implicit attitudes. Consistent with this proposition, De Houwer and Hermans (1994) found that, compared with words, pictures are linked more closely to evaluative information. In their work, people categorized pictures or words as either “good” or “bad.” They found pictures were coded faster than words. Moreover, the speed with which people could categorize pictures was not influenced by the presence of a word, whereas the presence of a picture interfered with and slowed down the categorization of words. For the same reason that pictures were expected to be superior to text in changing implicit attitudes, imagery-
provoking text was expected to be more effective than non–imagery-provoking text. Imagery-provoking text can generate visual imagery, sometimes to the same extent as pictures (Unnava and Burnkrant 1991; Wyer, Hung, and Jiang 2008). Therefore, imagery-provoking text should be as effective as pictures in altering implicit attitudes.

The present research also investigated which dimensions of visual imagery may be central to implicit attitude change. Previous research identified three dimensions of visual imagery: valence (i.e., the goodness or badness of visual imagery), vividness (i.e., images’ clarity and liveliness), and quantity (the number of visual images evoked by a stimulus) (Bone and Ellen 1992; Miller, Hadjimarcou, and Miciak 2000; Paivio 2007). Our proposition states that visual imagery is key in changing implicit attitudes. It implies that visual imagery valence—which is to say the goodness or badness of the mental pictures—should mediate the effect of type of counterattitudinal information (e.g., picture vs. non–imagery-provoking text) on implicit attitude change.

Vividness of visual imagery helps explain when and how mental images affect consumer behavior (Bone and Ellen 1992; Burns, Biswas, and Babin 1993; Pham, Meyvis, and Zhou 2001). Accordingly, we predicted that visual imagery vividness would account for changes in implicit attitudes, but only when consumers initially have unclear visual images about a brand. Consumers who have already been exposed to pictorial information about a brand will therefore already have vivid visual images (Burns, Biswas, and Babin 1993; Unnava and Burnkrant 1991). As a result, encountering counterattitudinal information in pictorial form should render the difference between the vividness of mental images based on existing and counterattitudinal information essentially equivalent.

In contrast, consumers who initially learn about a brand via text-based information would be expected to form mainly vague visual images (Burns, Biswas, and Babin 1993;
Unnava and Burnkrant 1991). If so, then encountering counterattitudinal information in the form of pictures, as opposed to text, should heighten the vividness with which consumers can mentally picture the brand. This reasoning points to the vividness of mental images as a putative mediator of implicit attitude change, implying a moderated mediation effect (Figure 1). Last, in line with research that suggests that the vividness, rather than the quantity, of visual imagery explains consumer reactions (Pham, Meyvis, and Zhou 2001), we did not expect the quantity of visual imagery to play a mediating role.

The Present Experiments

As summarized in Table 1, we report three experiments, and three additional experiments (detailed in Web Appendices F, N, and O), that tested the hypotheses in the contexts of warnings about misleading advertising and product recalls. Experiments 1 and 2 used similar procedures. Participants were first given positive information about a novel brand, after which we assessed their implicit and explicit brand attitudes. Participants were then assigned to a counterattitudinal condition (i.e., unfavorable pictures, text, imagery-provoking text, or imagery instructions), after which participants’ implicit and explicit attitudes toward the brand were re-assessed.

Experiment 1 tested and found support for the prediction that pictures and imagery-provoking text would change implicit attitudes better than text, as well as that visual imagery valence would mediate the change in implicit attitudes. Experiment 2 showed that when people do not possess clear mental images of a brand, seeing brand-relevant pictures produces vivid mental imagery, which in addition to the images’ valence, mediated the effect of text-based vs. pictorial counterattitudinal information on implicit attitude change. Experiment 3 directly manipulated people’s ability to visualize mental images and contrasted
visual and cognitive load tasks, as both require information to be held in working memory but operate on different processes (Herdman and Beckett 1996; Körner and Volk 2014). It found that a visual load task, which prevented people from engaging in visualization, also prevented implicit attitude change from pictures; whereas a cognitive load task, which did not prevent visual imagery formation, did not block implicit attitude change. This last finding supports the contention that System 1 (i.e., automatic processes) underlies implicit attitude change from pictures. Three additional experiments replicated and extended main text results (see Web Appendices F, N, and O). They found that instructions to imagine a scene were just as effective as seeing pictures in changing implicit attitudes (Web Appendix F) and that the previous mediation of visual imagery valence is moderated by individual differences in visual and verbal information processing (Web Appendix O). Overall, we consistently found that imagery-based materials changed both explicit and implicit attitudes, whereas non–imagery-based materials only changed explicit attitudes.

For all experiments, counterattitudinal stimuli were extensively pretested to ensure equivalent levels of explicit persuasiveness (resulting in equivalent levels of explicit attitude change) between conditions. These tests helped guard against concerns that image-based information may be more influential in changing implicit attitudes because it is more persuasive, as measured by explicit assessments. All experiments also tested and found that text- vs. image-based information led to largely equivalent changes in explicit attitudes (Web Appendix A; Tables 2, 3, and 4). A meta-analysis of all six experiments that compared imagery-based conditions to conditions that did not allow for visual imagery confirmed that there was no significant difference on explicit attitude change (Web Appendix B).
EXPERIMENT 1: PICTURES VS. WORDS IN CHANGING IMPLICIT ATTITUDES: THE ROLE OF VISUAL IMAGERY VALENCE

Experiment 1 studied corrective information in the context of warnings about misleading advertising (Darke, Ashworth, and Ritchie 2008). It used three conditions. Participants saw a corrective picture or read one of two corrective texts. One text was intended to evoke counterattitudinal visual imagery, whereas the other was not. This design allowed us to test the central prediction that image-based information is more effective than text in changing implicit attitudes. The condition in which participants read imagery-provoking text was used to provide further evidence that visual imagery is key to changing implicit attitudes. We predicted that pictures and imagery-provoking text would lead to similar changes in implicit attitudes, and these changes would be greater than those prompted by non–imagery-provoking text.

Method

Sample and design. Two hundred twenty-two undergraduates at a Hong Kong university (75 males) completed the experiment in exchange for HK$40. The experiment used a 3 (condition: text vs. picture vs. imagery-provoking text) × 2 (measurement order: explicit vs. implicit attitude first) × 2 (measurement time: Time 1 and Time 2) mixed-subject design. Implicit attitude scores for three participants who committed too many errors (more than 50% errors on critical trials) could not be computed, leaving 219 participants for the analyses.

Stimuli and procedure. Participants watched a slideshow with five positive ads for Arcelik, an unknown brand of dishwashers in Hong Kong (Web Appendix C). We then measured initial implicit and explicit attitudes toward Arcelik, order counterbalanced. Next,
participants read a short press release ostensibly issued by the Hong Kong Consumer Council. The beginning of the press release was similar in all conditions and mentioned that the advertisements for Arcelik “have led many consumers to conclude that the advertised product was one of the highest-quality dishwashers available, but that independent testing had determined that it was actually the poorest performer on the market. Indeed, Arcelik had to recall its dishwashers due to a faulty hose clamp that caused many cases of flooding and waste of water.” In the text condition, participants then read, “Arcelik used a nylon hose clamp instead of the usual steel band. Since the nylon was of a very bad quality, the clamp often broke after a few months, causing a lot of damage.” In the picture condition, a picture of a damaged kitchen was shown (Web Appendix D). In the imagery-provoking text condition, participants read, “Take a moment to visualize the place where you currently live… Can you see it? Now, imagine your floor under water. Your furniture soaked in water and deformed. Your moldy carpet. Your cracked floor…. That is what happened to many buyers of Arcelik dishwashers.” Participants in all conditions wrote a summary of what they learned. Implicit and explicit attitudes toward Arcelik (counterbalanced) again were measured. Finally, participants rated the characteristics of their visual images and briefly described the images.

Implicit and explicit attitude measures. Implicit attitudes were assessed with an evaluative priming measure (Fazio et al. 1995). The task briefly presents a prime stimulus (e.g., Arcelik’s logo) followed by a positive or negative target word or picture. Participants’ job is to quickly decide whether the target is positive or negative by pressing one of two response keys. Implicit attitudes scores were calculated following standard procedures such that higher values indicated more positive implicit attitudes toward Arcelik (see Web Appendix E for the procedure and data preparation). We measured explicit attitudes with
three items rated on a semantic differential scale (1 = “negative/unpleasant/bad,” 9 = “positive/pleasant/good”). They were then averaged ($\alpha_{\text{min}} = .91$).

Qualities of visual images. A final questionnaire instructed participants to visualize the brand and rate their visual images using nine-point scales intended to assess three qualities of mental images. One quality, valence of visual images, was assessed with three items (“negative/positive,” “unpleasant/pleasant,” “bad/good,” $\alpha = .95$). A second quality, vividness of visual images (i.e., images’ clarity and liveliness; Paivio 2007), was assessed with five items ($\alpha = .86$): clarity (“fuzzy/clear”), strength (“weak/strong”), realism (“unrealistic/realistic”), liveliness (“not lively/lively and dynamic”), and level of detail (“vague/detailed”). The third quality, the perceived quantity of visual images, was measured with five items ($\alpha = .85$; Bone and Ellen 1992): to what extent visual images appeared to them (“to a very small extent/very great extent”), how many images were visualized (“few or no images/ lots of images”), ease with which the images were produced (“not easily at all/very easily”), speed of appearance (“not quickly at all/very quickly”), and how quickly images appeared (“progressively/suddenly”).

Results

Implicit attitude change. A $3 \times 2$ (condition) analysis of variance (ANOVA) on implicit attitude change indicated a main effect of condition ($F(2, 213) = 5.76$, $p < .01$). Table 2 reports descriptive and planned analyses statistics. As expected, the comparison of implicit attitude changes between the text condition and the combination of the picture and imagery-provoking text conditions revealed a significant difference, implicit attitudes changed less in the text condition than in other conditions. One-sample t-tests (test value 0) showed that implicit attitude change was significant and negative in the picture and imagery-provoking text conditions ($t(148) = 5.11$, $p < .001$) but did not significantly change
in the text condition (F < 1). The magnitude of implicit attitude change did not differ between the picture and imagery-provoking text conditions.

Measurement order did not interact with condition, even when comparing the text condition to the combined picture and imagery-provoking text conditions (F < 1). These results indicate that whether implicit attitudes were assessed before or after explicit attitudes, the changes in the implicit attitudes persisted in the same patterns.

Insert Table 2 about here

*Visual imagery dimensions.* Participants reported on the visual imagery they formed using three scales. We expected valence of the images to mediate implicit attitude change but not vividness or quantity of images because the initial information was pictorial. A 3 (condition) × 2 (measurement order) ANOVA on valence of visual imagery showed that valence of visual imagery differed by condition, as predicted (F(2, 213) = 8.12, p < .001). Measurement order did not evince a significant main effect nor interact with other factors (Fs < 1). Planned comparisons indicated that participants’ visual images of Arcelik were significantly more negative in the picture and imagery-provoking text conditions than in the text condition (Table 2). Valence did not differ between picture and imagery-provoking text conditions. These results demonstrated that the valence of visual imagery was altered by certain types of corrective materials, thereby suggesting that valence could mediate the relationship between type of corrective information and implicit attitude change.

Two 3 (condition) × 2 (measurement order) ANOVAs on vividness and quantity of visual images showed that these two qualities did not differ between conditions (Fs < 1.35; Table 2). This result suggests that they should not mediate the relationship between type of corrective information and implicit attitude change.
Mediation of valence of visual imagery. To assess mediation, we conducted a bias-corrected bootstrap mediation analysis using 10,000 bootstraps in the PROCESS tool for SPSS (Hayes 2013).³ The dependent variable was implicit attitude change toward Arcelik, with the initial implicit attitude toward Arcelik entered as a covariate. We compared the two conditions hypothesized to elicit visual imagery (picture and imagery-provoking text) to the neutral text, with valence of visual imagery as the putative mediator. The confidence interval (CI) for the indirect effect (–.11) excluded zero (95% CI = [–.1834, –.0501]). The direct effect was also significant ($p < .01$) and negative (–.34). Finally, we analyzed whether quantity and vividness of visual images could explain the effects of information type on implicit attitudes. We tested a model with three simultaneous mediators. As expected, the only significant indirect effect was the reported valence of participants’ visual images (estimate = –.10, 95% CI = [–.1842, –.0457]). Quantity (estimate = –.002, 95% CI = [–.0232, .0105]) and vividness (estimate = .002, 95% CI = [–.0148, .0345]) did not mediate. Therefore, the effect of the type of corrective information on implicit attitude change was explained by the presence of unfavorable visual imagery.

Discussion

Experiment 1 found that, to correct misleading advertising, a corrective picture is more effective than corrective text in changing implicit attitudes. Moreover, it found that when a corrective text is imagery-provoking it can lead to the same implicit attitude change as a corrective picture. These patterns occurred even though the three corrective conditions were equivalently effective in making explicit attitudes negative (see Table 2; Web Appendix A). Imagery-based materials changed both explicit and implicit attitudes, whereas materials not based on imagery only changed explicit attitudes. Indeed, the valence of visual imagery statistically accounted for (i.e., mediated) the change in implicit attitudes. Therefore, the type
of corrective information is important for implicit attitude change insofar as it gets consumers
to conjure up negative connotations of the brand in a visual way. An additional study
replicated these effects using a condition in which participants mentally simulated the scene
described by a text (see Web Appendix F).

**EXPERIMENT 2: WHEN VISUAL IMAGES ARE UNCLEAR INITIALLY**

Experiment 2 aimed to replicate the mediating role of visual imagery valence. It
further sought to show that visual imagery vividness mediates the superiority of pictures over
text on implicit attitude change in a specific condition—namely, when consumers have
initially unclear visual images about a brand. We proposed that the reason why visual
imagery vividness did not mediate implicit attitude change in Experiment 1 (and Web
Appendix F) is that participants first learned about a brand via pictures and only then
received counterattitudinal information in picture or text format. As a result, it may have been
difficult to find changes in visual imagery vividness because of the visual imagery evoked by
the initial information. Experiment 2 thus contrasted a condition in which the initial
information was pictorial with a condition in which the initial information was text-based,
and tested a moderated mediation pattern (Figure 1). Experiment 2 also predicted that valence
would mediate the effect of counterattitudinal pictures vs. text on implicit attitudes no matter
the format of the initial information (Figure 1). That is, regardless of whether consumers first
learn about a brand via text or pictures, their visual images should become more negative
when exposed to counterattitudinal pictures than counterattitudinal text, consistent with the
results of Experiment 1.

Experiment 2 also sought to address an alternative explanation for the superior effect
of image-based counterattitudinal information. Because implicit attitudes are often affect-
based (Gawronski and Bodenhausen 2006) and because text- and image-based information
could produce different emotional states (Jiang and Wyer 2009), we examined whether affect (i.e., feelings toward the counterattitudinal information; Pham et al. 2001), rather than valence and vividness of visual imagery, could explain why pictures are more effective than text in changing implicit attitudes.

Finally, Experiment 2 made two design changes aimed at showing the robustness of the proposed effects. First, it altered the context of the counterattitudinal information by using the context of a product recall, which can harm a firm’s reputation and financial value (Dawar and Pillutla 2000). Second, it used a different measure of implicit attitude, the Single Category Implicit Association Test (SC-IAT; Karpinski and Steinman 2006).

Method

Sample and design. One hundred seventy participants in the United States (32 males; $M_{age} = 47.3$) were recruited via an online panel company (Made in Surveys). The experiment used a 2 (initial information: picture vs. text) × 2 (product recall information: picture vs. text) × 2 (measurement time: Time 1 and Time 2) mixed-subject design. Thirty participants failed to remember what they learned from the product recall information (i.e., that Beifa dehumidifiers can catch fire). Their data were omitted. Therefore, 140 participants had adequate data for the analyses.

Stimuli and procedure. In the initial text condition, participants first read a favorable description of a dehumidifier made by Beifa, a brand unfamiliar to participants (Web Appendix G), that included information about the firm’s environmental efforts. Participants in the initial picture condition first read a short, positive, text-based description of Beifa’s dehumidifier and saw five pictures illustrating Beifa’s commitment to the environment (e.g., a beautiful lake; Web Appendix H). Participants summarized what they learned by
responding in an open-ended format. Initial explicit and implicit attitudes were then measured, in that order.

Participants next read that Beifa recalled its dehumidifiers for being flammable. For participants in the text recall condition, the text contained a written description of the failed product’s consequences: “Several houses and apartments were burned because of a short circuit that disrupted the automatic humidity control, which stops and restarts the dehumidifier as necessary. As a consequence, some BEIFA dehumidifiers worked without interruption for weeks, eventually causing them to overheat and to catch fire.” Participants in the picture recall condition saw a picture of a burning dehumidifier and another of a burning apartment as illustrations of the consequences (Web Appendix D). Then we assessed affect and re-assessed explicit and implicit attitudes, in that order.

Measures. Implicit attitudes were assessed with the SC-IAT, a computerized, quick classification task that requires participants to associate logos of Beifa with “good” or “bad” terms (see Web Appendix I for the detailed procedure). Data from the SC-IAT were prepared according to the scoring algorithm developed by Greenwald, Nosek, and Banaji (2003). A negative value indicates a more negative implicit attitude toward the brand, and a positive value indicates a more positive attitude. Explicit attitudes were assessed with three items (1 = “negative/unpleasant/I don’t like,” 9 = “positive/pleasant/I like,” \( \alpha_{\text{min}} = .93 \)). Visual imagery of the brand were rated using nine-point scales. Participants rated valence (\( \alpha = .97 \)), quantity (\( \alpha = .89 \)), and vividness (\( \alpha = .95 \)) of visual imagery with the same items used in Experiment 1. Respondents reported the feelings they had when they learned that the brand manufactures flammable products on a feeling thermometer (sliding scale: 0 = “very cold and unfavorable,” 100 = “very warm and favorable”) and on a 10-item affect scale from Pham et al. (2001)
(e.g., “I had unpleasant feelings reading the story,” “The story made me feel bad”; 1 = “not at all,” 5 = “very strongly,” $\alpha = .79$).

**Results**

Insert Table 3 about here

*Implicit attitude change.* A 2 (initial condition) × 2 (recall condition) ANOVA on implicit attitude change indicated a significant effect of recall condition.5 Table 3 reports the descriptive and ANOVA statistics. As expected, implicit attitudes changed more in the picture compared to text condition. One-sample t-tests (test value 0) showed that implicit attitude change was significant and negative in the picture recall condition ($t(74) = 4.17, p < .001$) but was not significant in the text recall condition ($t(64) = 1.38, p = .17$). Initial condition did not interact with recall condition. Thus, pictures changed implicit attitudes more than text, regardless of whether consumers initially learned about the brand from pictures or text.

*Mediation of valence of visual imagery.* A 2 (initial condition) × 2 (recall condition) ANOVA on visual imagery valence showed that, as expected, participants’ visual images were significantly more negative in the picture recall than in the text recall condition. Initial condition did not interact with recall condition and had a marginally significant main effect on visual imagery valence (Table 3). We conducted a mediation analysis with implicit attitude change as the dependent variable, recall condition (picture coded 1) as the independent variable, valence of visual imagery as the mediator, and initial implicit attitude and order of the tasks in the SC-IAT entered as covariates. The confidence interval for the indirect effect ($-.023$) excluded zero (95% CI = [−.0629, −.0021]). The direct effect was not significant ($p = .41$). Therefore, implicit attitude change from picture (vs. text) recall information was explained by participants’ unfavorable visual images of the brand. We next checked whether the mediation pattern was moderated by the format of the initial condition (PROCESS model
The test of mediated moderation relies on the index of moderated mediation (Hayes 2015). The 95% confidence interval for the index did include zero (95% CI = [–.0198, .0794]) suggesting that, as expected, the mediating path of visual imagery valence held across the picture and text initial conditions.

**Mediation of vividness of visual imagery.** A 2 (initial condition) × 2 (recall condition) ANOVA on imagery vividness showed a marginally significant interaction between initial and recall conditions (Table 3). As expected, when initial information about the brand was in text format, visual imagery vividness was affected by the picture recall more so than the text recall (F(1, 136) = 9.07, \( p < .01 \)). Yet, when the initial information was pictorial, this difference was not significant (F < 1). These results suggested that the vividness of visual imagery could mediate the relationship between type of recall information and implicit attitude change when the initial information was in text format, but not when it was pictorial.

We again used PROCESS model 7 (Hayes 2013) to test whether the initial information condition moderated the mediating path of vividness (Figure 1; text condition coded 0 for both the initial and recall information). The 90% confidence interval for the moderated mediation index did not include zero (90% CI = [.0017, .0834]; 95% CI = [–.0015, .0955]) providing (marginal) evidence for moderated mediation. As expected, when the initial information was given exclusively via text, the 95% bias-corrected confidence interval for the indirect effect (–.034) excluded zero (95% CI = [–.0932, –.0011]), providing evidence for mediation on the part of vividness. In contrast, and as expected, when initial brand information was pictorial, the 95% confidence interval included zero (95% CI = [–.0456, .0112]). The direct effect is not significant (\( p = .36 \)). Hence, consistent with predictions, visual imagery vividness mediated the effect of recall condition only when participants first learned about the brand in text, not in pictures.
Importantly, all the previous results hold when valence of visual imagery was controlled for or when it was added as another mediator (in parallel with vividness) in the model. Regarding quantity of visual imagery, it did not mediate the effect of recall condition on implicit attitude change (all 95% CIs included zero for the indirect effects).

*Affect.* We tested whether the information format changed feelings about the recall information, which then could explain the advantage of pictures over text in changing implicit attitudes. For both measures of affect, we conducted a 2 (initial condition) × 2 (recall condition) ANOVA. They showed non-significant main effects and interactions (Fs < 1.05). The evidence did not support affect as a potential alternate explanation.

**Discussion**

Experiment 2 confirmed the mediating role of visual imagery valence in accounting for the influence of picture-based counterattitudinal information over text-based information. It further showed that visual imagery vividness mediated the effect of pictures on implicit attitude change in one specific, predicted condition: when consumers had initially unclear visual imagery about a brand. In that case, the picture product recall (vs. text) clarified participants’ mental imagery, which led to implicit attitude change consistent with prior work (BURNS, Biswas, and Babin 1993; Pham, Meyvis, and Zhou 2001). Lastly, Experiment 2 tested whether feelings about the information could have been the explanatory factor. It found no evidence to support that notion, nor did an additional test we conducted (Web Appendix J).

**EXPERIMENT 3: HAMPERING VISUAL IMAGERY FORMATION**

Experiment 3 aimed to make considerable advances on the experiments reported thus far by using experimental manipulations to provide evidence that visual imagery plays a crucial role in implicit attitude change. Experiments 1 and 2 (and Web Appendix F) manipulated factors predicted to affect visual imagery. Yet, a stronger causal conclusion
would come from an experiment designed to block the ability to produce visual imagery.

Experiment 3 had some people learn about a product failure by viewing pictures while holding a visual pattern in memory, which created a visual load. We predicted that a visual load task, which hinders visualization (Körner and Volk 2014), would block the effectiveness of pictorial counterattitudinal information and, in turn, block implicit attitude change.

In contrast, we predicted that a cognitive load task (i.e., rehearsing a string of numbers) would not disrupt the effectiveness of counterattitudinal pictures because cognitive load does not prevent the formation of visual imagery (Körner and Volk 2014). Indeed, cognitive and visual load task share features (i.e., both require information to be held in working memory) but operate on different processes (Herdman and Beckett 1996; Körner and Volk 2014). Because System 1 (i.e., automatic processes) depends less on cognitive resources than System 2 (Evans 2008), showing that cognitive resources are not required for implicit attitude change from pictures would provide strong evidence that System 1 underlies implicit attitude changes.

Method

Sample and design. One hundred fifty-one undergraduates from a major Hong-Kong university (28 males) completed the experiment in exchange for HK$40. The experiment used a 3 (condition: visual load vs. cognitive load vs. no load) × 2 (measurement time: Time 1 and Time 2) mixed-subject design. Implicit attitude scores for seven participants who committed too many errors (more than 50% errors) could not be computed. Five participants committed more than two errors on the load task and their data were discarded (Gilbert and Hixon 1991). In total, there were data from 139 participants for the analyses.

Stimuli and procedure. Participants first were exposed to a positive text-based description of a new dehumidifier from Beifa, an unfamiliar brand in Hong Kong (Web
Appendix K). Using an open-ended format, participants summarized what they learned. Then initial explicit and implicit attitudes were measured, in that order. Participants in the no load condition next were informed that Beifa had to recall its dehumidifiers because they were flammable. Two pictures illustrated the negative consequences of the product catching fire (Web Appendix D). Participants in the other two conditions were instead informed that the study concerned how well people can perform two dissimilar tasks simultaneously.

Participants in the cognitive load condition were instructed to hold an eight-digit number in mind, and then saw the Beifa product recall information (Gilbert and Hixon 1991). Participants in the visual load condition were instructed to hold a pattern of six dots in mind (Herdman and Beckett 1996; Web Appendix L), and then saw product recall information. The number of dots was decided on the basis of a pretest that established that the two load tasks were similar in perceived difficulty (Web Appendix M). In both of these load conditions, participants were given 20 seconds to retain the information. After reviewing the Beifa product recall information, load condition participants reported the information they had mentally rehearsed. Last came the attitude measures. All participants completed explicit and implicit attitude tests, in that order.

Measures. Implicit attitudes toward Beifa were assessed using the evaluative priming task from Experiment 1. Explicit attitudes were assessed with the three items from Experiment 2 ($\alpha_{\text{min}} = .84$). We assessed perceived difficulty of the load task with two items (1 = “very easy/not at all challenging,” 7 = “very difficult/very challenging,” $\alpha_{\text{min}} = .95$).

Results

Manipulation checks. The magnitude of explicit attitude change did not differ among the three conditions (Table 4; Web Appendix A). Contrary to the pretest results (Web Appendix M) and those of a replication experiment (Web Appendix N), the cognitive load
task was perceived to be more difficult than the visual load task ($M_{\text{Visual Load}} = 2.75$, $M_{\text{Cognitive Load}} = 3.33$, $t(89) = 2.18$, $p < .05$). Although unexpected, if the visual load task felt easier than the cognitive load task, it would work against the hypothesized effect that implicit attitudes will change less when people’s minds are busy with a visual than with a cognitive load.

Implicit attitude change. We expected implicit attitudes toward the brand to change and become less favorable more so in the cognitive load and no load conditions compared with the visual load condition, and expected no difference between the former conditions. For completeness, we are reporting the omnibus interaction test and then the planned comparisons, which are the direct tests of the hypotheses. An ANOVA on implicit attitude change indicated a (marginally) significant omnibus effect of condition ($F(2, 136) = 2.76$, $p = .067$). Planned analyses showed that, as expected, the contrast comparing a combined factor of no load and cognitive load conditions against the visual load condition was significant (Table 4). As expected, implicit attitudes changed less in the visual load condition than in the other conditions. One-sample t-tests (test value 0) showed that implicit attitudes in the no load and cognitive load conditions became more negative ($t(94) = 4.07$, $p < .001$), but in the visual load condition the change was not significant ($F < 1$). Also as expected, the contrast comparing the no load condition to the cognitive load condition was not significant, showing equivalent degrees of change.

Discussion

Experiment 3 manipulated people’s ability to picture visual imagery in the context of learning about a product recall. We found that a visual load task, which hinders visualization, neutralized the effectiveness of unfavorable pictures on implicit attitude change. Whereas a cognitive load task, which did not prevent the formation of visual imagery, did not disrupt
implicit attitude change. An additional experiment replicated these results in showing that a visual load task prevented change in implicit attitudes from unfavorable pictures, whereas a cognitive load task did not impede implicit attitude change (Web Appendix N).

In total, these results provide further evidence in support of our theory that the formation of counterattitudinal visual imagery is essential to elicit implicit attitude change from image-based information. The findings imply that cognitive resources are not required for pictures to be able to alter implicit attitudes and are therefore consistent with our contention that the mechanism by which image-based information affects implicit attitudes is anchored in the automatic system, System 1. To our knowledge, this is the first evidence that a diminution of cognitive resources does not necessarily block a change in implicit attitudes (e.g., Mann and Ferguson 2015).

GENERAL DISCUSSION

The present research drew on dual-process theories and the qualities of visual imagery to offer new insights into the efficacy of warnings about misleading advertising and product recalls. We expected that image-based information would be more effective than text in changing implicit attitudes and proposed that the advantage of image-based information is anchored in its ability to generate counterattitudinal visual imagery. The results of three experiments (with three additional experiments reported in Web Appendices) showed that imagery-based materials changed both explicit and implicit attitudes, whereas materials not based on imagery only changed explicit attitudes (Table 1).

Experiment 1 found that corrective pictures or corrective imagery-provoking text were more effective in changing implicit attitudes toward a brand using deceptive advertisements than corrective text alone. This pattern was consistent, even though all corrective conditions were equally effective in changing explicit attitudes. A follow-up
experiment (Web Appendix F) found that text combined with instructions that ask participants to imagine what it implies was as effective as pictures in changing implicit attitudes, thereby confirming the central role of visual imagery. Those two experiments also found that valence of visual imagery mediated the change in implicit attitudes. Experiment 2 confirmed the mediating role of visual imagery valence and showed that visual imagery vividness also mediated the superior effect of pictures on implicit attitude change, albeit in one specific condition: when consumers had initially poor vivid visual imagery about a brand. In that case, the greater vividness of visual imagery emanating from the counterattitudinal picture, compared with the counterattitudinal text, explained implicit attitude change. These results are consistent with work indicating that imagery effects are often determined by the degree to which they are vivid (Burns, Biswas and Babin 1993; Bone and Ellen 1992). Experiment 3 directly manipulated participants’ ability to form visual images. As expected, a visual load task prevented implicit attitude change, whereas a cognitive load task did not. The cognitive load task and neutral (no load) task led to similar degrees of implicit attitude change, a finding that supports work on dual process models and thusly suggests that implicit attitude change from image-based information does not rely on deliberative cognitive processing.

An additional experiment (Web Appendix O) tested a theoretically derived boundary condition. It found that the advantage of picture over text in changing implicit attitudes held for people who are stronger in verbalizing, meaning that they do not often form visual imagery when reading text, but not for people who are stronger in visualizing, who easily form visual imagery from text. This experiment found, as well, that visual imagery valence mediated the type of corrective information on implicit attitude change for verbalizers but not
The null result for visualizers attests to the ease and readiness with which they form visual images from both text and pictures.

The convergent evidence that image-based information is more effective than text in changing implicit attitudes was obtained even though there were changes in procedure, methods, and contexts. We assessed implicit attitudes using evaluative priming, the SC-IAT, and the IAT. We used a host of stimuli including pictures of people, place, and objects. To see consistent evidence using multimethod approaches suggests confidence in the findings.

**IMPLICATIONS FOR FIRMS AND ORGANIZATIONS**

The results have direct practical applicability. Foremost, they question the efficacy of regulators’ most commonly used strategy to disclose misleading claims—namely, press releases (Darke, Ashworth, and Ritchie 2008)—in showing that they will be less effective than imagery-based strategies (e.g., pictorial corrective information) in altering implicit attitudes. In fact, a single piece of verbal information—again, the most common form of misleading advertising corrections—was ineffective in changing implicit attitudes. Take, for example, the FTC’s press release about misleading advertising by Mars Petcare U.S., Inc., which details the deceptiveness of claims that Eukanuba brand dog food helps dogs live longer (https://www.ftc.gov/news-events/press-releases/2016/08/mars-petcare-settles-false-advertising-charges-related-its, retrieved on the 9th of May 2017). Written in plain, descriptive prose, the alert is unlikely to have altered consumers’ implicit attitudes. Press releases with pictures (e.g., of old sick dogs), however, may help public officials protect consumers and punish offending advertisers.

Similarly, government agencies often announce product recalls using plain information that does not provoke visual imagery. As mentioned in the introduction to this article, the CPSC reported a defective product from Sony using dull, factual text. Per our findings, this
warning was unlikely to trigger negative visual imagery about the potential risks. To change implicit attitudes and protect consumers, public officials should use pictures and text that spur rich, negative visual images. The CPSC could have shown some pictures of burnt battery packs, for example.

In contrast with regulators who sometimes want to generate negative publicity toward a brand, managers facing a product recall may want to limit damage to their brand. Because recalls generate negative information about a brand’s performance and can harm its reputation (Dawar and Pillutla 2000), our findings might prompt brand managers to only use text recalls. Yet we caution that this strategy is not in consumers’, and therefore not firms’, best interests. Using text in order to limit the understanding of a product recall might not prevent consumers from using potentially dangerous products. The consequences can be painful and traumatic for consumers—and for the brand (Chang 2007).

Our results could explain why consumers often do not return recalled products (Chang 2007) or why warnings about misleading advertising only mildly influence the behaviors of existing consumers (Rao and Wang forthcoming). Indeed, we found that the most common corrective information— which does not trigger visual imagery—leaves implicit attitudes unchanged, and implicit attitudes have been shown to predict many behaviors when opportunities and motivation to understand are low (Perugini, Richetin, and Zogmeister 2010), which are the vast majority of everyday actions. Therefore, managers and regulators who seek to protect consumers from problematic claims and products should use image-based campaigns.

**FUTURE DIRECTIONS**

Although the results were encouraging and generalized to different contexts, measures, and stimuli, they point the way for potential future research. A question for future
work, then, is whether the processes documented here would differ if people first adopted negative attitudes and then encountered positive counterattitudinal information. On the one hand, implicit attitudes seem harder to change from negative to positive (Cone and Ferguson 2015) and, theoretically, negative information is psychologically weightier than positive information (Baumeister et al. 2001). On the other hand, we see no direct, theoretical reason why the superiority of image-based information over text information would not also hold in that case. These competing hypotheses could be a rich basis for future investigations.

The current findings suggest that the concreteness of representations in memory is key for implicit attitude change. Therefore, it is likely that the concreteness of stimuli also impacts the effects of messages on implicit attitudes. Future research could confirm this assumption and assess whether abstract or concrete words and/or pictures differ in their impact on implicit attitude change.

Finally, one feature of our experimental designs included having people report on the characteristics of their visual imagery, which could have prompted participants to visualize the focal brand even if they had not done so previously. It is therefore likely that people created new visual images during the course of the experiment. This raises the question of why imagery characteristics differed for participants who were instructed to imagine the text they are reading vs. other conditions (Web Appendix F). One response is that completing measures of visual imagery is unlikely to trigger as powerful visual imagery as deliberately intending to imagine a specific scene (e.g., imagining the brand as a thief; Web Appendix F). Nevertheless, the visual images created at the time of measurement may have polluted the imagery measures, which may explain why we found evidence of partial, and not full, mediation for some mediation tests. Future research could develop new techniques to assess
the dimensions (valence, vividness, and quantity) of visual imagery that do not create any new mental images.
REFERENCES


— and Rajees Sritharan (2010), “Formation, Change, and Contextualization of Mental
Associations: Determinants and Principles of Variations in Implicit Measures,” in
Handbook of Implicit Social Cognition: Measurement, Theory, and Applications, Bertram

Brands? New Evidence from the Implicit Association Test,” Journal of Consumer
Research, 35 (1), 178-88.

Application of Stereotypic Beliefs,” Journal of Personality and Social Psychology, 60 (4),
509-17.

and Using the Implicit Association Test: I. An Improved Scoring Algorithm,” Journal of
Personality and Social Psychology, 85 (2), 197-216.


Hayes, Andrew F. (2013), Introduction to Mediation, Moderation, and Conditional Process

Research, 50, 1-22.

Evidence Supporting a Dual-Route Model of Word Recognition,” Journal of Experimental

Processing,” Journal of Experimental Social Psychology, 45, 486-95.


Concreteness is not a dimension used to explain the effects of visual imagery because, as mentioned, visual images always pertain to specific entities and are therefore inherently concrete—more so than verbal representations in memory (Amit and Green 2012).

Pretests are available on request from the authors.

For all mediation analyses, in all studies, we used bias-corrected bootstrap analyses with 10,000 bootstraps in the PROCESS tool for SPSS (Hayes 2013).

These participants did not answer “yes” to the statement “Beifa dehumidifiers can catch fire.” We checked that participants’ drop-off rates did not differ between conditions (ps > .45). We also performed analyses without removing these participants, which altered only the significance level of results concerning vividness of visual imagery.

Results did not change when the order of the tasks within the SC-IAT was added in the model.

For participants with high error rates, it was not possible to know whether those came about because the mental load task was rather strong or the task was not taken seriously, Gilbert and Hixon (1991) recommend discarding these participants. All significant results were preserved when analyses are performed on all participants.

Implicit attitudes can be modified under conditions requiring minimal cognitive focus (e.g. when people view repeated subliminal stimuli). However, to the best of our knowledge, all studies that manipulated cognitive processing conditions (high vs. low processing ability) reported weaker implicit attitude changes in conditions that constrain cognitive processing.
### Table 1

**STUDY SUMMARIES**

<table>
<thead>
<tr>
<th>Study (Sample Size)</th>
<th>Initial Condition(s)</th>
<th>Counterattitudinal Conditions (Mean Implicit Attitude Change)</th>
<th>Implicit Measure</th>
<th>Mediator(s)</th>
<th>Mediators Ruled Out</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1 (219)</td>
<td>Picture(s)</td>
<td>- Corrective pictorial condition (M = -0.30)</td>
<td>Evaluation priming task</td>
<td>Valence of visual imagery</td>
<td>- Vividness of visual imagery</td>
<td>Misleading advertising disclosure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Corrective imagery-provoking text (M = -0.36)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Corrective text (M = 0.01)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment in Web Appendix F (107)</td>
<td>Picture(s)</td>
<td>- No disclosure (M = 0.03)</td>
<td>Evaluation priming task</td>
<td>Valence of visual imagery</td>
<td>- Vividness of visual imagery</td>
<td>Ambush marketing disclosure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Text disclosure (M = 0.03)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Pictorial disclosure (M = -0.40)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>- Instruction to use visual imagery disclosure (M = -0.41)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experiment 2 (140)</td>
<td>Picture(s) vs. text (manipulated)</td>
<td>- Initial text followed by text recall (M = -0.07)</td>
<td>Single Category Implicit Association Test</td>
<td>- Valence of visual imagery</td>
<td>- Quantity of visual images</td>
<td>Product recall</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initial text followed by picture recall (M = -0.26)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initial picture followed by text recall (M = -0.05)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Initial picture followed by picture recall (M = -0.24)</td>
<td></td>
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</tr>
</tbody>
</table>
Implicit attitude scores obtained from evaluative priming tasks (Experiment 1, 3 and Experiments in Web Appendix F and N) have a theoretical minimum of \(-1\) and maximum of \(+1\).

Implicit attitude scores obtained from Implicit Association Tests, i.e., D scores, (Experiment 2 and Experiment in Web Appendix O) have a theoretical minimum of \(-2\) and maximum of \(+2\).

The distinction between verbalizers and visualizers is based on moderation analyses using the Johnson–Neyman technique.

<table>
<thead>
<tr>
<th>Experiment in Web Appendix N (150)</th>
<th>Text - Cognitive load (M = (-.29)) - Visual load (M = (-.05)) - No load (M = (-.41)) Evaluation priming task</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment in Web Appendix O (312)</td>
<td>Text - Cognitive load (M = (-.12)) - Visual load (M = .13) - No load (M = (-.19)) Evaluation priming task</td>
<td></td>
</tr>
<tr>
<td>Picture - Text (M\textsubscript{Verbalizers} = .03, M\textsubscript{Visualizers} = (-.03)) - Picture (M\textsubscript{Verbalizers} = -.20, M\textsubscript{Visualizers} = (-.18)) Implicit Association Test - Valence of visual imagery - Misleading advertising disclosure - Reinterpretation - Perceived diagnosticity - Processing fluency</td>
<td></td>
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</tr>
</tbody>
</table>
Table 2
EXPERIMENT 1: DESCRIPTIVE AND PLANNED COMPARISONS STATISTICS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Planned Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Corrective Text</td>
</tr>
<tr>
<td>Explicit attitude change</td>
<td>-1.96 (1.88)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Implicit attitude change</td>
<td>.01 (.46)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Valence of visual images</td>
<td>5.01 (1.61)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Vividness of visual images</td>
<td>4.75 (1.29)</td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity of visual images</td>
<td>4.43 (1.33)</td>
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<td></td>
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</tbody>
</table>

Notes: From left to right, the first three columns list means and standard deviations in parentheses. The far right-hand column details planned comparison results.
Table 3
EXPERIMENT 2: DESCRIPTIVE AND ANOVA STATISTICS

<table>
<thead>
<tr>
<th>Condition</th>
<th>2 (Initial Condition) × 2 (Recall Condition) ANOVA Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial Text</td>
</tr>
<tr>
<td></td>
<td>Text Recall</td>
</tr>
<tr>
<td>Explicit attitude change</td>
<td>-4.61 (2.61)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Implicit attitude change</td>
<td>-.07 (.34)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Valence of visual images</td>
<td>4.32 (2.07)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Vividness of visual images</td>
<td>5.09 (2.05)</td>
</tr>
<tr>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity of visual images</td>
<td>5.00 (1.90)</td>
</tr>
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<td></td>
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<td></td>
<td></td>
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</tbody>
</table>

Notes: From left to right, the first four columns list means and standard deviations in parentheses. The far right-hand column details ANOVA results.
Table 4
EXPERIMENT 3: DESCRIPTIVE AND PLANNED COMPARISONS STATISTICS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Planned Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>No Load</td>
<td></td>
</tr>
<tr>
<td>Cognitive Load</td>
<td></td>
</tr>
<tr>
<td>Visual Load</td>
<td></td>
</tr>
<tr>
<td>Explicit attitude</td>
<td>F_{Visual \ vs. \ (Cognitive \ and \ No \ Load)} \ (1, 136) = 4.91, \ p &lt; .05</td>
</tr>
<tr>
<td>change</td>
<td>F_{No \ Load \ vs. \ Cognitive \ Load} \ (1, 136) = .58, \ p = .45</td>
</tr>
<tr>
<td>-.31 (1.33)</td>
<td>(1.71)</td>
</tr>
<tr>
<td>-.306 (1.71)</td>
<td>(1.39)</td>
</tr>
<tr>
<td>-.314 (1.39)</td>
<td></td>
</tr>
<tr>
<td>Implicit attitude</td>
<td></td>
</tr>
<tr>
<td>change</td>
<td></td>
</tr>
<tr>
<td>-.41 (.87)</td>
<td>(1.71)</td>
</tr>
<tr>
<td>-.29 (.84)</td>
<td>(1.39)</td>
</tr>
<tr>
<td>-.05 (.60)</td>
<td></td>
</tr>
</tbody>
</table>
| Notes: From left to right, the first three columns list means and standard deviations in parentheses. The far right-hand column details planned comparison results.
Figure 1
CONCEPTUAL MODEL
Web Appendix

WEB APPENDIX A: ANALYSES TO ASSESS WHETHER CORRECTIVE INFORMATION IN TEXT VS. PICTORIAL FORMAT LED TO EQUIVALENT CHANGES IN EXPLICIT ATTITUDES

In order to ensure equivalency in our materials’ ability to produce explicit attitude change, all of the main experiments tested the different forms of information (e.g., text vs. pictures) to assess whether they led to equivalent changes in explicit attitudes. Those analyses are presented below, in this Web Appendix.

Experiment 1

Consistent with pretest results, a 3 (condition) × 2 (measurement order) ANOVA on explicit attitude change indicated a nonsignificant main effect of condition (F(2, 213) = 2.00, p = .14). This indicates that the magnitude of explicit attitude change did not differ among the three conditions. Measurement order (i.e., explicit or implicit attitude first) had a significant main effect (F(1, 213) = 43.84, p < .001). The change in explicit attitude was greater when explicit attitudes were measured before implicit attitudes but the change in explicit attitude was significant in both cases (both ts > 8.85 and ps < .001). This can be explained because the evaluative priming task used to assess implicit attitudes most likely diluted somewhat the impact of the corrective information.

Experiment 2

A 2 (initial information) × 2 (recall information) ANOVA on explicit attitude change indicated that both main effects and interaction between initial and counterattitudinal information were not significant (Table 3). Hence the change in explicit attitudes was
equivalent in all conditions in the direction of becoming less favorable toward the brand (one-sample t-test; $t(139) = 23.33, p < .001$).

**Experiment 3**

An ANOVA on explicit attitude change indicated a nonsignificant effect of condition ($F < 1$). Hence the change in explicit attitudes was equivalent in all conditions in the direction of becoming less favorable toward the brand (one-sample t-test; $t(138) = 25.04, p < .001$).
WEB APPENDIX B: META-ANALYSIS TO ASSESS EXPLICIT ATTITUDE CHANGE AS A FUNCTION OF IMAGERY-BASED CONDITIONS VS. CONDITIONS THAT DID NOT ALLOW FOR VISUAL IMAGERY.

One of the main points in this paper is that imagery-based stimuli, compared to similar non–imagery-based stimuli, change implicit attitudes even when the information in both formats produce equivalent changes in explicit attitudes. Because null effects in small samples are difficult to interpret (Simonsohn 2015), we boosted the statistical power of our tests by conducting a meta-analysis of all six experiments (the three main experiments and Web Appendices F, N, and O; total sample size = 1,041) that compared imagery-based conditions (e.g., pictures, imagery-provoking text) to conditions that did not allow for visual imagery (e.g., non–imagery-provoking text, visual load) and measured their effects on explicit attitude change. (For the experiment in Web Appendix F we discarded the condition in which participants were exposed to a noncounterattitudinal article; i.e., the no disclosure condition.)

We used Comprehensive Meta-Analysis software (CMA 3.0; Borenstein et al. 2009), which computes a standardized mean difference (SMD) effect size (g, Hedges and Olkin 1985) for each study, then calculates a weighted average. The weighted average gives studies with more participants more weight in the results.

The results showed that changes in explicit attitudes were equivalent across conditions (fixed-effect estimate = .0297, 95% confidence interval = [-.0965, .1560], test of SMD = 0: z = .46, p = .64). The Q statistic, which registers heterogeneity (Hedges and Olkin 1985), indicated nonsignificant heterogeneity across studies (Q(5) = 6.29, p = .28).

In summary, the results of this meta-analysis (total N = 1,041) further confirmed that the conditions that changed implicit attitudes did so beyond changes in explicit attitudes,
which were equivalent. Therefore, imagery-based materials can change both explicit and implicit attitudes, whereas non–imagery-based materials seem only to change explicit attitudes.
WEB APPENDIX C: INITIAL ADVERTISEMENTS FOR ARCELİK (EXPERIMENT 1) AND BEIFA (WEB APPENDIX O).
Spend less time washing dishes, and relax!

Ham Tin Beach

TAI LONG WAN
### WEB APPENDIX D: COUNTERATTITUDINAL STIMULI USED IN THE PICTORIAL CONDITIONS

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Counterattitudinal Pictures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiment 1</td>
<td>![Image of a damaged kitchen]</td>
</tr>
<tr>
<td>Experiments 2 and 3</td>
<td>![Image of a burning device]</td>
</tr>
<tr>
<td></td>
<td>![Image of a building fire]</td>
</tr>
</tbody>
</table>
WEB APPENDIX E: DESCRIPTION OF THE EVALUATIVE PRIMING PROCEDURE AND DATA PREPARATION

Evaluative priming procedure

Participants were introduced to a speeded classification task, and were prompted to be fast and accurate. Participants rated words or pictures appearing in the center of a computer screen as being either “good” or “bad,” and reaction times were recorded. Before each word or picture, a brand logo was briefly presented. Participants then indicated whether the word or picture was good or bad using specific keys on their computer keyboard. Participants were told not to press any key on the basis of the logos but to pay attention to them nonetheless because later they would be questioned about the logos. The purpose of this procedure is that seeing a brand logo should facilitate identifying a subsequent positive stimulus as good and inhibit identifying a subsequent negative stimulus as bad to the extent that respondents have pre-existing positive associations with the brand.

Stimulus words were drawn from Bargh et al. (1992) and pictures were drawn from the International Affective Picture System (IAPS; Lang, Bradley, and Cuthbert 2008). Pictures for the eight key trials, in which the primes were Arcelik logos, were distinctly positive (kitten, baby, sunset and baby seal) or negative (child crying, tornado, shipwreck, garbage). Arcelik logos served as the prime eight times: four times followed by a positive stimulus and four followed by a negative stimulus. To reduce suspicion about the logos of Arcelik, filler trials used logos from other brands as well as neutral target words. These combinations resulted in 54 filler trials.

Target words and pictures for the priming trials were assigned randomly, and subsequent critical trials were separated by at least two filler trials. Before each trial a star
was displayed on the center of the computer screen for 2.5 s. Following Fazio et al. (1995), all primes (i.e., brand logos) were presented for 315 ms, followed by a 135-ms interval before onset of the target word.

Data preparation

Implicit attitudes scores were calculated following standard procedures (Fazio et al. 1995; Petty et al. 2006). We excluded trials with response times greater than 2,500 ms and less than 200 ms, and excluded trials on which participants responded with the incorrect key (e.g., pressing the “good” key for a bad word). For the first implicit attitude test, the excluded trials accounted for 6.5% of all trials, whereas 3.9% of trials were excluded for the second implicit attitude test. These percentages are within the normal range (Fazio et al. 1995).\(^9\) We scored attitudes such that higher values indicated more positive implicit attitudes toward Arcelik, and scores were averaged.
WEB APPENDIX F: ADDITIONAL EXPERIMENT, TEXT PAIRED WITH IMAGERY

INSTRUCTIONS

This experiment tested the predictions that pictures are more effective than text in changing implicit attitudes and that the valence of visual imagery mediates the conditional change in implicit attitudes, both of which also were tested in Experiment 1. In order to provide further evidence that visual imagery is key to changing implicit attitudes, the present experiment also included a condition in which participants read counterattitudinal text that was followed by instructions to simulate the text's point using visual imagery. We predicted that providing consumers with imagery instructions following counterattitudinal text would have a similar effect on implicit attitudes as would seeing counterattitudinal pictures only.

The present experiment studied ambush marketing, which is when brands attempt to mislead consumers into thinking that they are official sponsors of an event (Mazodier, Quester, and Chandon 2012). Because ambush marketing is seen as one threat to the future of major sporting events, events seek to retaliate by disclosing ambush marketing brands’ wrongdoings to the public. The present experiment tested the prediction that disclosing an ambush attempt using the most common strategy—text as part of a newspaper announcement (Mazodier, Quester, and Chandon 2012)—would be less effective in changing implicit attitudes than disclosing the ambush attempt using pictures or instructions to create visual imagery of the ambusher after reading the text. We further predicted that having negative mental images of the ambush brand, Beifa, would mediate this effect.

Method

Sample and design. One hundred nine undergraduates from a major French business school (66 males) took part in exchange for course credit. The experiment used a 4 (condition: no ambush disclosure vs. ambush disclosure with text vs. ambush disclosure with
pictures vs. ambush disclosure with text followed by visual imagery instruction) × 2
(measurement time: Time 1 and Time 2) mixed-subject design. Two participants did not
correctly understand the information provided and their data were omitted (two disclosure
with text participants believed that Beifa was a sponsor after reading disclosure information,
with scores higher than the scale midpoint (4) when rating whether Beifa was a sponsor,
standardized scores > 3.29). This left 107 participants for the analyses.

Stimuli and procedure. We tested our predictions in the context of the Beijing 2008
Olympic Games using Beifa, a brand unknown in Europe, as an ambush sponsor. Participants
in all conditions first performed a procedure that gave the impression that Beifa was an
Olympic sponsor. Participants saw a slideshow with pictures taken during the 2008 Beijing
Olympic Games (e.g., national athletes winning, opening ceremony) as well as print ads
displayed during the Games (including the three following ads for Beifa, Figure F1). Then
initial implicit and explicit attitudes toward Beifa were measured, in that order.

Figure F1

ADVERTISEMENTS FOR BEIFA
In the text disclosure condition, participants then read an article revealing the ambusher status of Beifa. The article stated that, “during the Olympic Games, Beifa launched a large ad campaign in China. This ad campaign strongly suggested that Beifa was an official sponsor of the Games, yet Beifa did not give one dime to the International Olympic Committee. This led most of the Chinese people to believe that Beifa was an official sponsor of the Games, which despaired official sponsors.” Participants wrote a short summary of the article.
In the *no ambush disclosure condition*, participants read a neutral article of similar length concerning 2008 Beijing Olympic athletes such as Michael Phelps or Usain Bolt.

In the *pictorial disclosure condition*, participants were told that the International Olympic Committee was launching a campaign to inform the public about ambushers such as Beifa. We hired a professional draftsman to create three drawings depicting Beifa as a person who was stealing from the International Olympic Committee, which also was portrayed as a person. Participants saw two exposures of each drawing, positioned as print ads from the International Olympic Committee (Figure F2).

Figure F2

**DRAWINGS USED TO ILLUSTRATE BEIFA AS AN AMBUSH MARKETER**
In the visual imagery disclosure condition, participants read the article from the text disclosure condition and were then instructed to visualize a scene in which a person is stealing money from someone who cannot defend himself. Then they were instructed to imagine that the thief is Beifa and the victim is the International Olympic Committee, and to try and imagine the facial expressions of the two characters.

In all conditions, final implicit and explicit attitudes toward Beifa were then measured, in that order. Finally, we assessed characteristics of visual imagery toward Beifa.

Measures. Implicit attitudes were assessed with an evaluative priming measure (Fazio et al. 1995; Petty et al. 2006) similar to the one used in Experiment 1, described in Web Appendix E, but that used only words as targets. The task was performed in French, the participants’ native language.

Explicit attitudes toward Beifa were assessed with three items rated on seven-point scales with the anchors: “bad/good,” “negative/positive,” and “unpleasant/pleasant.” The items were averaged ($\alpha_{time\;1} = .90$; $\alpha_{time\;2} = .94$). We also measured to what extent participants believed that Beifa sponsored the Beijing Olympic Games on a seven-point scale (“strongly..."
disagree/strongly agree”) both before and after disclosure or, for the no disclosure condition, before and after reading the neutral article.

A final questionnaire had participants visualize the ambusher, Beifa, and provide a written description of the visual images. They then rated these visual images on seven-point scales: image valence (“negative/positive,” “unpleasant/pleasant,” “bad/good”; \( \alpha = .93 \)), quantity of images (to what extent mental images appeared to them, how many images were visualized, speed of appearance, ease with which the images were produced; \( \alpha = .81 \)), and image vividness (clarity and level of detail; \( \alpha = .79 \)) (Bone and Ellen 1992).

**Pretesting.** In this experiment, the counterattitudinal stimuli were extensively pretested in order to rule out an alternate explanation for our effects, that pictorial information was more effective than text in creating unfavorable attitudes. Therefore, we assessed whether counterattitudinal pictorial and text-based information were similarly informative and persuasive in forming initial attitudes.

In Pretest 1, participants (N = 20) read the experiment’s disclosure press article or reviewed the three drawings. They then wrote their thoughts concerning Beifa. The 12 words they most often cited were: “abusive,” “cheater,” “dishonest,” “illegal,” “liar,” “misleading,” “opportunistic,” “profiteer,” “thief,” “traitor,” “unfair” and “usurper.”

New participants (N = 38) took part in a between-subject experiment with two conditions (immediate disclosure with text vs. immediate disclosure with pictures). In the immediate disclosure with text condition, participants immediately read the press article disclosing the ambush status of Beifa and then saw the slideshow with the three ads for Beifa. In the immediate disclosure with pictures condition, participants immediately saw the disclosure drawings and then saw the slideshow. The goal was to compare spontaneous memory associations between Beifa and the 12 aforementioned words for each of the two
disclosure conditions using a semantic priming task (Meyer and Schvaneveldt 1971). To the extent that text- and image-based information share meaning, we expected to find no differences in spontaneous memory associations between the two disclosure conditions.

The semantic priming task was similar to the evaluative priming task used to measure implicit attitudes, except that participants categorized target words appearing in the center of a computer screen as being either words or nonwords. The rationale for this procedure is that, if a brand spontaneously conveys a given meaning, seeing that brand should facilitate the identification of a subsequent word with this meaning. On critical trials, logos of Beifa served as a prime 12 times for the 12 words identified in the thought-listing task. Differences in response time between the two disclosure conditions was not significant, neither at an aggregate level (M_{Text} = 779ms, M_{Pictorial} = 832ms, F < 1) nor for each target word separately (the most was for the word “traitor,” F_{min} = 2.37, p_{min} = .13). These results thus indicate that the spontaneous meanings concerning Beifa inferred from the text information (the press article) and from the image-based information (the drawings) did not differ.

Pretest 2 assessed the explicit persuasiveness of the two disclosure conditions. To the extent that text and pictorial information have the same level of explicit persuasiveness, they should lead to the same level of explicit attitudes when forming new attitudes. We thus expected to find similarly negative explicit attitudes toward Beifa when disclosure was performed immediately in both conditions. Forty-nine community adults and students (28 males) were given one of the two disclosure conditions (immediate disclosure with text vs. immediate disclosure with pictures). We measured explicit attitudes toward Beifa using three items rated on seven-point scales with the anchors: “bad/good,” “negative/positive,” and “unpleasant/pleasant.” The items were averaged (α = .91). We also measured to what extent they believed that Beifa was sponsoring the Beijing Olympic Games on a seven-point Likert
Three participants did not understand the information, and their data were omitted leaving 46 participants. As expected, explicit attitudes toward Beifa did not differ by condition ($M_{\text{Text}} = 2.63; M_{\text{Pictorial}} = 2.81; F < 1$). This ensured that the pictures (drawings) and text (press article) had equivalent level of explicit persuasiveness. As intended, pictures and text were equivalent in the explicit and implicit information they were able to convey and in terms of explicit persuasiveness.

Assessments in the experiment itself confirmed the assumption that the differing forms of information led to equivalent changes in explicit attitudes. An ANOVA on explicit attitude change indicated the expected effect of condition ($F(3, 103) = 11.38, p < .001$). Table F1 presents the descriptive and planned analyses statistics. Consistent with the pretest results, planned analyses showed that explicit attitude change in the no disclosure condition, compared to the three disclosure conditions, differed significantly. One-sample t-tests (test value 0) showed that explicit attitudes did not change in the no disclosure condition, as expected ($F < 1$), whereas explicit attitudes became more negative after disclosure in the three disclosure conditions ($t(82) = 8.81, p < .001$). Moreover, looking within the three disclosure conditions, explicit attitude change did not differ between conditions. Thus, consistent with pretest results, adding imagery instructions to the text disclosure condition (i.e., the visual imagery disclosure condition) did not alter explicit attitudes toward Beifa any more than text disclosure alone or pictorial disclosure.
Table F1
DESCRIPTIVE AND PLANNED COMPARISONS STATISTICS

<table>
<thead>
<tr>
<th>Condition</th>
<th>No disclosure</th>
<th>Text disclosure</th>
<th>Pictorial disclosure</th>
<th>Imagery disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit attitude change</td>
<td>.35 (.46)</td>
<td>-.91 (1.14)</td>
<td>-1.22 (1.17)</td>
<td>-1.09 (1.05)</td>
</tr>
<tr>
<td>Implicit attitude change</td>
<td>.03 (.46)</td>
<td>.03 (.52)</td>
<td>-.40 (.52)</td>
<td>-.41 (.57)</td>
</tr>
<tr>
<td>Valence of visual images</td>
<td>4.28 (1.20)</td>
<td>3.84 (1.32)</td>
<td>3.23 (1.22)</td>
<td>2.98 (1.20)</td>
</tr>
<tr>
<td>Vividness of visual images</td>
<td>3.06 (1.78)</td>
<td>3.74 (1.35)</td>
<td>3.19 (1.42)</td>
<td>3.45 (1.50)</td>
</tr>
<tr>
<td>Quantity of visual images</td>
<td>3.50 (1.50)</td>
<td>4.04 (1.35)</td>
<td>3.03 (1.18)</td>
<td>3.97 (1.29)</td>
</tr>
</tbody>
</table>

Planned Comparisons

- **No disclosure vs. 3 disclosure conditions**:
  
  $F(1, 103) = 32.97, p < .001$
  
- **Text vs. (Pictorial and Imagery)**:
  
  $F(1, 103) = .94, p = .33$

- **Implicit vs. Explicit attitude change**:
  
  $F(1, 103) = 12.89, p < .01$
  
- **Text vs. No disclosure**:
  
  $F(1, 103) = .99, p = .33$

- **Valence of visual images**:
  
  $F(1, 103) = 6.43, p = .01$
  
- **Vividness of visual images**:
  
  $F(1, 103) = 1.43, p = .23$

- **Quantity of visual images**:
  
  $F(1, 103) = 3.00, p = .09$
Notes: From left to right, the first three columns list means and standard deviations in parentheses. The far right-hand column details planned comparison results.

Results

Data preparation. To obtain implicit attitudes scores, we analyzed the evaluative priming data following the same standard procedure as in Experiment 1. We scored attitudes such that higher values indicated more positive implicit attitudes toward Beifa, and scores were averaged.

Manipulation checks. The paradigm rested on participants initially believing that Beifa was an official sponsor. Participants in all conditions were successfully made to believe that Beifa sponsored the Olympic games (M_noDisc = 6.04, M_Text = 5.59, M_Pictorial = 5.96 and M_Imagery = 5.79). All means were significantly greater than the scale midpoint of 4 (all ts > 4.64 and ps < .001). Disclosure had the expected negative effect on this belief (M_Text = 1.33, M_Pictorial = 1.48, M_Imagery = 1.14, all ts > 11.00 and ps < .001), and the belief that Beifa did not sponsor the Beijing Olympics was similar across the three disclosure conditions (F < 1.2).

Implicit attitude change. An ANOVA on implicit attitude change indicated a main effect of condition (F(3, 103) = 6.36, p = .001). Table F1 reports the descriptive and planned analyses statistics. Planned analyses indicated that the contrast comparing the text disclosure condition with the combined pictorial and visual imagery disclosure conditions (i.e., imagery-based disclosures) was significant. As expected, implicit attitudes changed more in the pictorial and visual imagery disclosure conditions than in the text disclosure condition. One-sample t-tests (test value 0) showed that implicit attitude change was significant and negative in the pictorial and visual imagery disclosure conditions (t(55) = 5.63, p < .001) but not in the text disclosure condition (F < 1). Moreover, the magnitude of implicit attitude change did not differ between pictorial disclosure and visual imagery disclosure conditions. Similarly, the
magnitude of implicit attitude change did not differ between text disclosure and no disclosure conditions. We thus demonstrated that disclosure with visual imagery instructions and pictorial disclosure were more effective than text disclosure in changing implicit attitudes. Text disclosure was not any more effective than no disclosure in decreasing the favorability of implicit attitudes toward Beifa. Notably, explicit attitude change was similarly negative in the three disclosure conditions.

Mediation of valence of visual imagery. Valence of visual imagery differed by condition, as expected (F(3, 103) = 5.94, p = .001). Planned comparisons indicated that mental visual images were significantly more negative in the pictorial and visual imagery disclosure conditions than in the text and no disclosure conditions (Table F1). Valence did not differ between pictorial disclosure and visual imagery disclosure conditions, nor between text disclosure and no disclosure conditions. These results suggested that valence of visual imagery could mediate the relationship between type of disclosure and implicit attitude change.

We assessed the possibility of mediation using implicit attitude change toward Beifa as the dependent variable and initial implicit attitude toward Beifa as a covariate. We compared text disclosure with the two conditions we hypothesized would elicit mental visual imagery (i.e., pictorial and visual imagery conditions), and the mediator was valence of visual imagery toward Beifa. The analysis revealed the predicted indirect effect (–.13) of the combined influence of visual imagery or pictorial disclosure (vs. text disclosure) on implicit attitude change through valence of visual imagery with a 95% confidence interval excluding zero (95% CI = [–.2322, –.0347]). The direct effect was also significant (p < .01) and negative (–.24). The effect of disclosure strategy on implicit attitude change could be explained by the valence of visual imagery.
In this experiment, as in Experiment 1, we expected the valence of the visual imagery to mediate implicit attitude change and not vividness or quantity of visual images. We therefore tested a model in which valence ratings, quantity and vividness of participants’ mental visual images acted as potential simultaneous mediators. The only significant indirect effect was the mediation by visual imagery valence (estimate = –.12, 95% CI = [–.2276, –.0312]).

Discussion

The present experiment used ambush marketing disclosure and found that disclosing an ambush attempt using pictures or instructions to imagine the ambush marketer were more effective in changing implicit attitudes toward the ambusher than telling consumers about the ambush attempt using text alone. These patterns occurred even though the three disclosure conditions were equivalently effective in negatively affecting explicit attitudes toward the ambusher. The present study provided further evidence that visual imagery plays a crucial role in changing implicit attitudes. One condition’s disclosure came via text that was followed by instructions to visualize the ambusher, and the other effective condition depicted a picture of the ambusher as disclosure.

This experiment further found, as expected, that the key component that changed implicit attitudes was the valence of participants’ visual imagery about the ambusher. Visual imagery was more negative in the conditions in which disclosure came via pictures or text followed by visual imagery instructions than via a text disclosure only condition. Valence of visual imagery mediated the relationship between how the disclosure information was conveyed and implicit attitude change.
When humidity levels are high, the new BEIFA dehumidifier combines power and energy efficiency to remove moisture from your home. The unit has a 4.5-L capacity and can dehumidify large areas in a minimal amount of time. Plus, it has several features most other dehumidifiers do not have, including automatic features that let you set your desired humidity level and leave. The unit will do all of the work for you. To summarize, the BEIFA dehumidifier is designed for comfort and convenience. It is the best dehumidifier on the market, in part because it requires minimal monitoring and maintenance.

Furthermore, BEIFA makes eco-friendly products and use an eco-friendly process. Indeed, BEIFA invested millions of US dollars to treat and clean its used water. Thanks to this sophisticated water filtration system, the discharged water of BEIFA is as clean as the water from the mountains. BEIFA is really committed to protect our water and our beautiful lakes. Therefore, our review team gives the Gold Award of the 2015 dehumidifiers to the new BEIFA.
When humidity levels are high, the new BEIFA dehumidifier combines power and energy efficiency to remove moisture from your home. It is the best dehumidifier on the market, in part because it requires minimal monitoring and maintenance. Furthermore, BEIFA makes eco-friendly products and uses an eco-friendly process. Indeed, BEIFA treats and cleans its used water thanks to a sophisticated water filtration system. BEIFA is committed to protect our water as illustrated by these pictures. Therefore, our review team gives the Gold Award of the 2015 dehumidifiers to the new BEIFA.
WEB APPENDIX I: DESCRIPTION OF THE SC-IAT PROCEDURE

The Single Category Implicit Association Test (SC-IAT) is a modified version of the Implicit Association Test (IAT; Greenwald, McGhee, and Schwartz 1998). Like the IAT, the SC-IAT rests on the assumption that it should be easier to make the same behavioral response (i.e., a key press) to concepts that are strongly associated than to concepts that are weakly associated in memory. Participants have to perform several categorization tasks as fast as possible, including two focal tasks that are used to compute the SC-IAT results. In one focal task, participants have to press one key when the item appearing on the center of the screen is a logo of Beifa or a word representing the category “good” (e.g., “marvelous,” “superb,” “pleasure”) and another key when the item appearing on the center of the screen is a word representing the category “bad” (e.g., “tragic,” “horrible,” “agony”). In the second focal task, participants have to press one key when the item appearing on the center of the screen is a word representing the category “good” and another key when the item appearing on the center of the screen is a Beifa logo or a word representing the category “bad.” The order of the focal tasks in the SC-IAT was counterbalanced between participants and, for a given participant, the time 1 SC-IAT and time 2 SC-IAT had the same order of the focal tasks. Implicit attitude toward Beifa is measured by comparing the speed of categorizing items in these two different sorting conditions. To the extent that Beifa is spontaneously liked, the mean response latency should be faster when Beifa is paired with “good” terms than when it is paired with “bad” terms.
We post-tested the effects of the three corrective conditions of Experiment 1 on participants’ feelings when learning that ARCELİK manufactures poor quality products. One hundred twenty participants were drawn from the same subject population as in Experiment 1. The procedure was similar to that used in Experiment 1 except that we did not measure explicit and implicit attitudes. Respondents reported their feelings toward the story on both a feeling thermometer (slider scale ranging from 0 = “very cold and unfavorable” to 100 = “very warm and favorable”) and on a five-point affect scale with 10 items (e.g., “I had unpleasant feelings reading the story,” \( \alpha = .77 \), Pham et al. 2001). Affective ratings did not differ between the three corrective conditions and that for both measures (F's < 1.35, \( p \) s > .27), suggesting that affect likely does not account for the effects of corrective information on implicit attitudes.
WEB APPENDIX K: INITIAL PRODUCT DESCRIPTION USED IN EXPERIMENT 3

When humidity levels are high, the new BEIFA dehumidifier combines power and energy efficiency to remove moisture from your home. The unit has a 4.5-L capacity and can dehumidify large areas in a minimal amount of time. Plus it has several features most other dehumidifiers do not have, including automatic features that let you set your desired humidity level and leave. The unit will do all of the work for you.

To summarize, the BEIFA dehumidifier is designed for comfort and convenience. It is the best dehumidifier on the market, in part because it requires minimal monitoring and maintenance. Therefore, our review team gives the Gold Award of the 2015 dehumidifiers to the new BEIFA.
WEB APPENDIX L: VISUAL LOAD MANIPULATION – PATTERN OF SIX DOTS TO KEEP IN MIND
WEB APPENDIX M: PRETEST OF STIMULI IN EXPERIMENT 3

This pretest assessed whether the visual and cognitive load tasks were similar in perceived difficulty and assessed if the magnitude of explicit attitude change did not differ among conditions.

Sample and design

One hundred fifty undergraduates from a major Hong Kong University (43 males) completed the experiment in exchange for course credit. The experiment used a 3 (condition: visual load vs. cognitive load vs. no load) × 2 (measurement time: Time 1 and Time 2) mixed-subject design.

Stimuli and procedure

This pretest used the same stimuli and followed the same procedure as the one detailed in Experiment 3, with the exception that we did not assess implicit attitudes toward Beifa. All participants were first exposed to a positive, textual product description of a new dehumidifier from Beifa, an unfamiliar brand in Hong Kong (Web Appendix K). Initial explicit attitudes were then measured.

Participants in the no load condition were then informed that Beifa had to recall its dehumidifiers because they could catch fire. Two pictures illustrated the negative consequences of the product catching fire (Web Appendix D). Participants in the cognitive load condition were then asked to keep in mind an eight-digit number and then were informed about the Beifa product recall. Participants in the visual load condition were asked to keep in mind a pattern of six asterisks (Web Appendix L) and then were informed about the Beifa product recall. Final explicit attitudes were then measured.

Measures
Explicit attitudes toward Beifa were assessed with three nine-point scales: “negative/positive,” “unpleasant/pleasant,” “I don’t like/I like” ($\alpha_{\min} = .86$). We assessed perceived difficulty of the load task with two seven-point scale items (“very easy/very difficult,” “not at all challenging/very challenging”; $\alpha_{\min} = .91$).

**Results**

The cognitive and visual load tasks had the same perceived difficulty ($M_{\text{Visual Load}} = 3.42$, $M_{\text{Cognitive Load}} = 3.05$, $t(100) = 1.20$, $p = .23$). Hence, different levels of task difficulty should not drive the results of the main experiment.

An ANOVA on explicit attitude change indicated a nonsignificant effect of condition ($F(2, 147) = 1.56$, $p = .22$). Hence, the change in explicit attitudes was equivalent in all three conditions.

This pretest thus established that the visual and cognitive load tasks used in Experiment 3 were similar in perceived difficulty and that the magnitude of explicit attitude change did not differ among the three conditions.
WEB APPENDIX N: REPLICATION ATTEMPT OF EXPERIMENT 3’S RESULTS.

Three experiments (1, 2, and the one in Web Appendix F) consistently showed the superiority of imagery-based materials over non-imagery-based materials in changing implicit attitudes. Experiment 3 was the only one that directly manipulated participants’ ability to produce mental imagery, and that showed that hindering visual image formation blocked implicit attitude change. It was thus important to show that these results could be replicated. In this replication attempt, the stimuli and procedure were the same as the ones used for Experiment 3, except that the visual load task used a pattern of asterisks (*) instead of dots.

Sample and design

One hundred seventy-two undergraduates from a major Hong Kong University (51 males) completed the experiment in exchange for HK$40. The experiment used a 3 (condition: visual load vs. cognitive load vs. no load) × 2 (measurement time: Time 1 and Time 2) mixed-subject design. Implicit attitude scores for 11 participants who committed too many errors (more than 50% errors) could not be computed. Thirteen participants committed more than two errors on the load task, and their data were discarded (Gilbert and Hixon 1991). In total, there were data from 148 participants for the analyses. All significant results are preserved when analyses are performed on all participants.

Measures

Implicit attitudes toward Beifa were assessed using the same evaluative priming task as in Experiment 1. Explicit attitudes toward Beifa were assessed with items used previously (three 9-point scales: “negative/positive,” “unpleasant/pleasant,” “I don’t like/I like”; $\alpha_{\text{min}} = .85$). We assessed perceived difficulty of the load task with two 7-point scale items (“very easy/very difficult,” “not at all challenging/very challenging”; $\alpha = .91$).
Results

Manipulation checks. Consistent with the pretest (Web Appendix M), the cognitive and visual load tasks had the same perceived difficulty ($|t| < 1$). This test gave assurance that different levels of task difficulty cannot drive our results. Expectedly, the magnitude of explicit attitude change did not differ among the three conditions (see Table N1).

Table N1
DESCRIPTIVE AND PLANNED COMPARISONS STATISTICS

<table>
<thead>
<tr>
<th>Condition</th>
<th>Planned Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Load</td>
<td>Cognitive Load</td>
</tr>
<tr>
<td>Explicit attitude change</td>
<td>-3.88 (1.29)</td>
</tr>
<tr>
<td>Implicit attitude change</td>
<td>-.19 (.79)</td>
</tr>
</tbody>
</table>

F\text{Visual vs. (Cognitive and No Load)} (1, 145) = .56, \( p = .46 \)
F\text{No Load vs. Cognitive Load} (1, 145) = 1.88, \( p = .31 \)
F\text{Visual vs. (Cognitive and No Load)} (1, 145) = 5.78, \( p < .05 \)
F\text{No Load vs. Cognitive Load} (1, 145) = .29, \( p = .59 \)

Notes: From left to right, the first three columns list means and standard deviations in parentheses. The far right-hand column details planned comparison results.

Implicit attitude change. We expected implicit attitudes toward Beifa to decrease less in the visual load condition than in the cognitive load and no load conditions, and we did not expect a significant difference between the cognitive load and no load condition. An ANOVA on implicit attitude change indicated a significant omnibus effect of condition (F(2, 145) = 3.08, \( p < .05 \)). Table N1 reports the descriptive and planned analyses statistics. It showed that, as expected, the contrast comparing a combined factor of no load and cognitive load
conditions with the visual load condition was significant. As expected, implicit attitudes changed less in the visual load than in the other conditions. One-sample t-tests (test value 0) showed that implicit attitudes in the no load and cognitive load conditions became more negative ($t(103) = 2.17, p < .05$) and, unexpectedly, became more positive in the visual load condition ($t(43) = 2.04, p < .05$). As expected, the contrast comparing the no load condition with the cognitive load condition was not significant. Thus, implicit attitude change toward Beifa was equivalent in the cognitive load and in the no load condition.

Discussion

This experiment replicates the results of Experiment 3: a cognitive load task did not impede implicit attitude change. Yet, unexpectedly, the visual load task led to an increase in implicit positivity toward Beifa. This result parallels the unexpected findings of Cone and Ferguson (2015, Experiment 1a). The only difference between this experiment and Experiment 3 was that the visual load task used a pattern of asterisks instead of dots. While it is possible that this unexpected finding is a false positive, visual processing can automatically process several pieces of information in parallel and in a gestalt manner (Townsend and Kahn 2014). Hence, it is possible that the (negative) product recall pictures were processed simultaneously with the pattern used for the visual load task. In that case, if the pattern of asterisks used for the visual load task was more positively valenced than the pattern of dots, this could have influenced implicit attitudes toward Beifa.

In a post-test, on a sample drawn from the same subject population as in the main experiment ($n = 71$), we assessed this possibility. We measured explicit attitudes toward the patterns of asterisks and dots, with three items rated on a semantic differential scale that has nine points ("negative/positive," "unpleasant/pleasant," and "I dislike/I like"; $\alpha = .84$). We found that explicit attitudes toward the pattern of asterisks and dots did not actually differ (F
< 1). Hence it is likely that the unexpected increase in implicit positivity toward Beifa in the visual condition was a false positive result.

Findings from this experiment, along with Experiment 3, are consistent with work showing that working memory has two systems of limited capacity: a phonological system that processes verbal and numerical information, and a visuospatial system that processes visuospatial information (Baddeley 1992; Baddeley and Andrade 2000). Like Baddeley and Andrade (2000), our results indicate that being able to generate visual imagery from pictures is hindered by a competing visual load task. While this finding might appear to contradict findings that suggest the imagery system is able to process several pieces of information simultaneously (Townsend and Kahn 2014), that finding has mainly been obtained when processing a single, coherent picture (Sharps and Nunes 2002). It is thus unlikely that unrelated pictures (e.g., the visual load pattern and images used for the product recall) can be processed simultaneously.
WEB APPENDIX O: MODERATING EFFECT OF COGNITIVE STYLE

Experiment 1 found that a corrective picture and imagery-provoking text both are more effective than plain corrective text in changing implicit attitudes. This new experiment had three central aims. First, we hypothesized that the relative advantage of information presented via text or pictures in changing implicit attitudes would be contingent on individual differences in the propensity to process information visually or verbally (Childers, Houston, and Heckler 1985; Kirby, Moore and Schofield 1988; Kraemer, Rosenberg, and Thompson-Schill 2009). People with a verbal cognitive style tend to process text semantically—that is, without forming visual images. That stands in contrast to a visual style, which is attributed to those who tend to form visual images when processing imagery-related text information (Kraemer, Rosenberg, and Thompson-Schill 2009). We expected that implicit attitude change would occur more after seeing pictures than reading text for verbalizers. Yet for visualizers, who are likely to form visual imagery from text, we expected that pictures and text would be similarly effective in altering implicit attitudes.

Given Experiment 1’s results showing that the valence of visual imagery mediated the change in implicit attitudes, and given the interest in text processing style, this new experiment aimed to test a moderated mediation model (Figure O1). Because visualizers form visual imagery from text, corrective information in the form of text and pictures should similarly affect the valence of visual imagery elicited and hence not explain (mediate) the effect of corrective information format (text vs. picture) on implicit attitude change. Among verbalizers, we expected to replicate the previous mediating effect of visual imagery valence seen in Experiment 1.
Second, this experiment also attempted to demonstrate that the results were not dependent on a particular measure. It therefore used a different measure of implicit attitudes, the Implicit Association Test (IAT; Greenwald, McGhee, and Schwartz 1998).

Finally, this experiment sought to rule out possible confounds. We examined whether reinterpretation (i.e., new information changing the meaning of previously learned information; Mann and Ferguson 2015), perceived diagnosticity (Cone and Ferguson 2015), or processing fluency (Alter and Oppenheimer 2009) could explain the advantage of pictures over text in changing implicit attitudes (expected for verbalizers in this study). Each of these factors could differ between pictures and text and have been shown to influence implicit attitudes (Cone and Ferguson 2015; Mann and Ferguson 2015), rendering them arguable alternate explanations for the hypothesized effects.

As in all experiments, we assessed whether the corrective picture and text led to similar degrees of explicit attitude change and found that the magnitude of explicit attitude change was greater in the corrective text than in the picture condition. An ANOVA on explicit attitude change showed, contrary to the pretesting, a significant effect of condition ($F(1, 310) = 3.90, p = .05$). Yet the magnitude of explicit attitude change was greater in the corrective text condition ($M_{\text{Text}} = –3.35$) than in the corrective picture condition ($M_{\text{Picture}} = –2.94$). While unexpected, this difference works against our hypothesized effect, which is that implicit attitudes would change more in the corrective picture than text condition (for verbalizers).

Figure O1

MODERATED MEDIATION MODEL
Method

Sample and design. Three hundred eighteen adults living in the United Kingdom (150 males, $M_{age} = 28.7$) participated via the Prolific Academic website (www.prolific.ac) in exchange for 2.35 pounds. The experiment used a 2 (condition: picture vs. text) × 2 (measurement time: Time 1 and Time 2) mixed-subject design. Six participants’ data were unusable because more than 10% of their answers in the Implicit Association Tests (IATs) were faster than 300ms (Greenwald, Nosek, and Banaji 2003), leaving 312 participants.

Stimuli and procedure. The procedure was similar to Experiment 1’s. Participants first saw five positive ads for Beifa (Web Appendix C), a brand of dishwashers unfamiliar to participants. We then measured initial explicit and implicit attitudes toward Beifa, in that order.

Next, participants read a short press release issued by the “Consumer Council, which protects and promotes consumer rights in the United Kingdom.” The beginning of the press release was the same as in Experiment 1. After the initial text, participants in the picture condition saw a picture of a damaged kitchen (as in Experiment 1; Web Appendix D). Participants in the text condition read non–imagery-provoking text (from Experiment 1): “Beifa used a nylon hose clamp instead of the usual steel band. Since the nylon was of a very bad quality, the clamp often broke after a few months, causing a lot of damage,” followed by the additional sentence, “Imagine a kitchen flooded in water.” This line was added with the
intent of prompting visualizers to form negative visual imagery toward Beifa without being strong enough to lead verbalizers to form visual imagery. In both conditions, participants wrote a summary of what they learned.

A second evaluation of explicit and implicit attitudes toward the brand were then measured, in that order. Next we assessed participants’ cognitive style, valence of visual imagery about Beifa, processing fluency of the corrective information, perceived diagnosticity of the corrective information, and the extent to which the corrective information changed the meaning of the ads (i.e., reinterpretation; Mann and Ferguson 2015).

Explicit measures. We assessed explicit attitudes toward the brand with three items (1 = “negative/unpleasant/I don’t like,” 9 = “positive/pleasant/I like”; $\alpha_{\text{min}}=.93$). Valence of visual images was assessed with three items (1 = “negative/unpleasant/bad,” 9 = “positive/pleasant/good”; $\alpha=.94$). Processing fluency was assessed with a single item (1 = “very easy,” 7 = “very hard to process”), and reinterpretation was measured with the question, “How much did the new information change the meaning of Beifa’s earlier messages?” (1 = “not at all,” 9 = “very much”) Lastly, the corrective information’s diagnosticity was measured with the item, “To what extent did the later information change your overall impression of Beifa?” (1 = “not at all,” 9 = “extremely”)

Cognitive style was assessed with the revised Verbalizer–Visualizer Questionnaire (revised VVQ; Kirby, Moore, and Schofield 1988), a well-validated measure (Kraemer, Rosenberg, and Thompson-Schill 2009). The revised VVQ consists of 20 items (1 = “strongly disagree,” 7 = “strongly agree”), half of which denote a verbal cognitive style (e.g., “I enjoy doing work that requires the use of words”) and half that denote a visual cognitive style (e.g., “I find illustrations or diagrams help me when I’m reading”). After reverse-scoring appropriate items, we summed responses ($\alpha_{\text{min}}=.72$). Following recommendations (Childers,
Houston, and Heckler 1985), we then computed a difference score that reflected tendencies to process information visually or verbally (Jiang and Wyer 2009). The theoretical range is -60 (strong verbalizer) to +60 (strong visualizer), and the empirical range in our sample was -43 to +51 ($M = 2.47, SD = 9.78$).

Implicit measures. Implicit attitudes were assessed with the IAT. The IAT was presented as a computerized, quick categorization task (Greenwald, McGhee, and Schwartz 1998). The task instructed participants to associate logos of Beifa and, alternately, other brands that were unfamiliar to participants with words semantically related to the concepts of goodness or badness. To the extent that Beifa was spontaneously associated with positivity, responses should be faster when Beifa is paired with words indicating positive concepts (e.g., “marvelous,” “superb,” “pleasure”) than for words indicating negative concepts (e.g., “tragic,” “horrible,” “agony”). Data from the IAT were prepared according to a standard algorithm (Greenwald, Nosek, and Banaji 2003). Values less than zero indicated negative implicit attitudes toward Beifa, whereas positive values indicated positive implicit attitudes relative to other brands (see Mann and Ferguson 2015 for a similar use of the IAT).

Results

Moderation of cognitive style. To assess the moderating effect of cognitive style on implicit attitude change, we used the regression-based PROCESS tool for SPSS (Hayes 2013). The dependent variable was implicit attitude change toward Beifa with initial implicit attitude toward Beifa and order of the tasks in the IAT entered as covariates. The independent variable was condition, and the moderator was cognitive style. As expected, there was a significant interaction between condition and cognitive style ($b = .0077, t(306) = 2.04, p < .05$).
We used the Johnson–Neyman technique to identify the range of cognitive style values for which the picture (vs. text) led to greater implicit attitude change (Hayes 2013). This analysis indicated that the picture was significantly more effective than the text in changing implicit attitudes for participants with a cognitive style score lower than −7.90 (i.e., for verbalizers) (b = −.11, t(307) = 1.97, p = .05). The means of implicit attitude change differed between the text and picture conditions for all cognitive style values lower than −7.90 (verbalizer; M\text{Text} = .03, M\text{Picture} = −.20). For participants with a cognitive style value higher than −7.90, implicit attitude change did not differ by condition (M\text{Text} = −.19, M\text{Picture} = −.18). These results showed that whether or not a picture is more effective than text in changing implicit attitudes depends on one’s cognitive style. Consistent with theorizing, we only observed this advantage for verbalizers and not for visualizers.

Did cognitive style moderate whether the valence of visual imagery mediated the effect of condition on implicit attitudes change? We expected that the mediating effect of visual imagery valence would be observed only for verbalizers and not for visualizers. We used the PROCESS model 7 (Hayes 2013) moderated mediation test (Figure O1). The dependent variable was implicit attitude change toward Beifa with initial implicit attitude scores and order of the tasks in the IAT entered as covariates. The independent variable was condition, the mediator was valence of visual imagery, and the moderator was cognitive style. The test of mediated moderation is provided by the index of moderated mediation. The 95% confidence interval for the index did not include zero (95% CI = [.0001, .0025]), thereby providing evidence for moderated mediation.

We used the Johnson–Neyman technique to identify the range of cognitive style values that revealed the mediated effect. Visual imagery valence mediated the effect of condition for participants with a cognitive style score less than −3.50 (i.e., for verbalizers)
(estimate = –.01, 95% CI = [–.0326, –.0001]). For all other values (i.e., for visualizers) visual imagery valence did not account for implicit attitude change, indicating that it was similar across text and imagery conditions. Hence, as expected, we found that the mediating effect of visual imagery valence held only for verbalizers, not for visualizers.

Ruling out possible confounds. We tested processing fluency, diagnosticity, and reinterpretation as potential alternate explanations for the advantage of pictures over text in changing implicit attitudes (for verbalizers). We found no evidence that they played a meaningful role (ts < 1; all 95% CIs included zero).

Discussion

This experiment showed several key outcomes. We found that cognitive style, an individual difference that tracks the propensity to process information visually or verbally, qualified the advantage of picture over text in changing implicit attitudes. For visualizers, who often reflexively form visual images when reading text, pictures and text were similarly effective. For verbalizers, who often do not form visual images when reading text, a picture was more effective than text in altering implicit attitudes. As in Experiment 1, visual imagery valence statistically accounted for (mediated) implicit attitude change. As predicted, valence differences mattered when explaining the effect among verbalizers, but not for visualizers (i.e., a moderated mediation pattern). The nonsignificant result for visualizers speaks to the assumption that they develop visual imagery regardless of the information’s format (text vs. picture). Lastly, this experiment found no support for alternate explanations concerning fluency, reinterpretation, or diagnosticity.
REFERENCES SPECIFIC TO THE WEB APPENDICES


Some negative pictures used were semantically linked to the notion of damage, which is what the picture and text disclosure also depicted. This semantic correspondence between pictures might have facilitated the effects reported in this study. To rule out this possibility, follow-up experiments used different implicit measures with verbal stimuli and without semantic correspondence.


In all cases for all reaction times across all studies using evaluative priming, we removed 5.2 percent of trials on average, which across all studies never meant removing more than 7.4 percent. More information on this matter can be obtained from the authors.