

**NONPROBATIVE PHOTOS INFLATE THE TRUTHINESS  
AND FALSINESS OF CLAIMS**

**by**

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## Abstract

When people evaluate claims they often rely on what comedian Stephen Colbert calls truthiness, judging claims using subjective feelings of truth, rather than drawing on facts. Over seven experiments I examined how nonprobative photos can manufacture truthiness in just a few seconds. I found that a quick exposure to a photo that relates to, but does not provide any probative evidence about the accuracy of claims can systematically bias people to conclude claims are true. In Experiments 1A and 1B, people saw familiar and unfamiliar celebrity names and, for each, quickly responded "true" or "false" to the claim "This famous person is alive" or (between subjects) "This famous person is dead." Within subjects, some names appeared with a photo of the celebrity engaged in his/her profession whereas other names appeared alone. For unfamiliar celebrity names, photos increased the likelihood that subjects judged the claim to be true. Moreover, the same photos inflated the truth of "Alive" and "Dead" claims, suggesting that photos did not produce an "alive bias," but a "truth bias."

Experiment 2 showed that photos and verbal information similarly inflated truthiness, suggesting that the effect is not peculiar to photographs per se. Experiment 3 demonstrated that nonprobative photos can also enhance the truthiness of general knowledge claims (*Giraffes are the only mammals that cannot jump*). In Experiments 4-6 I examined boundary conditions for truthiness. I found that the semantic relationship between the photo and claim mattered. Experiment 4 showed that in a within-subject design, related photos produced truthiness, but unrelated photos acted just like the no photo condition. But unrelated photos were

not always benign, Experiment 5 showed that their effects depended on experimental context. In a mixed design, related photos produced truthiness and unrelated photos produced falsiness.

Although the effect of related photos was robust across materials and variation in experimental context, when I used a fully between-subjects design in Experiment 6, the effect of photos (related and unrelated) was eliminated. These effects add to a growing literature on how nonprobative information can influence people's decisions and suggest that nonprobative photographs do more than simply decorate, they can rapidly manufacture feelings of truth. As with many effects in the cognitive psychology literature, the photo-truthiness effect depends on the way in which people process and interpret photos when evaluating the truth of claims.

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## Table of Contents

|   |           |
|---|-----------|
| <b>Chapter 1</b>                                      | <b>9</b>  |
| <i>Judging Truth</i>                                  | <b>10</b> |
| <i>Repetition and Truth.</i>                          | <b>11</b> |
| <i>Conceptual Fluency and Cognitive Availability.</i> | <b>13</b> |
| <i>Imagery and Reality Monitoring.</i>                | <b>14</b> |
| <i>Trawling for Confirming Evidence.</i>              | <b>16</b> |
| <i>Overview</i>                                       | <b>18</b> |
| <b>Chapter 2</b>                                      | <b>19</b> |
| <b>Experiment 1A and 1B</b>                           | <b>19</b> |
| <b>Method</b>   | <b>19</b> |
| <i>Subjects</i>                                       | <b>19</b> |
| <i>Design</i>   | <b>19</b> |
| <i>Procedure</i>                                      | <b>19</b> |
| <b>Results and Discussion</b>                         | <b>21</b> |
| <i>Truthiness or aliveness?</i>                       | <b>22</b> |
| <b>Chapter 3</b>                                      | <b>25</b> |
| <b>Experiment 2 and 3</b>                             | <b>25</b> |
| <b>Method</b>   | <b>25</b> |
| <i>Subjects</i>                                       | <b>25</b> |
| <i>Design</i>   | <b>25</b> |
| <i>Procedure</i>                                      | <b>25</b> |
| <b>Results and Discussion</b>                         | <b>26</b> |
| <b>Experiment 3</b>                                   | <b>28</b> |

|  |           |
|--|-----------|
| <b>Method</b>  | <b>28</b> |
| <i>Subjects</i>  | <b>28</b> |
| <i>Design</i>  | <b>28</b> |
| <i>Procedure</i>   | <b>28</b> |
| <b>Results and Discussion</b>                              | <b>28</b> |
| <b>Summary of Experiments 1-3</b>                          | <b>29</b> |
| <b>Under what conditions do photos produce truthiness?</b> | <b>31</b> |
| <b>Chapter 4</b>   | <b>34</b> |
| <b>Experiment 4</b>  | <b>34</b> |
| <b>Method</b>  | <b>34</b> |
| <i>Subjects</i>  | <b>34</b> |
| <i>Design</i>  | <b>34</b> |
| <i>Procedure</i>   | <b>34</b> |
| <b>Results &amp; Discussion</b>                            | <b>36</b> |
| <b>Experiment 5</b>  | <b>40</b> |
| <b>Method</b>  | <b>40</b> |
| <i>Subjects</i>  | <b>40</b> |
| <i>Design</i>  | <b>40</b> |
| <i>Procedure</i>   | <b>40</b> |
| <b>Results &amp; Discussion</b>                            | <b>40</b> |
| <b>Experiment 6</b>  | <b>43</b> |
| <b>Method</b>  | <b>43</b> |
| <i>Subjects</i>  | <b>43</b> |
| <i>Design</i>  | <b>43</b> |
| <i>Procedure</i>   | <b>43</b> |
| <b>Results &amp; Discussion</b>                            | <b>43</b> |
| <b>Summary of Experiments 4-6</b>                          | <b>44</b> |

|  |           |
|--|-----------|
| <b>Chapter 5</b>   | <b>48</b> |
| <b>General Discussion</b>  | <b>48</b> |
| <b>Review</b>  | <b>48</b> |
| <b>Connections with the Broader Literature</b>                     | <b>49</b> |
| <i>Mental Construal</i>  | <b>49</b> |
| <i>Reality Monitoring and Vividness</i>                            | <b>50</b> |
| <i>The Seductive Allure of Brain Images</i>                        | <b>52</b> |
| <b>Avenues for Future Research</b>                                 | <b>54</b> |
| <i>Does truthiness stick?</i>                                      | <b>54</b> |
| <i>Are Some People more Susceptible to Truthiness than Others?</i> | <b>55</b> |
| <b>Practical Implications</b>                                      | <b>57</b> |
| <i>Education</i>   | <b>57</b> |
| <i>Media and Public Information Campaigns</i>                      | <b>58</b> |
| <b>Final Remarks</b>   | <b>59</b> |
| <b>References</b>  | <b>61</b> |
| <b>Appendix A</b>  | <b>77</b> |
| <b>Appendix B</b>  | <b>80</b> |
| <b>Appendix C</b>  | <b>83</b> |
| <b>Appendix D</b>  | <b>85</b> |
| <b>Appendix E</b>  | <b>88</b> |
| <b>Methods Replication 1</b>                                       | <b>88</b> |
| <i>Subjects</i>  | <b>88</b> |
| <i>Design</i>  | <b>88</b> |
| <i>Procedure</i>   | <b>88</b> |

|   |            |
|---|------------|
| <b>Results and Discussion Replication 1</b> | <b>89</b>  |
| <b>Methods Replication 2</b>                | <b>90</b>  |
| <i>Subjects</i>                             | <b>90</b>  |
| <i>Design</i>                               | <b>90</b>  |
| <i>Procedure</i>                            | <b>90</b>  |
| <b>Results and Discussion Replication 2</b> | <b>90</b>  |
| <b>Appendix F</b>                           | <b>92</b>  |
| <i>Subjects</i>                             | <b>92</b>  |
| <i>Design</i>                               | <b>92</b>  |
| <i>Procedure</i>                            | <b>92</b>  |
| <b>Results and Discussion Replication 3</b> | <b>92</b>  |
| <b>Appendix G</b>                           | <b>94</b>  |
| <i>Subjects</i>                             | <b>94</b>  |
| <i>Design</i>                               | <b>94</b>  |
| <i>Procedure</i>                            | <b>94</b>  |
| <b>Results and Discussion Replication 4</b> | <b>94</b>  |
| <b>Appendix H</b>                           | <b>96</b>  |
| <b>Results and Discussion Replication 5</b> | <b>96</b>  |
| <b>Author Index</b>                         | <b>98</b>  |
| <b>Keyword Index</b>                        | <b>103</b> |
| <b>List of Figures</b>                      | <b>104</b> |



## Chapter 1

“I am no fan of dictionaries or reference books,” says comedian Stephen Colbert, “constantly telling us what is or isn't true.” Instead of looking up claims in a book, Colbert urges viewers to “try looking it up in your gut.” This is *truthiness*: “truth that comes from the gut, not books.”<sup>1</sup> Of course, when people evaluate claims they use both rational thinking and intuitive hunches—often doing so, as Colbert implied, without having access to the facts. A century of research shows that these feeling-based judgments are susceptible to influence from general beliefs, prejudices, and expectations, from features of the current context such as demand characteristics, and from aspects of past experience that interact with the present to privilege the accessibility of some memories over others (Bransford & Johnson; 1972; Henkel & Mather, 2007; Kunst-Wilson & Zajonc, 1980; Lewandowsky, Stritzke, Oberauer, & Morales, 2005; Lindsay, 2008; Ozubko & Fugelsang, 2011). In this thesis I use the term “*truthiness*” to refer to a category of phenomena in which the addition of nonprobative information causes people to shift rapidly towards believing a claim (see also the *illusory truth effect*; Begg, Anas, & Farinacci, 1992).<sup>2</sup>

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<sup>1</sup> see <http://www.colbertnation.com/the-colbert-report-videos/24039/october-17-2005/the-word---truthiness>

<sup>2</sup> Portions of this thesis appeared in:

Newman, E. J., Garry, M., Bernstein, D. M., Kantner, J., & Lindsay, D. S. (2012). Non- probative photos (or words) promote truthiness. *Psychonomic Bulletin and Review*. doi: 10.3758/s13423-012-0292-0

Newman, E. J., Garry, M., Unkelbach, C., Bernstein, D. M., & Lindsay, D. S. (2012). Truthiness and Falsiness of Trivia Claims Depend on Judgmental Contexts. Manuscript submitted for review.

But I have expanded on the introduction, data analysis and discussion here.

## ***Judging Truth***

Suppose you evaluate the claim “Stephen King is alive.” You are probably familiar with Stephen King. The cognitive literature suggests that you will try to retrieve information from memory—related knowledge, thoughts, and images—to help you decide whether he is alive (Graesser & Hemphill, 1991). We know from research on confirmation bias that people search for information that supports their hypotheses—perhaps because (as per Spinoza’s notion) comprehending a claim entails representing it as true, whereas falsifying it requires a secondary, more effortful step (Clark & Chase, 1972; Gilbert, Tafarodi, & Malone, 1993; Nickerson, 1998; Koriat, Lichtenstein, & Fischhoff, 1980; Richter, Schroeder, & Wohrmann; 2009; cf. Nadarevic & Erdfelder, in press).<sup>3</sup> In one classic study, people read a description about a woman called Jane (Snyder & Cantor, 1979). Some of the information was in line with the idea that Jane could be an introvert (“Jane refrained from socializing during her coffee break”) and some information was in line with the idea that Jane could be an extrovert (“Jane didn’t hesitate to speak to strangers when jogging”). Two days later subjects described her suitability for a job as a real estate agent or a librarian. Subjects who evaluated Jane for the librarian role recalled more information in support of the idea that Jane was introverted. Likewise, subjects who evaluated Jane for the real estate role recalled more information in support of the idea that Jane was extroverted. Put simply:

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<sup>3</sup> Although the research in this thesis is my own, I conducted it in a lab and supervised a team comprised of research assistants and honors students. I also received advice and direction from my supervisors and collaborators. Therefore, I often use the word “we” in this thesis to reflect that fact. As you will also see, I use the word “we” in a different context to refer to what is known (or not known) in the wider scientific community.

people tended to recall information that was consistent with their hypothesis (see also positive test strategy; Klayman & Ha, 1987).

So given the claim “Stephen King is alive,” you might be inclined to mentally test the hypothesis that he is indeed alive: You “see” recent images of him, “hear” him on NPR, or “remember” seeing advertisements for his latest book. The fluency with which you generate these alive-consistent thoughts and images may bolster their perceived currency. And so you conclude that the claim is true.

But now suppose you evaluate the claim “Nick Cave is alive.” If you are like most people in my studies, his name is unfamiliar to you and you know little to nothing about Nick Cave. You might think “Nick Cave? Not sure if I’ve heard of him. I have no idea if he’s alive.” You might be unable to conjure thoughts and images to help you evaluate whether the claim is true. Your only recourse would be to guess. But nonprobative information can affect people’s guesses in the moment. Indeed, several lines of research lead to the idea that when a claim appears with a photograph like the one of Nick Cave in Figure 1.1, the photo might bias people to guess that the claim is true.

### ***Repetition and Truth.***

A large literature on repetition and truth demonstrates how nonprobative information can signal truth and systematically bias people’s judgements. In these experiments, subjects typically see a series of statements at time 1, then at time 2 they see some of those statements again along with some new statements (Begg et al., 1992; Hasher, Goldstein, & Toppino, 1977). Even when statements have been presented in a way to discredit them at time 1, repeated statements are rated true

more often when they appear again at time 2 (Begg et al., 1992; see Dechêne, Stahl, Hansen, & Wänke, 2010). Over the last two decades, numerous studies have replicated this finding and illuminated the mechanisms that contribute to the illusory truth effect (Reber & Schwarz, 1999; Unkelbach, 2007; Dechêne, Stahl, Hansen, & Wänke, 2009 ).

The leading explanation for this boost in perceived truth is that repeating information increases the ease or cognitive fluency with which people can process the statement when they encounter it again—and people interpret an experience of cognitive fluency as a cue to truth (Begg et al., 1992; Unkelbach, 2007; Reber & Unkelbach, 2010). Put another way, seeing a statement at time 1, helps it spring to mind later at time 2. But this feeling of easy processing can be manufactured in the moment and an illusion of truth can happen without having seen a statement earlier (Reber & Schwarz, 1999). For instance, in one study, subjects judged the truth of a series of statements. The key manipulation was that some of those statements were presented in high colour contrast (say, dark blue on a white background) and some were presented in low colour contrast (say, yellow on a white background). Although colour was unrelated to the objective truth status of the statements, those statements presented in high colour contrast were rated as true more often. This finding fits with the idea that the illusion of truth effect is not tied to prior exposure per se, but rather that prior exposure facilitates processing of the statement at time 2.

Moreover, people will make sense of this increase in processing ease depending on the experimental context (Whittlesea, 1993; see Schwarz, 2010).

When given the task of judging truth (as in the experiments described above), people may interpret ease of processing as a signal that something is familiar and likely true (Unkelbach, 2007), but when given the task of judging preferences or fame, people may interpret ease of processing as a signal that something is preferred or famous (see for example Jacoby, Kelley, Brown, & Jasechko, 1989; Mandler, Nakamura, & Van Zandt, 1987). So how might a single exposure to a photo boost processing ease?

***Conceptual Fluency and Cognitive Availability.***

We know from studies of cognitive fluency that presenting information in a semantically rich context can facilitate conceptual processing and lead to illusions of familiarity in the moment. For example, people more often claim they studied a target word (“boat”) earlier when the test word appears in a semantically predictive sentence (“The stormy seas tossed the *boat*”) rather than in a neutral sentence (“He saved up his money and bought a *boat*,” Whittlesea, 1993). The semantically predictive context is thought to help people anticipate the final word, producing unexpectedly fluent conceptual processing, which they take as evidence of familiarity—leading them to say they had recently seen the word. This finding also fits with literature on cognitive availability: Repeated or semantically primed information is easily retrieved from memory and people often conclude (sometimes falsely) that easy retrieval signals frequency, familiarity, and truth (Begg et al., 1992; Kelley & Lindsay, 1993; Tversky & Kahneman, 1973; Whittlesea, 2011).

This literature suggests that in a single presentation, photos might provide a semantically rich context, making details about an otherwise unfamiliar name feel

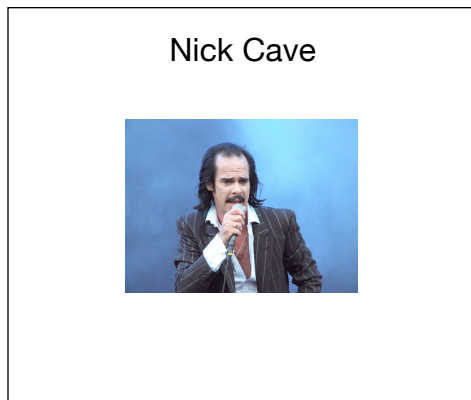


Figure 1.1 Example of materials from Experiment 1-2.  
Photo credit Josep M Martí, Creative Commons License.

more cognitively available and in the context of a true/false judgment, make the concept described in the claim seem true. To understand our thinking, reconsider the claim about Nick Cave, but this time look at the photo in Figure 1.1

Suddenly you know a little more about him. You might think “He’s probably

some kind of entertainer—he is dressed in a suit, I see a microphone. His stance makes it look like he could be singing...” The photo is related to the claim and nonprobative—it does not tell you whether Nick Cave is alive—but information you glean from that photo might nonetheless boost cognitive availability and help you process the claim more fluently<sup>4</sup>.

### ***Imagery and Reality Monitoring.***

Related lines of research show that when people can easily imagine a target claim they often conclude—only moments later—that it is more likely (Sherman, Cialdini, Schwartzman, & Reynolds, 1985; see Alter & Oppenheimer, 2009 for a review). In one study, subjects read about an illness that had easy to imagine

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<sup>4</sup> It is of course possible that photos would not affect people’s judgments in the moment. The cognitive fluency literature also tells us that if people can readily identify the source of processing fluency, they will correctly attribute the experience of processing ease to its source (in this case, a photo) rather than misattribute the ease of processing to the task at hand (see Jacoby & Whitehouse, 1989; Oppenheimer, 2004; Schwarz, 2010). Without a time delay, or another manipulation that would obscure the potential influence of a photo, we might find that photos do not affect people’s judgments of truth.

symptoms, such as a headache or low energy or difficult to imagine symptoms such as an inflamed liver or a malfunctioning nervous system (Sherman et al.). When they were asked to rate the likelihood that they would contract the disease in the future, those who tried to imagine the easy symptoms said it was more likely than those who imagined the difficult symptoms. This effect extends to other domains of judgement; the easier it was for people to mentally image a travel destination, the more people expressed interest in visiting that destination (Petrova & Cialdini, 2005). Together these findings fit with the *Reality Monitoring Framework*—when our mental experience is rich with perceptual features and springs to mind easily it feels real; we are more likely to conclude that it is a true experience (Johnson & Raye, 1981). Photos should provide the raw materials for imagery, thereby facilitating generation of the rich perceptual and conceptual details people typically interpret as cues to reality (e.g., Johnson, 2006).

Moreover, people are inclined to trust photos, which are often the best evidence that something actually occurred (Kelly & Nace, 1994). In one study, people rated the believability of (fake) articles and photos attributed to either the New York Times or the National Enquirer. Perhaps unsurprisingly, people rated content from the New York Times as more believable. And although they rated articles from the National Enquirer as relatively low in believability, they nonetheless believed the photos presented in that same publication (Kelly & Nace). Put another way, people trust photos even when they do not trust the source in which they appear. So even if photos do not provide probative evidence for a target claim (like the photo in Figure 1.1), they might nonetheless boost belief in

the claim because photos are inherently credible themselves. In a particularly worrisome example of this sort of bias, students rated the scientific reasoning of a neuroscience article more favorably if the article included an image of the brain (McCabe & Castel, 2008; although see Farah & Hook 2012; Michael, Newman, Vuorre, Cumming, & Garry, 2013 for evidence that the power of a brain image may have been overstated).

This body of research suggests that photos might boost the truthiness of claims by bootstrapping the generation of related ideas and images, or by creating an aura of plausibility simply because people find photos to be credible. Many studies have demonstrated that imagination or repeated exposure to claims, can—over time—produce illusions of truth, belief, and memory (Bernstein, 2005; Brown & Marsh, 2008; Garry, Manning, Loftus, & Sherman, 1996; Lindsay, Hagen, Read, Wade, & Garry, 2004). But we propose that a claim coupled with a related but nonprobative photo might, in the moment, combine with confirmation bias to produce immediate truthiness (cf. Hansen & Wanke, 2010).

### ***Trawling for Confirming Evidence.***

Another way nonprobative photos might promote truthiness is that people might "trawl" through the photo, selectively interpreting information they find as support for a default bias to see the claim as true (Clark & Chase, 1972; Gilbert et al., 1993; Nickerson, 1998; Richter et al., 2009; cf. Nadarevic & Erdfelder, in press). Indeed a large body of work shows that people will not only recall information through the lens of a hypothesis, belief, or expectation (see, for example, Assefi & Garry, 2003; Bartlett, 1932; Carmichael, Hogan, & Walter,



1932; Snyder & Cantor, 1979), but they will also interpret new information to fit with a hypothesis at hand. In one study, some people were led to believe that a child came from a low socioeconomic background, while others were led to believe that a child came from a high socioeconomic background (Darley & Gross, 1983). Then half of the subjects watched a video showing the child taking a test. Those who saw the video used information in the video to support their hypothesis about the child: people who learned that the child was from a high socioeconomic background thought the child did better on the test than those who learned the child was from a low socioeconomic background. Moreover, people who learned that the child was from a high socioeconomic background also reported seeing more positive behaviours in the video. That is, although everyone saw the same video, groups interpreted the evidence in the video through the lens of their own hypothesis.

Taken together, this research suggests that in assessing the claim that Nick Cave is alive people might mine and interpret information from the photo that confirms the hypothesis at hand. For instance, just as with the video of the child, someone might look at the photo in Figure 1.1 to confirm a hypothesis. They might think, “...his hair style looks like it is from the 70’s, but the microphone looks new which might mean he performed recently, so perhaps he is alive.” Relatedly, the ease with which photos make this selective interpretation possible might also steer people away from spending extra effort to consider reasons why the claim is false (see Gilbert et al., 1993).

***Overview***

In the first two experiments, we showed people familiar and unfamiliar celebrity names; half the celebrities were alive and half were dead. Celebrity names appeared with or without a photo of them engaged in their profession. For each name, we asked some subjects to judge the truth of the claim “This famous person is alive.” The photos depicted celebrities alive, which might be taken as evidence of celebrities being alive. Therefore, we asked another group of subjects to respond to the claim “This famous person is dead.” If photos help boost cognitive availability of related thoughts and images, or help people trawl for and selectively interpret information in line with their hypothesis about unfamiliar celebrities, then photos should increase the truthiness of claims about those celebrities, regardless of whether the claim is that the celebrity is alive or dead (cf. Unkelbach, 2007).

## **Chapter 2**

### **Experiment 1A and 1B**

#### ***Method***

##### ***Subjects***

In Experiment 1A, 92 undergraduate psychology students from Victoria University of Wellington participated for course credit. In Experiment 1B, 48 undergraduate psychology students from the University of Victoria, Canada, participated for optional bonus points.

##### ***Design***

For Experiments 1A and 1B we used a 2 (photograph: yes, no) x 2 (familiarity: familiar, unfamiliar) x 2 (claim: alive, dead) mixed design, manipulating photograph and familiarity within subjects and claim between subjects.

##### ***Procedure***

Based on data from preliminary norming, we assembled sets of low- and moderate-familiarity celebrity names; for brevity we refer to these as “unfamiliar” and “familiar” celebrities. Half of these celebrities were alive, and names of dead and alive celebrities were equal on familiarity (on a 5-point scale,  $M_{\text{Alive}} = 2.89$ ,  $SD_{\text{Alive}} = .62$ ,  $M_{\text{Dead}} = 2.87$ ,  $SD_{\text{Dead}} = .58$ ), and represented a similar range of eras and professions.<sup>5</sup>

We used Macintosh iBook G4 computers and PsyScope software to present 80 celebrity names—40 familiar and 40 unfamiliar—to subjects. Names appeared, individually, in large black font against a white background. On half the trials,

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<sup>5</sup> See Table 1 in Appendix A for a complete set of these names.

subjects saw a photo of the celebrity engaged in his or her profession. For example, like the photo of Nick Cave, an Australian singer and musician, performing with a microphone in his hand (see Figure 1.1).

The order of names was randomized for each subject and counterbalanced to appear equally often with or without a photo, orthogonal to the alive/dead and low/high familiarity variables. Subjects learned that sometimes they would see a photo and sometimes they would not. We did not provide any further instructions about how they should use the photo. As each name or name-photo pair appeared, we asked half our subjects to decide the truth of the claim “This famous person is alive” and the other half to decide the truth of the claim “This famous person is dead.” We asked subjects to respond “...as quickly as possible, but not so quickly that you start making errors” and asked them to respond within 3 seconds.<sup>6</sup>

Experiment 1B, a replication, followed the same procedure with new sets of “unfamiliar” and “familiar” celebrities assembled after new norming with Canadian students. Subjects saw 84 celebrity names, presented using E-Prime Software on PCs.

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<sup>6</sup> In Experiment 1A, we did not record data for trials when responses exceeded 3 seconds, which happened on 9.62% of trials, but in Experiment 1B we recorded and analyzed all response times. Also, because of a programming error, two celebrity names appeared in the incorrect counterbalance; we excluded those names from analyses, but we find the same (significant) pattern of results when we include them.

## ***Results and Discussion***

We calculated people's bias ( $c$ ) to say a claim was true (Stanislaw & Todorov, 1999).<sup>7</sup> Figure 2.1 shows that across Experiments 1A and 1B, the black bars are relatively more negative (lower values of  $c$ ) than the gray bars, indicating that pairing a claim with a photo led people to be more inclined to say that the claim was true. Moreover, this truthiness effect was most pronounced for unfamiliar names.

That is, a mixed repeated measures (photograph: yes, no) x 2 (familiarity: familiar, unfamiliar) x 2 (claim: alive, dead) ANOVA showed that there was a main effect for photo: relative to the no photo control, people were more biased to say true when photos accompanied names (Experiment 1A,  $F(1, 90) = 4.87, p = .03, \eta_p^2 = .05$ ; Experiment 1B,  $F(1, 46) = 10.53, p < .01, \eta_p^2 = .19$ ). In both experiments the effect of photos tended to be larger for unfamiliar names (Experiment 1A,  $t_{\text{unfamiliar}}(91) = 2.21, p = .03$ , Cohen's  $d = .23$ ; Experiment 1B,  $t_{\text{unfamiliar}}(47) = 3.74, p < .01, d = .56$ ) than for familiar names (Experiment 1A,  $t_{\text{familiar}}(91) = 1.02, p = .31, d = .11$ ; Experiment 1B,  $t_{\text{familiar}}(47) = 1.25, p = .22, d = .19$ ), although the Photo x Familiarity interaction was significant only in

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<sup>7</sup> In all of the experiments described in this thesis, people have the task of deciding whether a series of claims are true or false. I analyzed people's performance on these tasks using Signal Detection Theory (Stanislaw & Todorov, 1999; Wickens, 2002). The main measure of interest was people's tendency to respond that a statement is true—their response bias. People's ability to discriminate between true and false statements ( $d'$ ) is not the focus of this set of experiments, but I have nonetheless reported these data in full in the appendices. In the experiments reported here I used  $c$  to measure people's response bias.  $c$  is a measure in standard deviation units, of the distance between people's criterion to say a claim is true and the point at which people's response bias is neutral. Two of the key assumptions of SDT are that the signal and noise distributions are normal and have the same standard deviation. Often these assumptions are sound, but given the low item numbers in some of the experiments reported here, I calculated the total proportion of true responses for each condition and ran parallel analyses for each experiment (see Stanislaw & Todorov, 1999; Wickens, 2002). I find the same pattern of results. For consistency I report analyses of  $c$  for each experiment and note the parallel analysis of the proportion of true responses in a footnote for each experiment. Table 2 in Appendix B provides a brief summary of the results of parallel  $d'$  analyses.

Experiment 1B,  $F(1, 46) = 5.40, p = .03, \eta^2 = .11$ , not in Experiment 1A,  $F(1, 90) < 1^8$ .

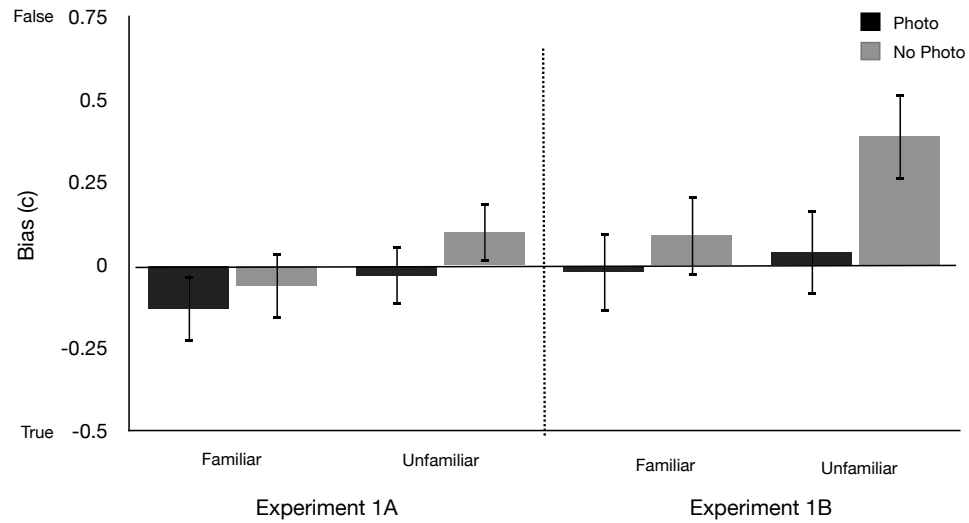


Figure 2.2. Bias for claims about familiar and unfamiliar names (in Experiments 1a-1b) presented with or without a photograph and collapsed across dead/alive factor. Negative value of  $c$  is a bias to say true. In Experiments 1a-2, photos (or words) affected bias for unfamiliar names. Error bars show 95% within-subject confidence intervals for the photo/no-photo effect at each level of familiarity/difficulty (see Masson & Loftus, 2003).

### ***Truthiness or aliveness?***

Recall that the photos provided evidence of the celebrities being alive, so we might expect that the photos would produce an alive bias, rather than a truth bias. But photos promoted a truth bias regardless of the claim people responded to.

<sup>8</sup> For Experiment 1A we found the same significant pattern of results when we analyzed the total true proportions: there was a main effect for photo  $F(1,90) = 3.86, p = .05, \eta^2 = .04$ , a main effect for claim  $F(1,90) = 13.57, p < .01, \eta^2 = .13$ , and a significant Claim x Familiarity interaction  $F(1, 90) = 12.39, p < .01, \eta^2 = 0.12$ . All other interactions  $F < 1$ . For Experiment 1B we found the same significant pattern of results when we analyzed the total true proportions: there was Photo x Familiarity interaction  $F(1,46) = 7.05, p = .01, \eta^2 = 0.13$ , a main effect for claim  $F(1,46) = 4.79, p = .03, \eta^2 = 0.09$ , and a non-significant Photo x Claim x Familiarity interaction  $F(1,46) = 2.81, p = .10, \eta^2 = 0.06$ . All other interactions  $F < 1$ .

That is, claim (dead or alive) did not interact with photos ( $F < 2$ ). There was a non-significant Photo x Familiarity x Claim interaction in Experiment 1B,  $F(1, 46) = 2.62, p = .11, \eta^2 = .05$ ; this interaction was also non-significant in Experiment 1A,  $F < 1$ .

Interestingly, people tended to find “Alive” claims true more often than “Dead” claims. In Experiment 1A, this pattern was most pronounced for familiar names (Familiarity x Claim interaction,  $F(1, 90) = 13.05, p < .01, \eta^2 = .13$ ;  $t_{\text{familiar}}(91) = 4.63, p < .01, d = .98, t_{\text{unfamiliar}}(91) < 1$ ). In Experiment 1B a similar tendency occurred for all names,  $F(1, 46) = 3.94, p = .05, \eta^2 = .08$ . This finding suggests that people may have attributed the familiarity of the famous names to celebrities being alive. Perhaps this tendency would be reduced if we showed people non-famous names, rather than famous names.

As predicted, photos led to a truth bias for unfamiliar celebrity names. These results fit with a mechanism relating to cognitive availability: Photos might promote truthiness because they provide a rich semantic context that facilitates the generation of thoughts and images relating to the claim. But these results also fit with the idea that feelings of truthiness arose because photos are inherently credible or that over time people have come to associate photos with the conclusion that something is real and true (cf. Unkelbach, 2007). People often regard photos as evidence of reality. Indeed, Kelly and Nace (1994) showed that people trust photos even when they distrust the source in which they appear (say, the *National Enquirer*). Perhaps related to this finding, McCabe and Castel (2008) found that in contrast to photo-realistic images of the brain, bar graphs did not

enhance ratings of the scientific reasoning in an article (see also Keehner, Mayberry, & Fischer, 2011, but cf. Farah & Hook 2012; Michael et al., 2013). In Experiment 2, we examined whether truthiness was tied to the perceived credibility of photos or a learned association between photos and truth: would other kinds of nonprobative information also produce truthiness? To address this question, we compared the effect of photos to the effect of verbal descriptions of those photos. If these verbal descriptions also produce truthiness, it would suggest that when people lack knowledge, anything that makes it easier for people to generate thoughts and images related to a claim should bias them toward believing that claim.



## **Chapter 3**

### **Experiment 2 and 3**

#### ***Method***

##### ***Subjects***

Fifty-four undergraduate students from the University of Victoria, Canada, participated for optional bonus points.

##### ***Design***

We used a 2 (nonprobative information: yes, no) x 2 (format of nonprobative information: photo, verbal) x 2 (claim: alive, dead) mixed design. We manipulated the format (photo vs. verbal) and claim (dead vs. alive) between subjects, and reduced the design by including only the condition that produces truthiness: unfamiliar names.

##### ***Procedure***

Subjects saw 52 names comprised of 40 critical unfamiliar names from Experiment 1B and 12 moderate-familiarity celebrity names. We included a few moderate-familiarity names as fillers to make the task easier and more engaging for participants.

Half the subjects saw a photograph of the celebrity paired with half the names. The other half saw a verbal description of the celebrity instead of a photo. We created verbal descriptions for each name by asking two raters to extract specific but nonprobative information from each celebrity photo: ethnicity, sex, hair, generic occupation, and a career-related concrete noun (for example, the

information for Nick Cave would be *white male; medium length black straight hair; musician; microphone*).

Regardless of the format of the nonprobative information that sometimes appeared with celebrity names, subjects had the same task: half responded to the truth of the claim “This famous person is alive” and the other half to “This famous person is dead.” All other aspects of the method were identical to Experiment 1B.

### ***Results and Discussion***

Figure 3.1 shows that again photos produced truthiness—people responded true more often when claims appeared with a photo of the celebrity, regardless of whether people responded to “Alive” or “Dead” claims. Did verbal descriptions also produce truthiness? The answer is yes. People responded true more often when claims appeared with a verbal description of the celebrity, regardless of whether people responded to “Alive” or “Dead” claims.

That is, a mixed repeated measures 2 (nonprobative information: yes, no) x 2 (format of nonprobative information: photo, verbal) x 2 (claim: alive, dead) ANOVA showed a main effect for nonprobative information  $F(1, 50) = 10.27$ ,  $p < .01$ ,  $\eta_p^2 = .17$ . Claim did not interact with the presence or format of nonprobative information (all  $F$ s  $< 1$ ).<sup>9</sup>

These findings show that truthiness is not tied to the perceived credibility of photos. Instead these results point to a more general mechanism whereby

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<sup>9</sup> For Experiment 2 we found the same significant pattern of results when we analyzed the total true proportions: there was main effect of Nonprobative Information  $F(1, 50) = 14.33$ ,  $p < .01$ ,  $\eta_p^2 = 0.22$ , and a non-significant main effect for claim  $F(1,50) = 1.11$ ,  $p = .30$ ,  $\eta_p^2 = .02$ . All other interactions  $F < 1$ .

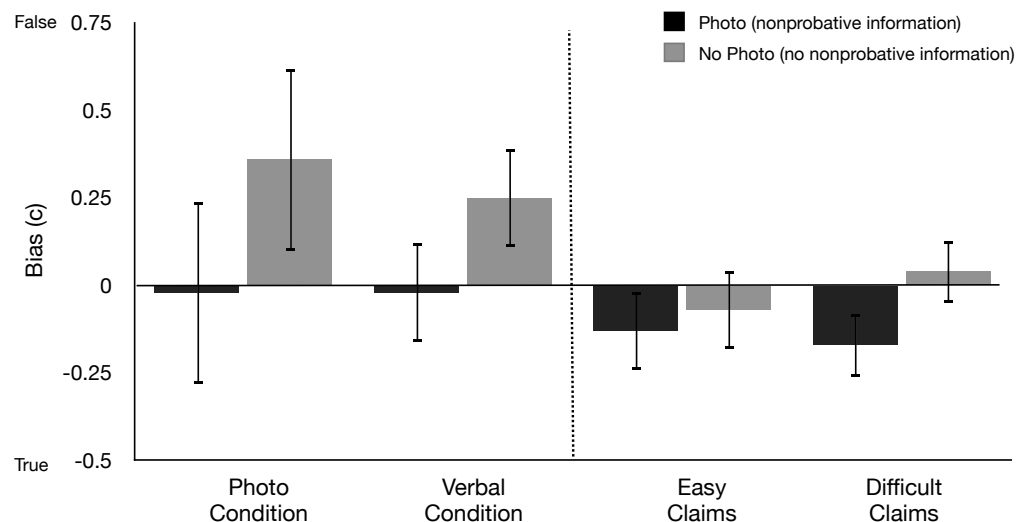


Figure 3.1. Bias for claims about unfamiliar names (Experiment 2) presented with or without a photograph or verbal information, collapsed across dead/alive factor; easy and difficult trivia claims (in Experiment 3) presented with or without a photograph. Negative value of  $c$  is a bias to say true. In Experiment 2, photos (or words) affected bias for unfamiliar names; in Experiment 3, photos affected bias for difficult trivia statements. Error bars show 95% within-subject confidence intervals for the photo/no-photo effect at each level of familiarity/difficulty (see Masson & Loftus, 2003).

manipulations that facilitate the generation of related thoughts and images, against the backdrop of a hypothesis confirming stance, lead people to conclude that claims are true. To explore the generalizability of the effect of nonprobative photos on subjective truth, I tested the hypothesis that general knowledge claims (“Turtles are deaf”) seem truer when paired with a photo that is related to, but does not specifically depict, the claim.

## **Experiment 3**

### ***Method***

#### ***Subjects***

In Experiment 3, 70 undergraduate psychology students from Victoria University of Wellington participated for course credit.

#### ***Design***

We used a 2 (photograph: yes, no) x 2 (difficulty: easy, hard) within-subjects design.

#### ***Procedure***

We used trivia statements from previous research and data from preliminary norming to assemble sets of easy and difficult true/false trivia statements sampling general knowledge (Nelson & Narens, 1980; Unkelbach, 2007). People answered easy statements correctly 80-100% of the time, and answered difficult statements correctly 40-60% of the time.<sup>10</sup>

We used the same presentation and response formats as in the prior experiments. On half the trials, subjects saw a photo that depicted the grammatical subject of the statement, but never provided any diagnostic information about whether the statement was true. For example, the claim that “Macadamia nuts are in the same evolutionary family as peaches” appeared with a photo of macadamia nuts.

### ***Results and Discussion***

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<sup>10</sup> See Table 3 in the Appendix C for a full list of all the Trivia Statements used in Experiment 3.

As Figure 3.1 shows, photos had the same effect as in our prior experiments: relative to when the trivia claims were presented without a photo, when people saw a related, but nonprobative photos paired with trivia claims they were more likely to conclude that the claims were true. That is, truthiness generalizes to general knowledge claims.

A repeated measures 2 (photograph: yes, no) x 2 (difficulty: easy, hard) ANOVA showed a main effect of photo  $F(1, 69) = 6.65, p = .01, \eta^2 = .09$ . Although the interaction between photo and difficulty did not reach significance,  $F(1, 69) = 1.82, p = .18$ , follow-up analyses support a similar conclusion to Experiments 1A and 1B, in that the effect of photos was most pronounced when people evaluated difficult rather than easy claims,  $t_{\text{difficult}}(69) = 3.16, p < .01, d = .39, t_{\text{easy}}(69) = .85, p = .40, d = .10$ .<sup>11</sup>

Although Figures 2.1 and 3.1 suggest that Experiments 1A, 1B, and 2 might be interpreted as showing that that photos move people towards a neutral bias, Experiment 3 shows that photos move people towards truthiness. In Experiment 3, even without photos people had a tendency to respond that claims were true, yet photos still promoted truthiness.

### ***Summary of Experiments 1-3***

Across four experiments, nonprobative photos inflated truthiness. It is arguably unsurprising that photos inflated the truth of “Alive” claims: Photos depicted celebrities alive, and should have facilitated imagery of those celebrities doing

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<sup>11</sup> For Experiment 3 we found the same significant pattern of results when we analyzed the total true proportions: there was main effect of photo  $F(1,69) = 9.68, p < .01, \eta^2 = 0.12$ , and a Photo x Difficulty interaction  $F(1, 69) = 3.54, p = .06, \eta^2 = .05$ . All other effects  $F < 1$ .

various things—all possible evidence of aliveness. The fascinating finding is that the same photos inflated the truthiness of “Dead” claims: Photos did not produce an “alive bias,” but a “truth bias.” Moreover, the truthiness effect generalized beyond Dead or Alive judgements: Nonprobative photos enhanced the subjective truth of general knowledge claims, too.

The finding that nonprobative verbal information also inflated truthiness suggests that the effect of photos on subjective truth is driven not simply by a perception that photos are inherently trustworthy. We speculate that nonprobative photos and verbal information help people generate pseudoevidence (cf. Kelly & Nace, 1994). People may selectively trawl and interpret information gleaned from a photo or description as consistent with their hypothesis and/or they may use such information to cue the mental generation of thoughts and images consistent with their hypothesis. It is also possible that the ease or fluency with which people bring related information (even partial or incomplete details) to mind contributes to a feeling of truthiness. Although we cannot determine which of these mechanisms underlies the truthiness effect, across four experiments our data suggest a general mechanism whereby the availability of related but nonprobative information promotes truthiness of unfamiliar claims.

Considered as a whole, our findings suggest that even without repeated exposures or instructions to imagine, the mere presence of nonprobative information such as photos might rapidly inflate the perceived truth of many types of true and false claims (cf. Brown & Marsh, 2008; Lindsay et al., 2004). Of course, these effects are not qualitatively new phenomena, but are instead

intriguing new exemplars of a growing family of effects related to inferences (perhaps unconscious inferences) about the mental generation of hypothesis-consistent evidence (Jacoby, Kelley, & Dywan, 1989; Johnson, 2006; Schwarz, 2010; Whittlesea, 2011). In addition, the effect of nonprobative photos seems to be quite robust. A robust effect is, of course, an essential tool for the development of theory and mechanism, which is what I explore in the next set of experiments.

***Under what conditions do photos produce truthiness?***

Both the trawling and conceptual fluency mechanisms (which are not mutually exclusive) hinge on the relationship between the photo and the claim. But consider now the right panel of Figure 3.2. There is, of course, no obvious semantic

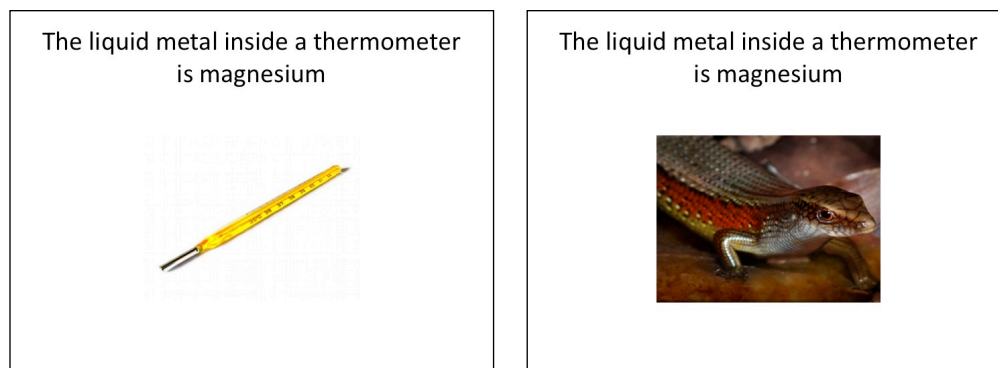


Figure 3.2 Example of related and unrelated photos and associated trivia claims. Thermometer photo courtesy of Andres Rueda, and Skink photo courtesy of William Cho; Creative Commons license.

relationship between a thermometer and a lizard. What might be the effect of such a pairing on your answer? This is the question we address in the next three experiments we present here, as part of our ongoing exploration of the mechanisms by which photos lead to truthiness.

There are reasons to predict that relative to related photos, unrelated photos should cause disfluency.<sup>12</sup> That is, unrelated photos should make it more difficult for people to bring related thoughts and images to mind. For instance, in one study, when people saw a target word that was semantically unrelated to a preceding sentence (“The librarian reached for the top shelf and pulled down a book” “napkin”), they rated that target word as less pleasant than when they saw a target that was semantically related (“read”; Lee & Labroo, 2004). One explanation for this effect is that the semantically related sentence helped subjects more quickly identify and comprehend the subsequent target word, whereas the semantically unrelated sentence prepared subjects for a meaning that mismatched the target. Put another way, the semantically unrelated words were relatively disfluent compared to their semantically related counterparts.

Parallel effects occur with perceptual manipulations; degraded images, difficult fonts, and low contrast colors can lead people to invest more cognitive effort to make sense of stimuli and people tend to evaluate these stimuli more negatively (Diemand-Yauman, Oppenheimer, & Vaughan, 2011; Petrova & Cialdini, 2005; Reber & Schwarz 1999; see Yue, Castel, & Bjork, in press). In the context of a truth judgment, additional cognitive effort might be taken as a signal that the

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<sup>12</sup> It is difficult to make a prediction comparing claims presented with unrelated photos to claims presented without a photo because I know of no equivalent no photo (“baseline”) condition in the fluency literature. Some studies have included a similar baseline condition. For instance, in one study, people were primed with correct, incorrect, or unrelated answers to trivia claims (Kelley & Lindsay, 1993). Compared to unrelated answers, correct answers boosted people’s accuracy and incorrect answers hurt people’s accuracy. But it is difficult to make a prediction from this study: would our claims presented with unrelated photos look more like the incorrect condition or more like the unrelated condition? Relatedly, is hard to tell which of these conditions would be most similar to our no photo baseline. Nonetheless, it makes sense that compared to claims presented without a photo, claims presented with unrelated photos should feel disfluent. Indeed, I find it hard to think of a mechanism that would make claims paired with unrelated photos seem more conceptually fluent than a baseline condition in which claims were presented without photos.



information they are evaluating is false.<sup>13</sup> Thus, if unrelated photos lead to disfluent processing, we should expect they would produce falsiness. That is, nonprobative, unrelated information should cause people to disbelieve a claim.

But there are also reasons to predict that unrelated photos would not cause falsiness. As we suggested earlier, when people are making a true/false decision they might trawl through and selectively interpret information from a related photo as evidence that the claim is true. It seems unlikely that people would engage in this “trawling” strategy with unrelated photos. It makes no sense to search a photo of a lizard for evidence about magnesium’s putative role in thermometers. Moreover, we know from research on the confirmation bias that if people encounter information inconsistent with the hypothesis at hand, they often ignore it, allocate less weight to that evidence, or even distort it to fit with their hypothesis (Darley & Gross, 1983; Kuhn, 1989; Snyder & Cantor, 1979; see Nickerson, 1998, for a review). Other research shows that adding related nonprobative information can sway people’s judgments about others, but that adding irrelevant information produces the same effect as giving people no information at all (Gill, Swann, & Silvera, 1998). Thus, a trawling mechanism would predict that unrelated photos would have little if any effect on people’s decisions.

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<sup>13</sup> Recent research also suggests that an experience of disfluency can reduce confirmation bias (Hernandez & Preston, in press). Thus if an unrelated photo produces a feeling of disfluency it might also dissuade people from pursuing evidence that a claim is true.

## Chapter 4

Based on these considerations, we examined the effects of semantically related and unrelated photos in three experiments. We showed people a series of trivia claims that, within-subjects, appeared with or without a photo that was or was not semantically related to the claim.

### Experiment 4

#### *Method*

##### *Subjects*

In Experiment 4, we used Amazon Mechanical Turk<sup>14</sup> (MTurk; [www.mturk.com/mturk](http://www.mturk.com/mturk)) to recruit subjects in the US. We predetermined a sample size of 200 subjects based on pilot testing. Because of a quirk in the way MTurk assigns subject slots, 208 subjects completed the experiment (similar deviations follow in the other experiments we report here). They received a \$0.60 Amazon credit.

##### *Design*

We manipulated one within-subjects factor called photo, with three levels (related photo, unrelated photo, no photo).

##### *Procedure*

We used trivia statements from previous research to assemble sets of difficult true/false trivia statements sampling general knowledge (Newman et al., 2012; see

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<sup>14</sup> Mechanical Turk is an online subject pool. Turk workers complete experiments and surveys and are given small amounts of Amazon credit (e.g. \$0.60) that they can use to purchase things on amazon.com. These subjects are diverse and the data from studies run online using Mechanical Turk produce similar results to those run in a laboratory (Buhrmester, Kwang, & Gosling, 2011; Germine, Nakayama, Duchaine, Chabris, Chatterjee, & Wilmer, 2012; Mason & Suri, 2011).

also Nelson & Narens, 1980; Unkelbach, 2007). People typically answer these statements correctly 40-60% of the time.

We used Qualtrics software to present 40 trivia claims to subjects. We told subjects that sometimes they would see a photo with these claims, and sometimes they would not. We did not provide any instructions about how they should use the photo. Instead, we asked subjects to decide the truth of the claim “...as quickly as possible, but not so quickly that you start making errors.”

The claims appeared, individually, in large black font against a white background. To orient people to the task, for the first 16 trials they saw easy trivia claims (which tend to be answered correctly 80-100% of the time). Half these easy claims appeared with a related photograph, half with no photograph. To ensure the practice phase did not teach subjects a rule about the relationship between truth and the presence of photos, we paired photos equally often with true and false statements.

Immediately after these easy practice trivia claims, the experimental phase began. Subjects saw 24 difficult trivia claims. For one third of trials, a related nonprobative photo depicted the grammatical subject of the statement (e.g., the claim, “Macadamia nuts are in the same evolutionary family as peaches” appeared with a photo of macadamia nuts). For another third of trials, a semantically unrelated nonprobative photo appeared with the claim (for instance, the claim about macadamia nuts appeared with a photo of a trash can). For the other third of the trials, people saw trivia claims presented without a photo. We used the set of related nonprobative photos from Newman et al., (2012) and

created a new set of semantically unrelated nonprobative photos for the three experiments reported here. A semantically unrelated photo was selected for each trivia claim. As a set, the unrelated photos represented a similar range of living and non-living objects as the original set of related photos from Newman et al. None of the photos revealed the accuracy of the trivia claims. We randomized the order of claims for each subject, and counterbalanced so that claims appeared equally often with a related photo, unrelated photo or no photo. We used an online script to assign subjects to conditions randomly.

### ***Results & Discussion***

Our primary aim was to examine the effects of semantic relatedness on truthiness and falsiness. To address this question we first calculated people's bias (C) to say a claim was true (Stanislaw & Todorov, 1999).<sup>15</sup> As the left panel of Figure 4.1 shows, pairing a claim with a related nonprobative photo produced truthiness (as shown by the relatively lower value of C). But the figure also shows that the semantic relationship mattered: Unrelated photos did not produce truthiness; instead, trials with unrelated photos behaved more like trials with no photos.

Consistent with the pattern displayed in the figure, a one-way ANOVA of C showed a main effect for photo  $F(2, 206) = 4.10, p = .02, \eta_p^2 = .04$ . Although related photos produced more bias to say true than unrelated photos or no photos, bias for unrelated and no photos was similar,  $t_{\text{related-unrelated}}(207) = 2.30, p = .02, d$

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<sup>15</sup> Because we had relatively few trials in Experiment 1, we also calculated the proportion of true responses for each photo condition and ran a parallel analysis. We found the same significant pattern of results: there was a main effect for photo  $F(2, 206) = 5.50, p < .01, \eta_p^2 = .05$ ;  $t_{\text{related-unrelated}}(207) = 2.38, p = .02$ ,  $t_{\text{related-no photo}}(207) = 3.29, p < .01$ ,  $t_{\text{unrelated-no photo}}(207) = .89, p = .37$ . Additional  $d'$  analyses appear in Appendix D.

$= .16$ ,  $t_{\text{related-no photo}}(207) = 2.77$ ,  $p = .01$ ,  $d = .20$ ,  $t_{\text{unrelated-no photo}}(207) = .47$ ,  $p = .64$ ,  $d = .04$ . These effects (as well as effects and patterns throughout this thesis) replicated in a subsequent experiment using the same materials and procedures with 204 subjects; see Appendix E).

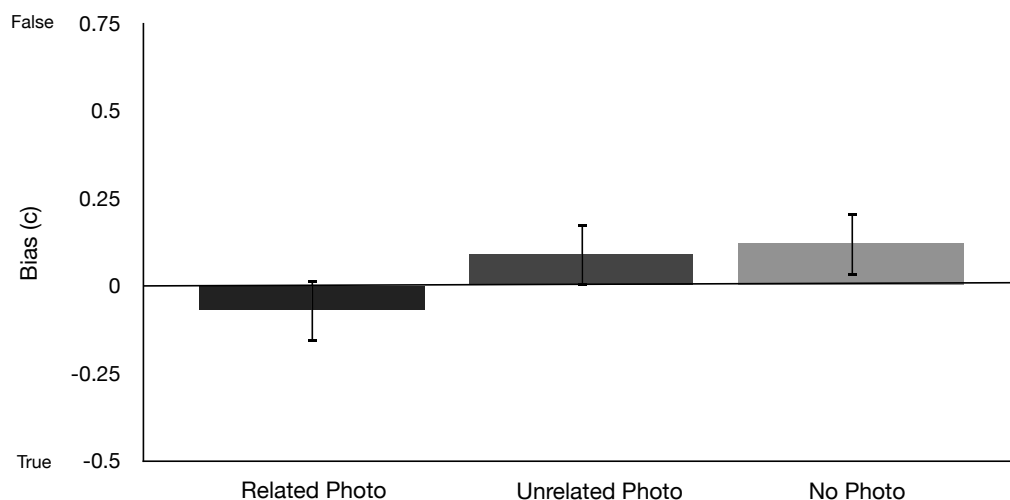


Figure 4.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the photo factor for Experiment 4 (see Masson & Loftus, 2003)

The finding that related, but not unrelated, photos produced truthiness replicates our earlier work and fits with the idea that unrelated photos would not affect people's true/false decisions.<sup>16</sup> At first glance, this result is at odds with the prediction that unrelated photos might produce disfluency; after all, presenting unrelated photos in the context of other related photos should have made the accompanying trivia claims feel especially incongruent (Dechêne et al., 2009;

<sup>16</sup> We wondered if unrelated photos did not produce falsiness because the combination of the practice task (comprised of related and no photos) and experiment proper meant that unrelated photos occurred rarely. The answer is no, as we detail in the replications that appear in Appendix E.

Westerman, 2008). But it is possible that this context led subjects to find a semantic relationship between the claim and the photo, for both types of photos. For instance, they might have looked at the thermometer claim paired with a lizard, and thought “Well, the lizard is long and thin, like a thermometer, and has a stripe up the center just like a thermometer.” Such a strategy would have mitigated the perceived incongruency between the photos and trivia claims, leading unrelated photos to become more like related photos and diluting their falsiness. This idea fits with research showing that people will find or create meaning (Bartlett, 1932), especially when they are faced with pairings that don’t have an obvious semantic relationship (for instance, novel metaphors; Grimshaw, Stewart, & Lauwereyns, 2011; Lynott & Connell, 2010).

Of course, a critic might argue that unrelated photos produced little bias compared to no photos for other, less interesting reasons: Perhaps people just adopted a strategy of ignoring unrelated photos, much like the way people in a Stroop task can adopt a strategy to ignore the word and focus on the color (Kane & Engle, 2003; Stroop, 1935; see also Besner, Stolz, & Boutilier, 1997). This strategy seems possible, but is unlikely on closer consideration. Because the unrelated photos randomly appeared among related photos, people must have processed photos enough to understand that they were unrelated. The response time data from our pilot testing fits with this idea. Although we did not collect response time data in the experiments we report here, response times in our lab-based pilot testing showed that subjects took longer to respond to claims presented with photos ( $F_{\text{photo}}(1, 128) = 12.36, p < .01, \eta^2 = .09$ ;  $M_{\text{related condition photo}} =$

4612.37ms, SD = 1926.83ms;  $M_{\text{related condition no photo}} = 4357.62\text{ms}$ , SD = 1344.80ms;  $M_{\text{unrelated condition photo}} = 4957.40\text{ms}$ , SD = 1624.02ms;  $M_{\text{unrelated condition no photo}} = 4470.93\text{ms}$ , SD = 1382.88ms). Moreover, people took a similar amount of time to respond to claims paired with related and unrelated photos (although directionally, people took longer to respond to claims with unrelated photos, this pattern did not reach significance,  $F_{\text{relatedness}}(1, 128) < 1$ ,  $F_{\text{relatedness} \times \text{photo}}(1, 128) = 1.21$ ,  $p = .27$ ,  $\eta_p^2 = .01$ ). Thus, the "ignoring" hypothesis does not seem satisfactory.

Taken together, these findings suggest that in the context of related photos, unrelated photos exert the same influence as no photos. But part of this context likely includes subjects' expectations that each photo is meaningfully related to a claim. Might that expectation modulate the effect of unrelated photos? If we minimized subjects' expectations about meaningful relationships between photos and claims, what then should be the effect of unrelated photos? One possibility is that unrelated photos would make it more difficult for people to bring related ideas to mind, producing disfluent processing. If so, we should see increased falsiness among subjects for whom photos were always unrelated. A second possibility is that setting people up to expect incongruence between photos and claims might lead them to ignore all of the photos, and focus on the claims—a strategy that should be much easier to apply when all the photos are unrelated (Kane & Engle, 2003). We addressed these questions in Experiment 5 by manipulating the semantic relatedness of photos between-subjects.

## Experiment 5

### *Method*

#### *Subjects*

We used MTurk to recruit 196 subjects in the US. They received \$0.60 Amazon credit for participating.

#### *Design*

We used a 2 (photo: yes, no) x 2 (relatedness: related, unrelated) mixed design, manipulating the presence of a photo within-subjects and relatedness of the photo between-subjects.

#### *Procedure*

We used the same procedure as Experiment 4 with the following changes. Immediately after seeing the easy practice trivia claims, people saw 32 difficult trivia claims (half true, half false). Half the claims appeared with a photo; for half the subjects the photo was always related to the claim whereas for the remaining subjects it was always unrelated to the claim with which it appeared.

### *Results & Discussion*

As Figure 4.2 shows, related photos again produced truthiness. But the Figure also shows that, in contrast to Experiment 1, unrelated photos produced a different pattern. Relative to when claims appeared without a photo, when claims appeared with an unrelated photo people were biased to conclude those claims were false. That is, unrelated photos produced falsiness.

A 2 x 2 mixed ANOVA showed the pertinent Photo x Relatedness interaction,  $F(1, 194) = 9.01, p < .01, \eta_p^2 = .04$ ; related photos produced truthiness,  $t_{\text{related-no}}$



$t_{\text{photo}(93)} = 2.12, p = .04, d = .23$  but unrelated photos produced falsiness,  $t_{\text{unrelated-no photo}(101)} = 2.12, p = .04, d = .19^{17}$ . These patterns replicated in a subsequent study in which 185 subjects were tested with the same materials and procedure (see Appendix F).

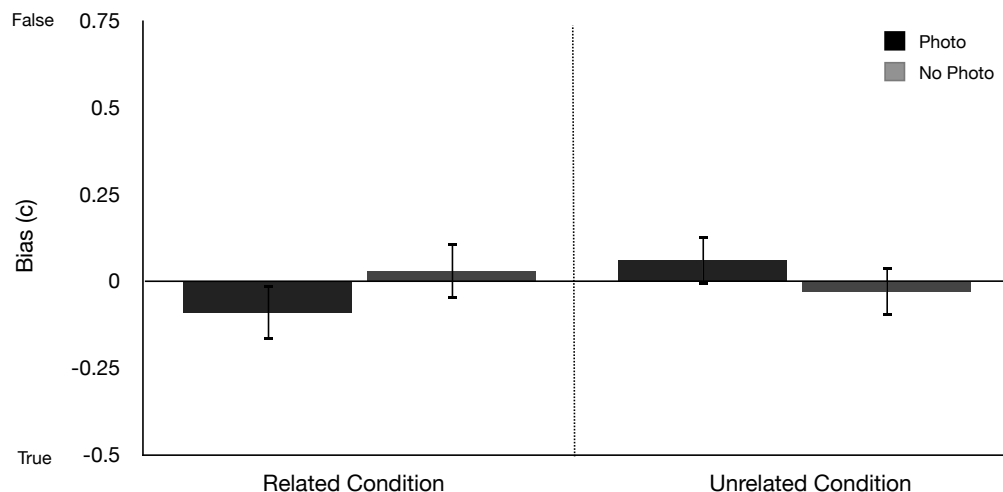


Figure 4.2. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the photo effect for related and unrelated conditions in Experiment 5 (see Masson & Loftus, 2003)

Taken together, Experiments 4 and 5 might lead us to conclude that although the effects of unrelated photos depend on the context in which they appear, related photos produce truthiness regardless of context. But recall that in both of these experiments (and in Newman et al., 2012), claims with related photos always appeared among claims without photos; the same is true of claims with unrelated photos. Thus we cannot rule out the possibility that truthiness also depends on

<sup>17</sup> For Experiment 5 we found the same significant pattern of results when we analyzed the total true proportions: there was no main effect of Photo  $F < 1$ , but there was a significant Photo  $\times$  Relatedness interaction  $F(1,194) = 11.31, p < .01, \eta^2 = .06$ ;  $t_{\text{related-no photo}(93)} = 2.47, p = .02, t_{\text{unrelated-no photo}(101)} = 2.26, p = .03$ .

context. That is, perhaps what drives truthiness is that people evaluate their processing experiences with photos against the benchmark of their experiences without photos.

In fact, a growing body of research fits with this idea and suggests that a feeling of easy retrieval or easy imagery is driven by a comparison against a standard (Unkelbach & Greifeneder, 2013). When it is easier than expected to retrieve something, people interpret that processing discrepancy as a cue to truth; conversely, when it is more difficult than expected to retrieve something, people interpret this discrepancy the opposite way. But when processing matches expectations, there is no discrepancy to interpret. Moreover, processing standards do not have to arise from sustained prior experiences; instead experimental manipulations can forge them in the moment (Jacoby & Dallas, 1981; Westerman, 2008; Whittlesea & Williams, 2001a, 2001b). For example, repetition is thought to produce truth because repeated statements are more easily processed, and people interpret this processing fluency as a sign that statements are true (Dechêne et al., 2010; Unkelbach, 2006). But as is the case with some of psychological science's well-known effects—such as the illusory truth effect—the effect of repetition on truth disappears when repetition is manipulated between-subjects (Dechêne et al., 2009; Roediger, 2008). If truthiness (and falsiness) depends on a standard, we should see that the pattern from Experiment 5 disappears when people have no standard against which to interpret the ease or difficulty of processing that accompanies claims paired with photos. Accordingly, in Experiment 6 we manipulated the photo factor entirely between-subjects.

## Experiment 6

### *Method*

#### *Subjects*

We used MTurk to recruit 301 subjects in the US. They received a \$0.60 Amazon credit.

#### *Design*

We used a single-factor (photo: related, unrelated, no photo) between-subjects design.

#### *Procedure*

Subjects saw the same trivia claims as in Experiment 5: 16 practice claims, followed by 32 trivia claims. The key difference in Experiment 6 is that we manipulated the photo factor between-subjects. That is, one third of subjects saw the claims paired with related photos, a third saw the claims paired with unrelated photos, and a final third saw the claims paired with no photo. We gave subjects the same instructions as in Experiment 4 and 5, except that we removed any reference to the presence or absence of photos.

### *Results & Discussion*

As Figure 4.3 shows, compared to when there was no photo, related photos did not produce truthiness, and unrelated photos did not produce falsiness. In other words, a one way ANOVA showed no effect for photo,  $F(2, 298) = .75, p = .47, \eta_p^2 = .01$ .<sup>18</sup>

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<sup>18</sup> For Experiment 6 we found the same non-significant pattern of results when we analyzed the total true proportions: there was no main effect of Photo  $F(2,298) < 1$ .

These findings fit with the idea that truthiness or falsiness depend on expectations acquired in the experimental context, and only occur when there is a discrepancy in the expected ease of processing. These patterns replicated in a subsequent study in which 301 subjects were tested with the same materials and procedure (see Appendix G)

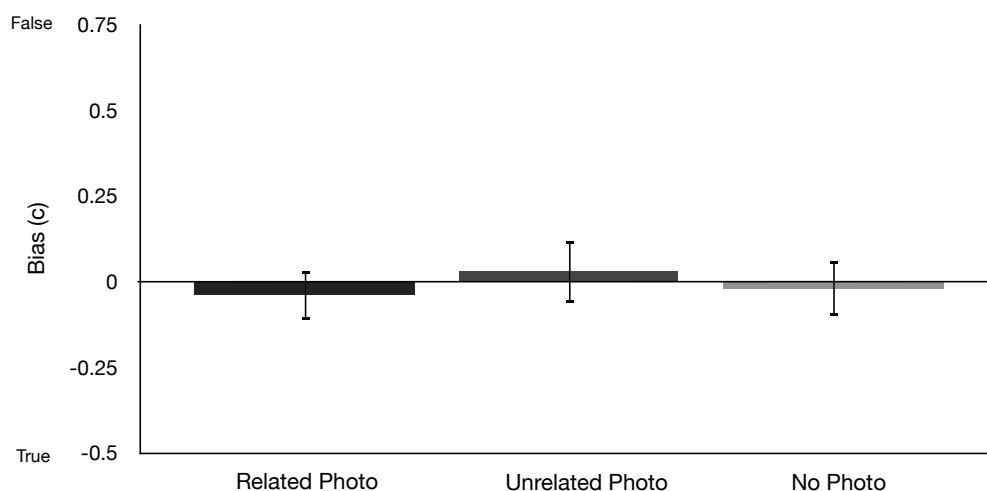


Figure 4.3. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% confidence intervals for each cell mean in Experiment 6 (see Masson & Loftus, 2003)

### ***Summary of Experiments 4-6***

Across three experiments, we found the effects of nonprobative photos vary with experimental context. We also found that the effects of nonprobative photos depend on the semantic relationship between the photo and the claim. When there was a no photo standard against which to evaluate either related or unrelated photos (Experiment 5), related photos increase the truth of claims (an effect we call truthiness), while unrelated photos decrease the truth of claims (an

effect we call falsiness). But when we removed that ability to compare against a standard by employing a between-subjects design, neither related nor unrelated nonprobative photos influenced people's true/false judgements. Considered as a whole, this pattern of results suggests that photos influence people's judgments when a discrepancy arises in the expected ease of processing—that is, when subjects find claims with photos easier (or more difficult) to evaluate compared to claims without photos (Westerman, 2008; Whittlesea & Williams, 2001a, 2001b). Moreover, these findings also support a mechanism in which—against a backdrop of an expected standard—related photos help people generate pseudoevidence to support the claim. Related photos might help people generate pseudoevidence by facilitating conceptual processing and (or) helping people trawl for evidence (Kelley & Lindsay, 1993; Nickerson, 1998; Tversky & Kahneman, 1973; Whittlesea, 2011). Our anecdotal observations of a small number of lab-tested pilot subjects (who provided think-aloud protocols while performing the procedure of Experiment 5 also fit with such a mechanism. For instance, when faced with the claim “Macadamia nuts are in the same evolutionary family as peaches” paired with a photo of macadamia nuts, one subject said, “I’m going to go with yes because they kind of look like peaches, so that would make sense.”

The effects of unrelated photos are less uniform, and suggest that context moderates their influence. Although these photos exerted little influence in Experiment 1, that they produced falsiness in Experiment 5 suggests that they are not always benign or ignored. Indeed, our anecdotal observations again suggest that subjects tried to find a relationship between the unrelated photos and claims.

For example, regarding the claim “The Mona Lisa has no eyebrows” paired with a photo of a tiger, another think-aloud pilot subject reported, “I noticed . . . that tigers don’t really have eyebrows either so it was maybe giving you a bit of an influence.” Interestingly, this subject saw only unrelated photos (as in Experiment 5), but nonetheless interpreted some of the photos as being related to the claims at hand. In the context of other semantically related photos, subjects may have been even more inclined to search for meaning (Grimshaw, Stewart, & Lauwereyns, 2011; see also Lynott & Connell, 2010).

Our findings also fit with a growing body of work showing that people evaluate their processing experience against a standard (Dechêne et al., 2009; Westerman, 2008; Whittlesea & Williams, 2001a, 2001b). When cognitive processing is easier (or more difficult) than expected, people make sense of that discrepancy within the current situation—in the context of a true /false task, they take easy processing as a signal that something is true, and take difficult processing as a signal that something is false. Still, it is surprising that people did not simply discount the influence of the photos; after all, when people can readily home in on the source that causes a discrepancy in processing, they tend to correctly attribute the discrepancy to that source (in this case, the photo) rather than misattribute the discrepancy to the task at hand (see Jacoby & Whitehouse, 1989; Oppenheimer, 2004; Schwarz, 2010). Although robust, the effects of nonprobative photos were relatively small in our studies—perhaps because people could easily home in on the source of discrepant processing. One avenue for future research might be to make the photo manipulation less obvious—making it more difficult for people to

identify the photo as being the likely source of discrepant processing. A manipulation like this might work to boost the effects of photos and truthiness.

## Chapter 5

### General Discussion

#### *Review*

Over 7 experiments we examined how nonprobative photos (or words) can influence people's judgements of truth. In the first two experiments, we found that adding a photograph of a celebrity (showing them engaged in their profession) biased people to say claims about a celebrity were true—regardless of whether the claim was “This famous person is alive” or “This famous person is dead.” Moreover, this truthiness effect was most pronounced when people evaluated claims about unfamiliar celebrities—that is, when they could not draw on their own general knowledge to decide the truth of a claim. This finding fits with research showing that people will draw on tangential cues to inform their decisions, especially when they do not have access to other objective or diagnostic information (e.g., colour contrast; Unkelbach, 2007).

In Experiment 2, we showed that truthiness was not tied to the perceived credibility of photos, but that giving people verbal descriptions of those photos produced the same effect. In Experiment 3, we examined the generalizability of the effect and found that photos that related to—but did not provide evidence for—general knowledge claims also produced truthiness. Taken together, the first four experiments showed that in the moment, related but nonprobative information can systematically bias people to conclude claims are true.

In the next three experiments we examined the conditions under which photos would produce truthiness. We found that simply adding information to a claim



does not produce truthiness: The semantic relationship between the photo and claim matters. Experiment 4 showed that in a within-subject design, related photos produced truthiness, but unrelated photos acted just like the no photo condition. Experiment 5 showed that unrelated photos were not benign, rather that their effects depended on experimental context: In a mixed design, related photos produced truthiness and unrelated photos produced falsiness. We also found that although truthiness generalized across materials, it did not generalize across experimental context: The effect of photos (related and unrelated) was eliminated when we used a fully between-subjects design in Experiment 6. Taken together, our findings suggest that the effect of nonprobative photos is relative. Our data fit with a mechanism in which against an expected standard of processing ease, related nonprobative photos can help people generate pseudoevidence regarding the truth of a claim.

### ***Connections with the Broader Literature***

#### ***Mental Construal***

Considered as a whole, these findings are reminiscent of the literature on effects of mental construal (Trope & Liberman, 2003, 2010). When people ponder a target stimulus in a concrete rather than abstract way, they tend to report that the target feels subjectively closer in time (or in physical distance) and is more likely to be true (Alter & Oppenheimer, 2008; Hansen & Wanke, 2010). Moreover, how people represent an event depends on the accessibility of semantically related information: In one study people judged that concrete statements were better descriptions of Los Angeles (“a dry temperate city”), than abstract statements (“a

tangle of freeways”) if they had been primed to consider Los Angeles earlier in the experiment (Alter & Oppenheimer, 2008). Semantically related photos might do something similar to the Los Angeles prime, and lead people to construe the trivia claim in more concrete terms, boosting its perceived truth. Conversely, unrelated photos might lead to abstract construal.

### ***Reality Monitoring and Vividness***

Our findings also fit with research on reality monitoring and vividness. When people evaluate the accuracy of mental events, they make decisions based on the characteristics of the mental event—using the amount of perceptual detail and ease of imagery as cues to reality (Johnson, 2006; Johnson & Raye, 1981). We know that photos can influence reality monitoring even after short exposures. Within just a few seconds photos can lead people to say they remember events that never happened (Brown & Marsh, 2008; Strange, Garry, Bernstein, & Lindsay, 2011). In one study, people saw a series of news headlines (true and false) and judged whether they remembered the news event described in each headline (Strange et al., 2011). Some of the headlines were presented along with a related “stock photo” (for instance: The false headline Blair under fire for botched Baghdad rescue attempt; won't step down, was paired with a photo of Tony Blair speaking in parliament). When people saw headlines paired with these stock photos, they were more likely to say they remembered the news event—even though the photos did not provide any evidence that the event occurred. One reason why photos can lead people to make reality monitoring errors, is that they should help people manufacture mental contents—images and perceptual details

—that are usually interpreted as evidence of truth or memory (Johnson, 2006; Johnson & Raye, 1981; see also Lindsay et al., 2004). Together this research suggests that photos are not just a cue to truth, but they can be a cue to reality more generally.

The literature on vividness also squares with our truthiness effect. Messages that are delivered in a vivid way—with concrete language, pictures, and additional details—are more persuasive than messages delivered in a less vivid way—with abstract language, no images and fewer details (Bell & Loftus, 1989; Nisbett & Ross, 1980; cf. Frey & Eagly, 1993; Taylor & Thompson, 1982). For instance, people are more likely to find a defendant guilty when eyewitness testimony is delivered with specific ("The man went and got a box of Milk Duds and a can of diet Pepsi"), rather than general details ("The man went and got a few more items;" Bell & Loftus, 1989; see also Reyes, Thompson, & Bower, 1980). One explanation for why vivid messages can be persuasive is that they tend to be better remembered; making it easier for people to retrieve and picture the message later—which might also work to bolster the perceived truth of the message (Collins, Taylor, Wood, & Thompson, 1988; Nisbett & Ross, 1980; Shedler & Manis, 1986).<sup>19</sup> Although vividness effects are usually measured some time after people have seen a message, our research suggests that adding nonprobative information to claims can have similar effects in the moment.

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<sup>19</sup> But evidence for this mechanism is mixed (e.g., Frey & Eagly, 1993) and some research suggests that people's memory of a vivid message does not necessarily predict the persuasive power of that message (Bell & Loftus, 1989; Shedler & Manis, 1986).

### ***The Seductive Allure of Brain Images***

The effects we report here are not the only demonstration of how nonprobative images can influence people's beliefs. For instance, in one well known study people agreed more with the conclusions in a news article when it featured an image of the brain, even though that image provided no additional evidence for the conclusions already in the text of the article (McCabe & Castel, 2008).

Although this finding has received much attention in both the popular and scholarly press (nearly 40 citations per year, according to Google Scholar, as at November 21, 2012), when Michael et al. (2013) attempted to extend this work and replicate the original study they failed. Instead, Michael and colleagues ran a series of studies—comprising ten experiments and nearly 2,000 subjects to estimate, more precisely the effect of adding a brain image. When the original McCabe & Castel (2008) data was combined with data from the 10 replications in a meta-analysis, Michael et al. determined that a brain image exerts little to no influence on the extent to which people agree with the conclusions of a news article. In fact, the precision in the meta-analysis showed that an effect size of zero remained a plausible true effect size, even though zero is admittedly at the lower limit of the estimate. How do we reconcile the findings of Michael et al with our results that suggest nonprobative photos do indeed have systematic effects on our judgments?

Although the effects we report here are small, one might wonder why a photo of Nick Cave or a thermometer increases perceived truth but an image of the

brain does not. On the one hand we might expect that brain images should exert more of an influence on people's judgments than photos of people or thermometers. We know that people trust neuroscience: Although Michael et al., (2013) did not find robust effects of brain images, they did find that when people read explanations of scientific findings that contained neuroscience people were more likely to find those explanations satisfactory than when people read explanations without neuroscience (a replication of Weisberg, Keil, Goodstein, Rawon, & Gray, 2008; see also McCabe, Castel, & Rhodes, 2011).

On the other hand, the brain images were added to an explanation that already contained neuroscience, so it might be that these effects are not additive. That is, once people have had their 'hit' of neuroscience through the text, the photo has only a trivial effect on their decisions. Relatedly, in the Michael et al study, subjects read 500-word passages paired with a photo of a brain, whereas in the 7 experiments reported here we showed subjects short claims of approximately 8 words. It is possible that the longer passage gave people enough semantic context so that the effect of brain images was trivial. That is, nonprobative photos might not boost processing any further when they are paired with detailed verbal descriptions (see Experiment 2). It is also possible that these more thorough descriptions gave people sufficient background knowledge to evaluate the article, making people less inclined to draw on brain images to inform their judgments. Indeed, in the experiments we report here we found that people were less susceptible to the effects of nonprobative photos when they could draw on general knowledge to answer a claim.

Of course it is also possible that the brain image only exerted a trivial effect on people's decisions because the presence of an image was manipulated between-subjects. As in the experiments reported here, it is possible that manipulating the presence of a brain image within-subjects would produce larger, more consistent effects.

### ***Avenues for Future Research***

#### ***Does truthiness stick?***

The effects we report here happen in a matter of seconds: People see a claim and respond as quickly as possible to decide if it is true. Do the effects of truthiness fade rapidly, by the time subjects have left our experiment?

A number of findings in the psychological literature on memory lead us to suspect that truthiness should persist over time. First, we know that photos or pictures can help people remember information (Bransford & Johnson, 1972; David, 1998; Mayer & Gallini, 1990; Strange et al., 2011; for a review see Carney & Levin, 2002; Mayer, 2008). Thus we would expect that compared to when people did not see a photo at time 1, photos would help people remember the statement at time 2 and should make it feel more cognitively available, familiar and true (Jacoby et al, 1989; Kelley & Lindsay, 1993; Ozubko & Fugelsang, 2011; Tversky & Kahneman, 1973; Whittlesea, 2011).

Second, people tend to have a good memory for photographs (Paivio, Rogers, & Smythe, 1968; Shepard, 1967). So at time 2, even if people just remember elements of the photo, it may still help them generate related thoughts images about the claim in the moment—boosting feelings of conceptual fluency and

truth. Third, if people learn an association between photos and truth at time 1, simply remembering that a statement appeared with a photo might lead people to conclude the statement is true at time 2 (see for instance, Unkelbach, 2007). So perhaps truthiness would persist over time, suggesting that a brief intervention with a nonprobative photo could have persistent effects on our beliefs about the world—true and false.

This kind of design would also allow us to examine whether photos have any special biasing power over other kinds of nonprobative information. Recall that in the experiments reported here, photos and verbal information similarly biased people to conclude claims were true. But over time, photos may have more biasing power than words. Given that people tend to remember pictures better than words, over time the effects of nonprobative verbal information might fade more rapidly than the effects of nonprobative photos (see Paivio, Rogers, & Smythe, 1968; Shepard, 1967).

### ***Are Some People more Susceptible to Truthiness than Others?***

We found that truthiness varied according to whether people judged easy or difficult claims and across experimental context, but we also found that truthiness varied across subjects. That is, not everyone fell victim to the effects of nonprobative information. Across our experiments between 60 and 70% of people fell victim to truthiness, but a substantial minority did not.

This finding fits with related work on memory showing that individual differences can account for people's tendency to call something “old”—that is, to say they remember having seen that thing earlier (e.g. Kantner & Lindsay, in

press). In one study, over a number of experiments and tasks, some people tended to respond liberally on a memory test, needing less evidence to conclude they had seen something before (Kantner & Lindsay, in press). Others tended to respond conservatively, needing relatively more evidence before they would conclude they had seen something before. In summary, this study provided evidence for individual differences in how people weigh memory evidence in recognition memory tests (see also Aminoff et al., 2012). There might also be individual differences in how people weigh nonprobative evidence in the context of a true/false judgment.

Perhaps some of our subjects had a lower threshold for relevant or convincing evidence and thus were particularly swayed by nonprobative evidence. To examine this idea, one avenue for future research would be to test whether people who show truthiness on one task, for instance in the trivia study, would also show truthiness in another task, for instance judging claims about celebrities. If there is a stable individual difference in people's tendency to be swayed by nonprobative information, we should see that truthiness on one task predicts truthiness on another task. In fact we might expect that these effects would extend beyond photos, because we know that people turn to many kinds of nonprobative evidence to make true/false judgements. That is, people who show truthiness with photos might also be more inclined to show truthiness with claims that have been



repeated, presented in high color contrast, or primed with semantically related ideas.<sup>20</sup>

Other individual difference measures might also inform us about people's susceptibility to truthiness and help illuminate underlying cognitive mechanisms. If nonprobative photos produce truthiness partly because they help people generate mental imagery relating to a claim, then photos might have particularly powerful effects for those people who struggle with mental imagery (cf. Petrova & Cialdini, 2005). Conversely, people who routinely engage in imagery might experience only a modest boost in processing a claim when it is paired with a photo and show very little truthiness. This idea fits with the findings reported in this thesis: When people judged unfamiliar, or difficult claims—those that should be more difficult to image than familiar or easy claims—they were most susceptible to the effects of nonprobative photos. Perhaps we would find similar effects across individuals, rather than items.

## ***Practical Implications***

### ***Education***

The educational psychological literature says that pictures can help by scaffolding new information, connecting it to prior knowledge, and improving comprehension and memory (Marcus, Cooper, & Sweller, 1996; Mayer, 2008). But that literature also shows that pictures help only when they represent relevant concepts, not when they are tangential decorations (see Carney & Levin, 2002).

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<sup>20</sup> There is also evidence that more transient features of an individual such as mood or using analytical thinking can influence the extent to which people use cues such as processing fluency to inform their judgements (Halberstadt & Catty, 2008; Halberstadt & Hooton, 2008; Koch & Forgas, 2012; Ruder & Bless, 2003).

Our research adds to this body of work and suggests that photos that decorate—ones that do not provide evidence for ideas in a piece of text—can influence people’s judgments in the moment and boost the perceived truth of the material they are paired with.

What we do not know from our research is whether photos would do more than just bias people’s responses, perhaps photos would influence how much effort people exert when trying to make sense of new information. Consider for a moment the research showing that people use ease of processing to guide the amount of effort or attention they invest in a task (Diemand-Yauman et al., 2011; Yue, Castel, & Bjork, in press). Indeed, when something feels difficult to process people tend to invest more attention to the task at hand, and are thus better at detecting inaccuracies (Song & Schwarz, 2008). It follows then, that pairing new information with unrelated nonprobative photos should encourage a more critical analysis of the details at hand. A manipulation like this in the context of education might help students better detect discrepancies and ward off misconceptions (cf. research on seductive details; Harp & Mayer, 1997; Lehman, Schraw, McCrudden, & Hartley, 2007).<sup>21</sup>

### ***Media and Public Information Campaigns***

In the context of the media and public information campaigns, photos and images are typically used to grab our attention and make information more memorable. Indeed there is a large literature that tells us that photos do these

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<sup>21</sup> Although correcting misconceptions often requires elaborate interventions (see for instance, Gregg, Winer, Cottrell, Hedman, & Fournier, 2001; Kowalski & Taylor, 2009), pairing misconceptions with an unrelated photo might make the misconception seem more false, and (or) encourage people to think more critically about the claim.

things (e.g., Mayer & Gallini, 1990; Sargent, 2007; Strange et al., 2011). But our research suggests a caution. Although related nonprobative photos might boost the truthiness of messages, when paired with warnings or false information, photos could be dangerous. In one study, subjects saw a series of messages from a typical “myth and facts” campaign. In an initial encoding phase subjects were told which messages were myths and which were facts, either once or three times (Skurnik, Yoon, Park, & Schwarz, 2005). For those people who took a test 30 minutes later repeated warnings about myths helped them—they were more accurate at judging the truth of the messages. But for those people (particularly, older adults) who took a test three days later, repeated warnings about myths hurt them and made myths turn into facts. That is, after a delay people remembered the message, but not the information regarding its accuracy (for a review see Schwarz, Sanna, Skurnik, & Yoon, 2007; see also sleeper effect Hovland & Weiss, 1951; Kumkale & Albarracin, 2004; Pratkanis, Greenwald, Leippe, & Baumgardner, 1988). Pairing photos with myths might provide an especially powerful instantiation of the sleeper effect—photos might lead people to elaborate on the general content of the message or distract the reader from the information about accuracy, making myths rapidly grow into facts.

### ***Final Remarks***

Taken together, the 7 experiments reported here suggest that nonprobative photographs do more than simply decorate claims: they wield a significant and immediate influence on beliefs and decision making. For cognitive scientists, our data suggest that photos are a novel manipulation of fluency, and fit with a broad

class of effects related to inferences about metacognitive experience and the availability of hypothesis-consistent evidence (Jacoby, et al., 1989; Johnson, 2006; Schwarz, 2010; Whittlesea, 2011).

Our research shows that nonprobative information influences people's judgements about general knowledge claims. But the effects of nonprobative information might extend to judgements about our own lives. When people evaluated whether events have happened, or are likely to happen to them, they often use cognitive availability to gauge reality (Brown & Marsh, 2008; Sherman et al., 1985; see also Belli, Winkielman, Read, Schwarz, & Lynn, 1998; Garry et al., 1996). So perhaps nonprobative information would boost the truthiness of claims about our own lives. Thus, an important question for future research is to determine whether photographs can do more than mislead us into believing claims, they might also rapidly rewrite our autobiographies and bias our estimates of future events.

Our data also suggest caution when images are used in contexts such as the criminal justice system. Although pictures and images usually help—boosting comprehension and memory for complex material, it is possible that images might also manufacture a sense of (perhaps unwarranted) authority (see Feigenson, 2010 for a recent discussion of the use of visual evidence in the courtroom).

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## Appendix A

Table 1.

*Celebrity Names from Experiment 1A and 1B*

|               | Alive Names         | Dead Names             | Familiarity |
|---------------|---------------------|------------------------|-------------|
| Experiment 1A | Harper Lee          | Donald Bradman         | Low         |
|               | Kelsey Grammer      | Lloyd Bridges          | Low         |
|               | Pete Townshend      | Ben Hogan              | Low         |
|               | Jacques Chirac      | Augusto Pinochet       | Low         |
|               | Geoffrey Palmer     | Jim Morrison           | Low         |
|               | Joni Mitchell       | Marlon Brando          | Low         |
|               | Jack Nicklaus       | Brandon Lee            | Low         |
|               | Taito Phillip Field | Charlton Heston        | Low         |
|               | Bob Geldof          | Pol Pot                | Low         |
|               | Kofi Annan          | Jacques Cousteau       | Low         |
|               | Jimmie Carter       | Evel Knievel           | High        |
|               | Neil Young          | Jeff Buckley           | High        |
|               | Noam Chomsky        | Nina Simone            | High        |
|               | Lee Tamahori        | David Lange            | High        |
|               | Kevin Costner       | Janet Frame            | High        |
|               | Judi Dench          | Christopher Reeve      | High        |
|               | Ray Romano          | Richard Nixon          | High        |
|               | Margaret Thatcher   | Kurt Cobain            | High        |
|               | David Copperfield   | Rosa Parks             | High        |
|               | Stephen Hawking     | Peter Blake            | High        |
|               | James Watson        | Jack Lemmon            | Low         |
|               | Nick Cave           | John Wheeler           | Low         |
|               | Tony Bennett        | Benazir Bhutto         | Low         |
|               | Carl Lewis          | Arthur C. Clarke       | Low         |
|               | John McEnroe        | Luther Vandross        | Low         |
|               | Jerry Lee Lewis     | Slobodan Milosevic     | Low         |
|               | B.B. King           | John Ritter            | Low         |
|               | Joan Collins        | Rick James             | Low         |
|               | Jane Fonda          | Gerald Ford            | Low         |
|               | John Cleese         | Jacqueline Kennedy     | Low         |
|               | Rupert Murdoch      | Robert Atkins          | High        |
|               | Bob Charles         | Billy T James          | High        |
|               | Fidel Castro        | Katharine Hepburn      | High        |
|               | Willie Nelson       | Dame Te Atairangikaahu | High        |
|               | Ian McKellen        | Linda McCartney        | High        |
|               | Colin Meads         | River Phoenix          | High        |
|               | Kenny Rogers        | Barry White            | High        |

|               |                     |                    |      |
|---------------|---------------------|--------------------|------|
|               | Michael Cullen      | Robert Muldoon     | High |
|               | Jim Bolger          | Yasser Arafat      | High |
|               | Stephen King        | Pope John Paul     | High |
| Experiment 1B | Marc Garneau        | Fred Hoyle         | Low  |
|               | Roberta Bondar      | John Tukey         | Low  |
|               | Linda Evangelista   | Nicole Reinhart    | Low  |
|               | Jacques Chirac      | Jerry Falwell      | Low  |
|               | Desmond Tutu        | Jam Master Jay     | Low  |
|               | Kofi Annan          | Carl Sagan         | Low  |
|               | Joan Collins        | Augusto Pinochet   | Low  |
|               | Ian McKellen        | Slobodan Milosevic | Low  |
|               | Tonya Harding       | Lloyd Bridges      | Low  |
|               | Jerry Lee Lewis     | Wilt Chamberlain   | Low  |
|               | John Cleese         | Sir Edmund Hillary |      |
|               | Judi Dench          | Jacqueline Kennedy | High |
|               | James Watson        | Aaliyah            | High |
|               | Joni Mitchell       | Marlon Brando      | High |
|               | BB King             | Linda McCartney    | High |
|               | Jane Fonda          | Chris Farley       | High |
|               | Aretha Franklin     | Jacques Cousteau   | High |
|               | Howie Mandel        | Katharine Hepburn  | High |
|               | Bruce Springsteen   | Dr Seuss           | High |
|               | Stephen King        | Jimi Hendrix       | High |
|               | Sean Connery        | Johnny Cash        | High |
|               | Joe Frazier         | Michael Hutchence  | Low  |
|               | Bob Geldof          | Jonathan Mann      | Low  |
|               | Edwin "Buzz" Aldrin | Donald Bradman     | Low  |
|               | Pete Townshend      | Florence Joyner    | Low  |
|               | Carl Lewis          | PW Botha           | Low  |
|               | Henry Heimlich      | Idi Amin           | Low  |
|               | Sidney Poitier      | Bill Hicks         | Low  |
|               | Jack Nicklaus       | Pol Pot            | Low  |
|               | Carly Simon         | Owen Hart          | Low  |
|               | Ralph Nader         | Jeff Buckley       | Low  |
|               | Ron Howard          | Chris Benoit       |      |
|               | Cat Stevens         | Joe Dimaggio       | High |
|               | George Foreman      | John Candy         | High |
|               | Kelsey Grammer      | Bob Hope           | High |

|                   |                   |      |
|-------------------|-------------------|------|
| Kenny Rogers      | Gerald Ford       | High |
| David Copperfield | Rick James        | High |
| Stephen Hawking   | Evel Knievel      | High |
| Margaret Thatcher | Barry White       | High |
| Fidel Castro      | Pope John Paul II | High |
| Muhammad Ali      | Ray Charles       | High |
| Lance Armstrong   | Frank Sinatra     | High |

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*Note.* In order to make the groups of names even across factors and counterbalancing, we excluded four names from analyses, leaving a total of 80 names as in Exp 1A. These four names had the median familiarity rating for each group (High Familiarity Dead, Low Familiarity Dead, High Familiarity Alive, Low Familiarity Alive). When we do include them in our analyses, they do not change the pattern of results.

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## Appendix B

Table 2.  
*Signal Detection parameters for claims presented with or without a photo.*

|                   |            | Names | Bias<br>Photo | Bias<br>No Photo | d'<br>Photo | d'<br>No Photo |
|-------------------|------------|-------|---------------|------------------|-------------|----------------|
| Experiment 1A     |            |       |               |                  |             |                |
| “Alive”           | Familiar   |       | -.28 ( .54)   | -.28 ( .48)      | 1.35 (1.03) | .90 ( .95)     |
|                   | Unfamiliar |       | -.01 ( .45)   | .07 ( .62)       | .77 ( .82)  | .86 (1.14)     |
| “Dead”            | Familiar   |       | .02 ( .48)    | .16 ( .51)       | 1.26 ( .99) | .75 ( .91)     |
|                   | Unfamiliar |       | -.05 ( .40)   | .14 ( .37)       | .57 ( .99)  | .46 ( .78)     |
| Experiment 1B     |            |       |               |                  |             |                |
| “Alive”           | Familiar   |       | .00 ( .41)    | -.01 ( .40)      | 1.01 ( .85) | .43 ( .86)     |
|                   | Unfamiliar |       | -.13 ( .47)   | .29 ( .58)       | .47 ( .61)  | .37 ( .72)     |
| “Dead”            | Familiar   |       | -.03 ( .43)   | .18 ( .37)       | .96 (1.07)  | .58 ( .60)     |
|                   | Unfamiliar |       | .21 ( .45)    | .50 ( .77)       | .21 ( .74)  | .36 ( .64)     |
| Experiment 2      |            |       |               |                  |             |                |
| Photo             |            |       |               |                  |             |                |
| “Alive”           | Unfamiliar |       | -.09 ( .44)   | .28 ( .47)       | .12 ( .56)  | -.05 ( .68)    |
| “Dead”            | Unfamiliar |       | .07 ( .55)    | .46 (1.03)       | -.33 ( .73) | .04 ( .98)     |
| Verbal            |            |       |               |                  |             |                |
| “Alive”           | Unfamiliar |       | -.12 ( .44)   | .28 ( .39)       | -.15 ( .70) | .19 ( .53)     |
| “Dead”            | Unfamiliar |       | .07 ( .57)    | .22 ( .67)       | -.24 ( .66) | .37 ( .71)     |
| Experiment 3      |            |       |               |                  |             |                |
| Trivia Statements | Easy       |       | -.13 ( .51)   | -.07 ( .51)      | 2.43 ( .89) | 2.53 (1.19)    |
|                   | Difficult  |       | -.17 ( .38)   | .04 ( .46)       | .12 ( .76)  | .17 ( .78)     |



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Note. Standard deviations are in parentheses. Negative bias ( $c$ ) values show a bias to say true. Higher sensitivity ( $d'$ ) values indicate better discrimination ability. In Experiment 1A and 1B, photos increased accuracy for familiar but not unfamiliar names. In Experiment 2 photos reduced accuracy for unfamiliar names; in Experiment 3, photos had no effect on accuracy. The finding that photos increased people's accuracy in judging claims about familiar celebrities fits with the idea that photos serve as rich retrieval cues that help people access information regarding the truth of a statement. But this pattern did not replicate for easy trivia claims in Experiment 3—seeing a photo with a trivia claim did not increase people's accuracy. One explanation that might account for these different patterns is that people were generally more accurate in Experiment 3 than Experiment 1. That is, the claims in Experiment 3 were easier to answer than claims in Experiment 1. So it might be that adding a photo to a claim that people get correct approximately 80-100% of the time might do very little to further boost accuracy. In fact the educational psychological literature tells us something similar: if text is easy to understand, adding a picture doesn't affect comprehension and memory. The more difficult the text is and the less general knowledge the subject has about the topic, the more a picture helps (see: Mayer 1992; Levin & Mayer, 1993). Taken together these data suggest that there might be some optimal level of difficulty where a photo facilitates accurate recall of facts.

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Table 3.  
*Hits and False Alarms for claims presented with or without a photo (Experiments 1-3)*

|               | Familiarity/<br>Difficulty | Hits<br>Photo | Hits<br>No Photo | FAs<br>Photo | FAs<br>No Photo |
|---------------|----------------------------|---------------|------------------|--------------|-----------------|
| Experiment 1A |                            |               |                  |              |                 |
|               | Familiar                   | 0.74 (0.18)   | 0.65 (0.22)      | 0.34 (0.20)  | 0.39 (0.19)     |
|               | Unfamiliar                 | 0.62 (0.20)   | 0.56 (0.20)      | 0.40 (0.19)  | 0.37 (0.20)     |
| Experiment 1B |                            |               |                  |              |                 |
|               | Familiar                   | 0.66 (0.19)   | 0.56 (0.18)      | 0.33 (0.19)  | 0.38 (0.19)     |
|               | Unfamiliar                 | 0.56 (0.20)   | 0.43 (0.23)      | 0.43 (0.20)  | 0.33 (0.21)     |
| Experiment 2  |                            |               |                  |              |                 |
|               | Photo                      | 0.51 (0.20)   | 0.38 (0.25)      | 0.52 (0.18)  | 0.37 (0.21)     |
|               | Verbal                     | 0.47 (0.21)   | 0.45 (0.20)      | 0.53 (0.19)  | 0.37 (0.20)     |
| Experiment 3  |                            |               |                  |              |                 |
|               | Easy                       | 0.87 (0.10)   | 0.85 (0.16)      | 0.19 (0.14)  | 0.17 (0.15)     |
|               | Difficult                  | 0.58 (.20)    | 0.52 (0.17)      | 0.54 (0.17)  | 0.46 (0.22)     |

*Note.* In calculating  $d'$  and  $c$ , I had to convert the proportion of Hit and FAs to  $z$  scores. When Hit/FA were 1 or 0, this was not possible and so I used a standard adjustment of the Hit/FA rates by converting values of 1 to .99 and values of 0 to .01 (Wickens, 2002).

## Appendix C

Table 4. *Trivia Statements from Experiment 3*

| Trivia Statements   | Difficulty      |
|---|-----------------|
| Dogs have better memories than cats   | False Ambiguous |
| The bird that lays the largest egg in relation to its own size is the hummingbird | False Ambiguous |
| Cactuses can reproduce by parthenogenesis   | False Ambiguous |
| The colour green has the longest wavelength in the spectrum                       | False Ambiguous |
| A "full house" is a poker hand in which all cards are of the same suit            | False Ambiguous |
| Macadamia nuts are in the same evolutionary family as peaches                     | False Ambiguous |
| The Cobra is the largest snake in the world                                       | False Ambiguous |
| The Cocos Islands are part of Indonesia   | False Ambiguous |
| The Yonghe Temple is in Shanghai  | False Ambiguous |
| The statuette on a Rolls Royce is called "The Victorian Whisper"                  | False Ambiguous |
| Giraffes are the only mammals that cannot jump                                    | False Ambiguous |
| The first heart-lung machine was commissioned in the Netherlands                  | False Ambiguous |
| The liquid metal inside a thermometer is magnesium                                | False Ambiguous |
| The electric chair was invented by an accountant                                  | False Ambiguous |
| A quarter of the bones in your body are in your hands                             | False Ambiguous |
| The only fish that can blink with both eyes at once is the manta ray              | False Ambiguous |
| Pumpkin is good for vision  | False Easy      |
| Olive oil is the only food that doesn't spoil                                     | False Easy      |
| The name for a group of birds is a school   | False Easy      |
| The capital of France is Lyon   | False Easy      |
| Galileo discovered gravity  | False Easy      |
| An elephant can see all of its feet at the same time                              | False Easy      |
| The short pleated skirt worn by men in Scotland is called a fife                  | False Easy      |
| An ostrich is a pink coloured bird that stands on one leg                         | False Easy      |
| Pearls are most often found inside scallops                                       | False Easy      |
| Neptune is the planet known for its rings   | False Easy      |
| The space shuttle that exploded in the mid 1980s was called the Champion          | False Easy      |
| Zeus is the legendary one eyed giant in Greek mythology                           | False Easy      |
| Intelligent people have more iron and manganese in their hair                     | False Easy      |
| Archie is a comic strip character who eats spinach for strength                   | False Easy      |
| Soccer is the sport associated with Wimbledon                                     | False Easy      |
| Cricket is played with a ball that has three holes in it                          | False Easy      |
| Women dream more than men   | True Ambiguous  |
| Turtles are deaf  | True Ambiguous  |
| The name of the Russian space station MIR means PEACE                             | True Ambiguous  |
| The Mona Lisa has no eyebrows   | True Ambiguous  |
| The plastic things on the ends of shoelaces are called aglets                     | True Ambiguous  |
| The largest European glacier is Vatnajökull on Iceland                            | True Ambiguous  |
| There are 120 drops of water in a teaspoon  | True Ambiguous  |
| Starfish don't have brains  | True Ambiguous  |
| Alberto Fujimori is a former president of Peru                                    | True Ambiguous  |
| The cat is the only pet not mentioned in the bible                                | True Ambiguous  |
| A group of people hired to applaud an act or performer is called a 'claque'       | True Ambiguous  |
| Months that begin with a Sunday will always have a Friday the 13th                | True Ambiguous  |
| A wobbler is a lure that is used for fishing                                      | True Ambiguous  |
| Seine nets are nets used for deep sea fishing                                     | True Ambiguous  |
| Honeybees kill more people worldwide each year than all poisonous snakes...       | True Ambiguous  |
| Clark Gable was the actor who played Rhett Butler in "Gone with the Wind"         | True Ambiguous  |
| Tea is the most popular beverage in China   | True Easy       |
| There are 336 dimples on a regulation golf ball                                   | True Easy       |

|   |           |
|---|-----------|
| Strawberries are the only fruit whose seeds grow on the outside         | True Easy |
| Apples are more efficient than caffeine at waking you up in the morning | True Easy |
| Neil Armstrong was the first person on the moon                         | True Easy |
| Everest is the tallest mountain in the world                            | True Easy |
| The cheetah is the animal that runs the fastest                         | True Easy |
| The flower necklace worn in Hawaii is called a lei                      | True Easy |
| A one-lens eye piece is called a monocle                                | True Easy |
| A compass is a navigation instrument used at sea to plot position       | True Easy |
| An ostrich's eye is bigger than its brain                               | True Easy |
| The first stamps were issued in England                                 | True Easy |
| The player who guards the net in soccer is called the goalie            | True Easy |
| A great white is a type of man-eating shark                             | True Easy |
| The main food consumed by half of the people worldwide is rice          | True Easy |
| Bats use soundwaves to locate and direct themselves during flight       | True Easy |

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## Appendix D

Table 5.  
*Discrimination ( $d'$ ) for claims presented with or without a related or unrelated photo. Experiments 4-6.*

|   | d'         | Statistical Analyses   |
|---|------------|--|
| Experiment 4  |            |  |
| Related Photos  | .22 (1.44) | A one way repeated measures ANOVA showed no main effect for photo $F(2, 206) = .36, p = .70, \eta_p^2 = .003$ .  |
| Unrelated Photos  | .15 (1.19) |  |
| No Photos   | .26 (1.40) |  |
| Experiment 5  |            |  |
| Related Condition   |            |  |
| Related Photos  | .34 ( .74) | A 2(photo: photo vs. no photo) x 2(relatedness: related vs. unrelated) mixed ANOVA with repeated measures on the first factor showed no main effect for relatedness, $F(1, 194) = 2.16, p = .14, \eta_p^2 = .01$ .; no main effect for photos, $F(1, 194) = .55, p = .46, \eta_p^2 = .003$ . and no Photo x Relatedness interaction, $F(1, 194) = 2.03, p = .16, \eta_p^2 = .01$ . |
| No Photos   | .18 ( .70) |  |
| Unrelated Condition   |            |  |
| Unrelated Photos  | .34 ( .72) |  |
| No Photos   | .39 ( .65) |  |
| Experiment 6  |            |  |
| Related Photos  | .24 ( .44) | A one way ANOVA showed no effect for photo, $F(2, 298) = .1.71, p = .18, \eta_p^2 = .01$ .   |
| Unrelated Photos  | .28 ( .47) |  |
| No Photos   | .36 ( .53) |  |
| <i>Note.</i> Standard deviations are in parentheses. Higher sensitivity (d') values indicate better discrimination ability. |            |  |

Table 6.

*Hits and False Alarms for claims presented with or without a photo (Experiments 4-6)*

|                     | Hits        | FAs         |
|---------------------|-------------|-------------|
| Experiment 4        |             |             |
| Related Photos      | 0.55 (0.25) | 0.49 (0.29) |
| Unrelated Photos    | 0.50 (0.25) | 0.46 (0.25) |
| No Photos           | 0.51 (0.27) | 0.43 (0.26) |
| Experiment 5        |             |             |
| Related Condition   |             |             |
| Related Photos      | 0.59 (0.18) | 0.48 (0.20) |
| No Photos           | 0.53 (0.21) | 0.46 (0.20) |
| Unrelated Condition |             |             |
| Unrelated Photos    | 0.54 (0.21) | 0.42 (.17)  |
| No Photos           | 0.58 (.17)  | 0.45 (0.19) |
| Experiment 6        |             |             |
| Related Photos      | 0.56 (0.13) | 0.47 (0.16) |
| Unrelated Photos    | 0.54 (0.16) | 0.44 (0.19) |
| No Photos           | 0.57 (0.16) | 0.44 (0.16) |

*Note.* In calculating  $d'$  and  $c$ , I had to convert the proportion of Hit and FAs to  $z$  scores. When Hit/FA were 1 or 0, this was not possible and so I used a standard adjustment of the Hit/FA rates by converting values of 1 to .99 and values of 0 to .01 (Wickens, 2002).

Table 7. *Discrimination Analyses for Replications of Experiments 4-6*

|   | d'<br>Related<br>Photo | d'<br>Unrelated<br>Photo | d'<br>No<br>Photo | Statistical<br>Analyses  |
|---|------------------------|--------------------------|-------------------|--|
| Experiment 4  |                        |                          |                   |  |
| Replication 1: Practice phase with unrelated photos   | .16 (1.30)             | .28 (1.33)               | .08 (1.37)        | A one way repeated measures ANOVA showed no main effect for photo $F(2, 202) = 1.20, p = .31, \eta_p^2 = .01$ .  |
| Replication 2: With no practice phase   | .18 (1.30)             | .12 (1.29)               | .22 (1.26)        | A one way repeated measures ANOVA showed no main effect for photo $F(2, 214) = .35, p = .70, \eta_p^2 = .01$ .   |
| Experiment 5  |                        |                          |                   |  |
| Replication 3   |                        |                          |                   |  |
| Related Condition   | .25 ( .75)             | *                        | .10 ( .66)        | A 2(photo: photo vs. no photo) x 2(relatedness: related vs. unrelated) mixed ANOVA with repeated measures on the first factor showed a Photo x Relatedness interaction, $F(1, 183) = 5.95, p = .02, \eta_p^2 = .03$ . regardless of condition, when people saw a photograph paired with a statement their discrimination was similar, $t$ related photo-unrelated photo(83) = .45, $p = .65$ , but when people evaluated claims without photos, those people in the unrelated condition had better discrimination than people in the related photo conditions, $t$ unrelated no photo-related no photo (183) = 3.73, $p < .01$ . |
| Unrelated Condition   | *                      | .30 ( .67)               | .47 ( .70)        |  |
| Experiment 6  |                        |                          |                   |  |
| Replication 4   | .20 ( .50)             | .31 ( .45)               | .34 ( .43)        | A one-way ANOVA showed no significant effect for evidence, $F(2, 298) = .255, p = .08, \eta_p^2 = .02$ .   |
| <i>Note.</i> Higher sensitivity ( $d'$ ) values indicate better discrimination ability. Considered together with the experiments reported in the main text, there were no consistent effects of photos on accuracy. |                        |                          |                   |  |

## **Appendix E**

For Experiment 4 the 16 orienting items appeared with a related photo or no photo, followed by a random series of 24 trivia claims in the experiment proper of 8 related, 8 unrelated, and 8 no photo. Therefore, people saw trivia claims with no photos 40% of the time; trivia claims with related photos 40% of the time, and trivia claims with unrelated photos only 20% of the time. To address this issue, I reran Experiment 4 so that the 16 orienting items appeared with an unrelated photo or no photo (Replication 1), as well as another version of Experiment 4 in which there was no orienting task (Replication 2). The orientating task in these two versions did not matter, and we replicated the primary findings in Experiment 4.

### ***Methods Replication 1***

#### ***Subjects***

In Replication 1, I used Amazon Mechanical Turk (MTurk; [www.mturk.com/mturk](http://www.mturk.com/mturk)), to recruit 204 subjects in the US. They received a \$0.60 Amazon credit.

#### ***Design***

I manipulated one within-subjects factor called photo, with three levels (related photo, unrelated photo, no photo).

#### ***Procedure***

We used the same procedure as in Experiment 4, except that for the first 16 trials, half of the easy claims appeared with an unrelated photograph and half appeared without a photo. In other words, subjects saw unrelated photos 40% of the time; no photos 40% of the time, and related photos only 20% of the time.



### ***Results and Discussion Replication 1***

Figure E.1 shows that, consistent with Experiment 4 and our prior research, pairing a claim with a related nonprobative photo produced truthiness. But the figure also shows that changing the frequency of items did not change the impact of unrelated photos—unrelated photos behaved most like trials with no photos.

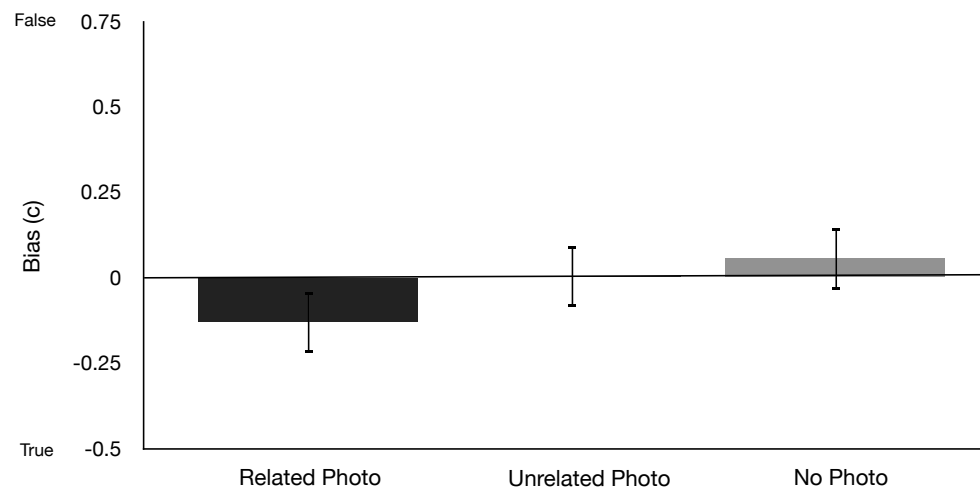


Figure E.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the photo factor for Replication 1 (see Masson & Loftus, 2003)

In other words, a one-way repeated measures ANOVA showed an effect for evidence,  $F(2, 202) = 4.29, p = .02, \eta_p^2 = .04$ . Followup comparisons showed that although seeing related photos produced more bias to say true than seeing unrelated photos,  $t_{\text{related-unrelated}}(203) = 2.18, p = .03$ , or no photos,  $t_{\text{related-no photo}}(203) = 2.78, p = .01$ , bias for unrelated and no photos was similar,  $t_{\text{unrelated-no photo}}(203) = .77, p = .44$ .

## ***Methods Replication 2***

### ***Subjects***

In Replication 2, I used Amazon Mechanical Turk (MTurk; [www.mturk.com/mturk](http://www.mturk.com/mturk)), to recruit 216 subjects in the US. They received a \$0.60 Amazon credit.

### ***Design***

I manipulated one within-subjects factor called photo, with three levels (related photo, unrelated photo, no photo).

### ***Procedure***

I used the same procedure as in Experiment 4, except that I removed the orienting phase. In other words, subjects saw a total of 24 trivia claims, an equal number of trivia claims paired with unrelated photos, related photos, and no photos.

## ***Results and Discussion Replication 2***

Figure E.2 shows that, consistent with Experiment 4 and our prior research, pairing a claim with a related nonprobative photo produced truthiness. But the figure also shows that removing the orienting phase did not change the impact of unrelated photos—again, unrelated photos behaved just like trials with no photos.

In other words, a one-way repeated measures ANOVA showed an effect for evidence,  $F(2, 214) = 4.25, p = .02, \eta_p^2 = .04$ . Followup comparisons showed that although seeing related photos produced more bias to say true than seeing unrelated photos,  $t_{\text{related-unrelated}}(215) = 2.85, p < .01$ , or no photos,  $t_{\text{related-no photo}}(215) = 1.90, p = .06$ , bias for unrelated and no photos was similar,  $t_{\text{unrelated-no photo}}(215) = 1.03, p = .30$ .

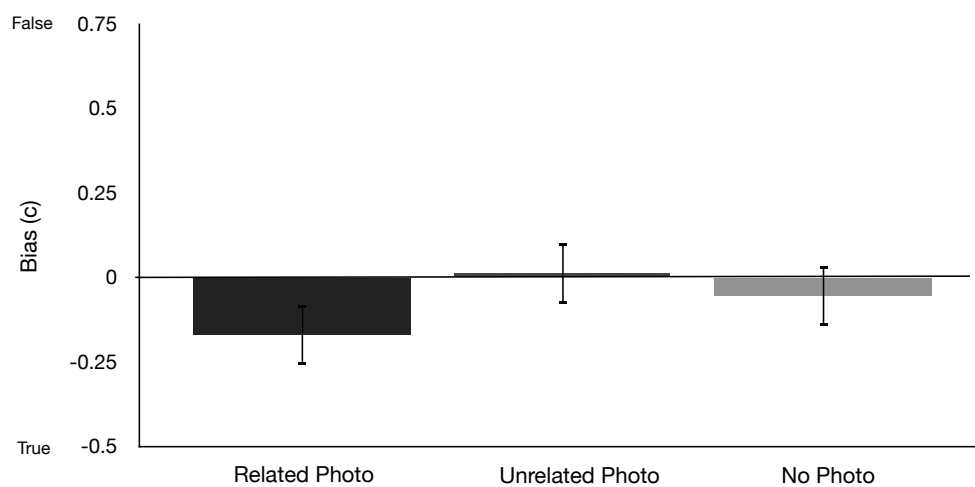


Figure E.2. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the photo factor for Replication 2 (see Masson & Loftus, 2003)

## **Appendix F**

I replicated Experiment 5 using exactly the same method. Subjects details and results of Replication 3 are reported here.

### ***Subjects***

In Replication 3, I used Amazon Mechanical Turk (MTurk; [www.mturk.com/mturk](http://www.mturk.com/mturk)), to recruit 185 subjects in the US. They received a \$0.60 Amazon credit.

### ***Design***

As in Experiment 5, I used a 2 (photo: yes, no) x 2 (relatedness: related, unrelated) mixed design, manipulating the presence of a photo within-subjects and relatedness of the photo between-subjects.

### ***Procedure***

I used the same procedure as in Experiment 5.

### ***Results and Discussion Replication 3***

Figure F.1 shows that, consistent with Experiment 5 when we manipulated the relatedness of photos between-subjects, we found truthiness and falsiness. Compared to when people saw trivia claims with no photo, when people responded to a claim paired with a related photo, they were biased to conclude the claim was true. In contrast, compared to when people saw trivia claims with no photo, when people responded to a claim paired with an unrelated photo, they were biased to conclude the claim was false

In other words, a 2(photo: photo vs. no photo) x 2(relatedness: related vs. unrelated) mixed ANOVA with repeated measures on the first factor showed a Photo x Relatedness interaction,  $F(1, 183) = 18.22, p < .01, \eta_p^2 = .09$ , related

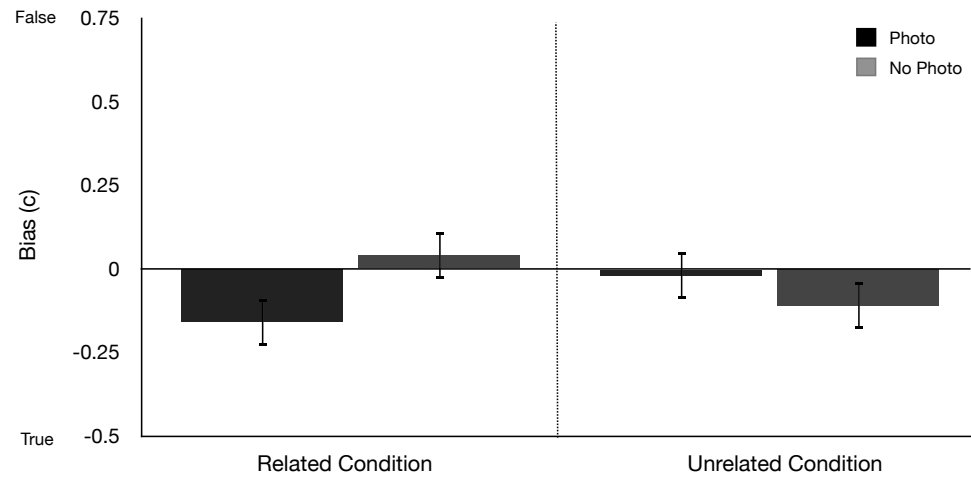


Figure F.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the photo effect for related and unrelated conditions in Replication 3 (see Masson & Loftus, 2003)

photos produced truthiness  $t_{\text{related-no photo}(83)} = 4.07, p < .01$ , but unrelated photos produced falsiness,  $t_{\text{unrelated-no photo}(100)} = 1.94, p = .06$ .

## **Appendix G**

I replicated Experiment 6 using exactly the same method. Subjects details and results of Replication 4 are reported here.

### ***Subjects***

In Replication 4, I used Amazon Mechanical Turk (MTurk; [www.mturk.com/mturk](http://www.mturk.com/mturk)), to recruit 301 subjects in the US. They received a \$0.60 Amazon credit.

### ***Design***

As in Experiment 6, I manipulated one between-subjects factor called evidence, with three levels (related photo, unrelated photo, no photo).

### ***Procedure***

I used the same procedure as in Experiment 6.

### ***Results and Discussion Replication 4***

Figure G. 1 shows that, consistent with Experiment 6 when we manipulated the relatedness of photos between-subjects, we found neither truthiness nor falsiness. Rather, when people did not have a standard to compare their experience to, photos did not influence their true/false decisions. In other words, a one-way ANOVA showed no effect for evidence,  $F(2, 298) = .1.02, p = .36, \eta_p^2 = .01$ .

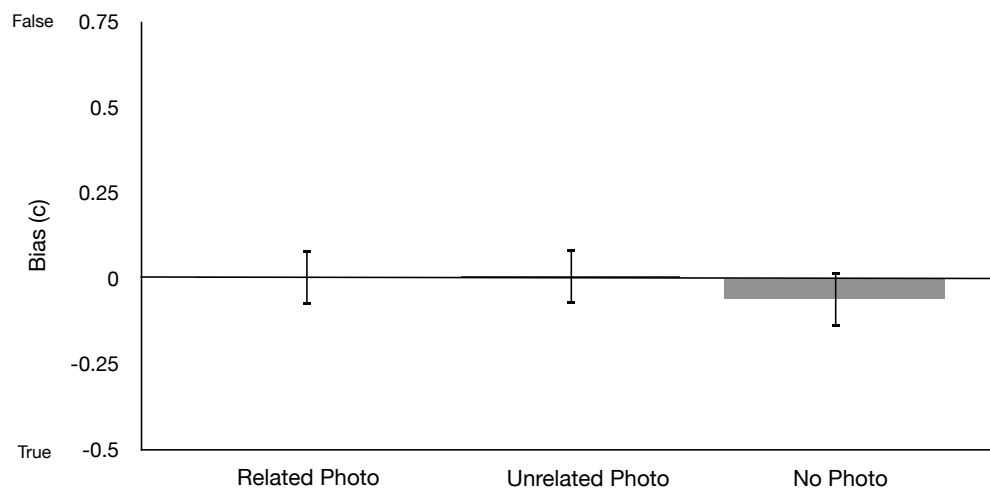


Figure G.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims. A negative value of  $c$  is a bias to say true. Error bars show 95% confidence intervals for each cell mean in Replication 4 (see Masson & Loftus, 2003)

## **Appendix H**

In order to show that the effects in Experiment 6 and Appendix G are not specific to the general knowledge claims, I conducted a conceptual replication using the paradigm and materials used in Experiment 1A.

### ***Subjects***

In Replication 5, 44 undergraduate psychology students from Victoria University of Wellington participated for course credit.

### ***Design***

I used a 2 (photograph: yes, no) x 2 (familiarity: familiar, unfamiliar) mixed design, manipulating familiarity within subjects and photo between subjects.

### ***Procedure***

I used the same procedure as in Experiment 1A, except the minor modifications that follow. In order to maximize power and because we found no effect of claim type, instead of responding to both “Alive” and “Dead” claims, in Replication 5 people only responded to “Alive” claims. The only other modification is that the presence of a photo was manipulated between-subjects.

### ***Results and Discussion Replication 5***

Figure H.1 shows that, consistent with Experiment 6 when we manipulated the presence of photos between-subjects, we did not find truthiness. Rather, we found that familiar names produced truthiness. Compared to unfamiliar names, people responded true more often when they assessed the claim “This famous person is alive” for familiar celebrity names. This finding fits with an effect we observed in Experiment 1B—regardless of whether a photo was present, people



responded true more often to the “Alive” claim when they made true/false decisions for familiar names. Taken together, these patterns fit with the idea that photos exert an effect when they make the claim feel easier to process than a standard—that is established within the experimental context.

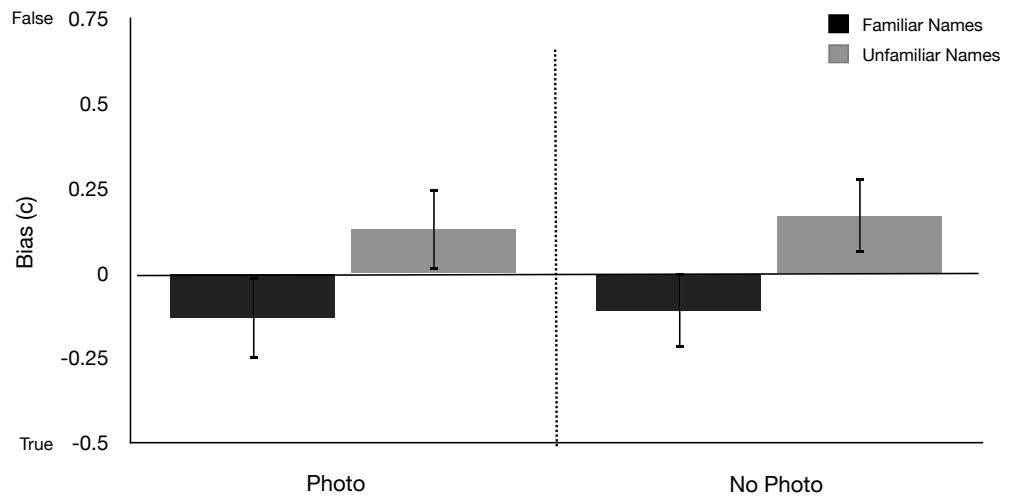


Figure H.1. Bias for claims about familiar and unfamiliar names presented with or without a photograph (between-subjects). Negative value of  $c$  is a bias to say true. Error bars show 95% within-subject confidence intervals for the familiarity effect for the photo and no photo conditions (see Masson & Loftus, 2003).

In other words, a repeated measures 2 (photograph: yes, no)  $\times$  2 (familiarity: familiar, unfamiliar) mixed ANOVA showed no effect for photos,  $F < 1$ , but an effect for familiarity,  $F(1, 42) = 23.58, p < .01, \eta_p^2 = .36$ . Photo did not interact with familiarity  $F < 1$ .

## Author Index

- |                                 |                      |
|---------------------------------|----------------------|
| Albarracin 59                   | Chase 10,16          |
| Alter 14,16,49,50               | Chatterjee 34        |
| Aminoff 56                      | Cialdini 14,15,32,57 |
| Anas 9,11,12,13                 | Clark 10,16          |
| Assefi 16                       | Clewett 56           |
| Bartlett 16,38                  | Collins 51           |
| Baumgardner 59                  | Connell 38,46        |
| Begg 9,11,12,13                 | Cooper 57            |
| Bell 51                         | Cottrell 58          |
| Belli 60                        | Cumming 16,24,52,53  |
| Bernstein 4,9,16,34,35,36,41,50 | Dallas 42            |
| Besner 38                       | Darley 17,33         |
| Bjork 32,58                     | David 54             |
| Boutilier 38                    | Dechêne 12,37,42,46  |
| Bower 51                        | Diemand-Yauman 32,58 |
| Bransford 9,54                  | Duchaine 34          |
| Brown, A. S. 16,30,40,50        | Dywan 31,54,60       |
| Brown, J. 13                    | Eagly 51             |
| Buhrmester 34                   | Engle 38,39          |
| Cantor 10,17,33                 | Erdfelder 10,16      |
| Carmichael 16                   | Farah 16,24          |
| Carney 54,57                    | Farinacci 9,11,12,13 |
| Castel 16,23,32,52,53,58        | Feigenson 60         |
| Chabris 34                      | Fischer 24           |

|  |                                   |
|--|-----------------------------------|
| Fischhoff 10                                   | Hagen 16,30,51                    |
| Fournier 58                                    | Hansen 12,16,37,42,46,49          |
| Freeman 56                                     | Harp 58                           |
| Frey 51  | Hartley 58                        |
| Frithsen 56                                    | Hasher 11                         |
| Fugelsang 9,54                                 | Hedman 58                         |
| Gallini 54,59                                  | Hemphill 10                       |
| Garry 9,16,24,30,34,35,36,41,50,51,52,53,54,59 | Henkel 9                          |
| Germine 34                                     | Hogan 16                          |
| Gilbert 10,16,17                               | Hook 16,24                        |
| Gill 33  | Hovland 59                        |
| Goldstein 11                                   | Jacoby 13,14,31,42,46,54,60       |
| Goodstein 53                                   | Johnson, A. 56                    |
| Gosling 34                                     | Johnson, M.K. 9,15,31,50,51,54,60 |
| Graesser 10                                    | Kahneman 13,45,54                 |
| Grafton 56                                     | Kane 38,39                        |
| Gray 52  | Kantner 9,34,36,41,55,56          |
| Greenwald 59                                   | Keehner 24                        |
| Gregg 58                                       | Keil 53                           |
| Greifeneder 42                                 | Kelley 13,31,32,45,54,60          |
| Grimshaw 38,46                                 | Klayman 11                        |
| Gross 17,33                                    | Koriat 10                         |
| Ha 11  | Kowalski 58                       |

- Kuhn 33  
 Kumkale 59  
 Kunst-Wilson 9  
 Kwang 34  
 Labroo 32  
 Lauwereyns 38,46  
 Lee 32  
 Lehman 58  
 Leippe 59  
 Levin 54,57  
 Lewandowsky 9  
 Liberman 49  
 Lichtenstein 10  
 Lindsay  
     9,12,16,30,32,34,35,36,41,45,50,51,54,55,56  
     ,59  
 Loftus, E.F. 16,51  
 Loftus, G.R. 22,27,37,41,44,89,91,93,95,97  
 Lynn 60  
 Lynott 38,46  
 Malone 10,16,17  
 Mandler 13  
 Manis 51  
 Manning 16,60  
 Marcus 57  
 Marsh 57  
 Mason 34  
 Masson 22,27,37,41,44,89,91,93,95,97  
 Mather 9  
 Mayberry 24  
 Mayer 54,57,58,59  
 McCabe 16,23,52,53  
 McCrudden 58  
 Michael 16,24,52,53  
 Morales 9  
 Nace 15,23,30  
 Nadarevic 10,16  
 Nakamura 13  
 Nakayama 34  
 Narens 34  
 Nelson 28,35  
 Newman 16,34,35,36,41  
 Nickerson 10,16,33,45  
 Nisbett 51  
 Oberauer 9  
 Oppenheimer 14,32,46,49,50  
 Ozubko 9,54  
 Paivio 54,55

|                              |                   |
|------------------------------|-------------------|
| Park 59                      | Silvera 33        |
| Petrova 15,32,57             | Skurnik 59        |
| Pratkanis 59                 | Smythe 54,55      |
| Rawon 53                     | Snyder 10,17,33   |
| Raye 15,50,51                | Song 58           |
| Read 16,30,51,60             | Stahl 12,37,42,46 |
| Reber 12,32                  | Stanislaw 21,36   |
| Reyes 51                     | Stewart 38,46     |
| Reynolds 14                  | Stolz 38          |
| Rhodes 53                    | Strange 50,54,59  |
| Richter 10,16                | Striztke 9        |
| Roediger 42                  | Stroop 38         |
| Rogers 54,55                 | Suri 34           |
| Ross 51                      | Swann 33          |
| Sanna 59                     | Sweller 57        |
| Sargent 59                   | Tafarodi 10,16,17 |
| Schraw 58                    | Taylor, A.K. 58   |
| Schroeder 10                 | Taylor, S.E. 51   |
| Schwartzman 14               | Thompson, S.C. 51 |
| Schwarz 14,31,32,46,58,59,60 | Thompson, W.C. 51 |
| Shedler 51                   | Tipper 56         |
| Shepard 54,55                | Todorov 21,36     |
| Sherman 14,15,16,60          | Toppino 11        |

Trope 49

Tversky 13,45,54

Unkelbach 9,12,13,18,23,28,35,42,48,55

Van Zandt 13

Vaughan 32,58

Vuorre 16,24,52,53

Wade 16,30,51

Walter 16

Wänke 12,16,37,42,46,49

Weisberg 53

Weiss 59

Westerman 38,42,45,46

Whitehouse 14,46

Whittlesea 12,13,31,42,45,46,54,60

Wickens 21,82,86

Williams 42,45,46

Wilmer 34

Winer 58

Winkielman 60

Wohrmann 10,16

Wood 51

Yoon 59

Yue 32, 58

Zajonc 9

## Keyword Index

|                             |                                   |
|-----------------------------|-----------------------------------|
| Amazon.....                 | <i>see</i> Mechanical Turk        |
| Brain Images.....           | 15,16,23,50-51                    |
| Cognitive Availability..... | 13,14,18,23,52,57                 |
| Conceptual Fluency.....     | 13,14,30,31,44,52                 |
| Confirmation Bias.....      | 10,16,17,31,32                    |
| Discrepancy.....            | 41-45                             |
| Disfluency.....             | 30,31,36                          |
| Expectancy.....             | <i>see</i> Discrepancy            |
| Familiarity.....            | 13,14                             |
| Feeling-based Judgment..... | 9                                 |
| Illusory Truth Effect.....  | 9,11-13,41                        |
| Imagery.....                | 14-16,28,48,49,54                 |
| Individual Differences..... | 53-54                             |
| Intuitive Hunches.....      | <i>see</i> Feeling-based Judgment |
| Mechanical Turk.....        | 33,34-42                          |
| Mental Construal.....       | 47,48                             |
| Reality Monitoring.....     | 14-16,48,49                       |
| Repetition.....             | <i>see</i> Illusory Truth Effect  |
| Response Bias.....          | <i>see</i> Truthiness             |
| Sleeper Effect.....         | 56,57                             |
| Trawling.....               | <i>see</i> Confirmation Bias      |
| Truthiness.....             | 9,16,21-23,28-30,40,41,43-57      |
| Vividness.....              | 48,49                             |

## List of Figures

|  |    |
|--|----|
| Figure 1.1. Example of materials from Experiment 1-2.....  | 14 |
| Figure 2.1. Bias for claims about familiar and unfamiliar names (in Experiments 1a-1b) presented with or without a photograph and collapsed across dead/alive factor.....  | 22 |
| Figure 3.1. Bias for claims about unfamiliar names (Experiment 2) presented with or without a photograph or verbal information, collapsed across dead/alive factor; easy and difficult trivia claims (in Experiment 3) presented with or without a photograph..... | 27 |
| Figure 3.2. Example of related and unrelated photos and associated trivia claims.....  | 31 |
| Figure 4.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims (within-subjects) (Experiment 4) .....   | 37 |
| Figure 4.2. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims (mixed) (Experiment 5) .....   | 41 |
| Figure 4.3. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims (between-subjects) (Experiment 6) .....  | 44 |
| Figure E.1. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims (within-subjects) (Replication 1) .....  | 89 |
| Figure E.2. Bias for difficult trivia claims presented with or without a photograph that was semantically related or unrelated to the trivia claims (within-subjects) (Replication 2) .....  | 91 |



|  |    |
|--|----|
| Figure F.1. Bias for difficult trivia claims presented with or without a photograph<br>that was semantically related or unrelated to the trivia claims (mixed)<br>(Replication 3) .....                | 93 |
| Figure G.1. Bias for difficult trivia claims presented with or without a photograph<br>that was semantically related or unrelated to the trivia claims (between-<br>subjects)<br>(Replication 4) ..... | 95 |
| Figure H.1. Bias for claims about familiar and unfamiliar names presented with or<br>without a photograph (between-subjects)<br>(Replication 5) .....  | 97 |