Truthiness and Law: Non-Probative Information Biases Perceived Credibility in Forensic Contexts

by

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B.A., Kwantlen Polytechnic University, 2017

Thesis Submitted in Partial Fulfillment of the

Requirements for the Degree of

Master of Arts

in the

Department of Psychology

Faculty of Arts and Social Sciences

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SIMON FRASER UNIVERSITY

Fall 2019

Approval

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Abstract

Non-probative but related photos have been shown to increase the perceived truth value of statements relative to when no photo is presented. In 2 experiments, I tested whether this truth bias generalizes to judgements of credibility in a forensic context. Participants read short vignettes in which a witness viewed an offence. The vignettes were presented with or without a non-probative, but related photo. In both experiments, participants gave higher witness credibility ratings on average in photo-present vignettes compared to photo-absent vignettes. In Experiment 2, some vignettes included additional non-probative information in the form of text. I replicated the effect of photo presence in Experiment 2, but the non-probative text did not have a significant effect on witness credibility. The results suggest that non-probative photos can increase the perceived credibility of witnesses in legal contexts.

Keywords: truthiness; fluency; legal; decision-making

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Chapter 1.

Introduction

In the Canadian legal system, the law of evidence contains the body of rules that govern admissibility of evidence. Generally, any information that is logically probative of *some* fact at issue tends to be admitted, with probative value being determined by three factors: (1) the frailties of the evidence; (2) the inferences that may reasonably be drawn from the evidence; and (3) the availability of other evidence to prove the same fact (R. v. Leitch and Jno-Baptiste, 2011). It is then up to the discretion of the trier of fact (typically the trial judge) to apply the appropriate weight to each piece of admitted evidence (R. v. Corbett 1988). This means that information that is non-probative (not indicative of truth) is not admissible. However, non-probative information is hard to eliminate entirely, and is often presented as a part of probative evidence. For example, witness testimony might include non-probative details. Non-probative information may also be included in digital media evidence such as PowerPoint presentations or animations used to illustrate expert opinions (Feigenson, 2010). For example, imagine that a blood-spatter analyst presents his findings in a PowerPoint presentation with pictures of spatter from the crime scene. The presentation may also include non-probative pictures, such as a picture of the victim, or other pictures from the scene. In this case, non-probative information would be present in the courtroom despite the best intentions to omit it from legal decision-making.

Outside of the courtroom, non-probative information is everywhere. It is especially prevalent in popular media sources. Social media outlets such as Facebook and YouTube, and independent news outlets like Buzzfeed have relied on catchy, controversial headlines to increase view counts (Blom & Hansen, 2015). A controversial new finding in science may be headlined along with a video or article link and presented with an eye-catching photo. These photos are often non-probative but are contextually related to the finding or claim made by the author of the article. In particular, non-probative but related brain images may sometimes increase agreement with cognitive research findings (McCabe & Castel, 2008; c.f. Michael, Newman, Vuorre, Cumming, & Garry, 2013).

A growing literature suggests that the addition of non-probative information can in fact have insidious effects on people's beliefs. For example, research suggests that when judging the truth value of trivia statements, people rely on subjective feelings of 'truthiness,' or how true the statement feels (Newman, Garry, Bernstein, Kantner, & Lindsay, 2012). Indeed, a growing literature suggests that presenting related, but non-probative photos or words alongside statements increases the perceived truth value of the statement (Fenn, Newman, Pezdek, & Garry, 2013; Newman et al., 2012; Newman, Garry, Unkelbach, Bernstein, Lindsay, & Nash, 2015). Consider the following statement, "True or false? Macadamia nuts come from the same evolutionary family as the peach." Many people do not know the answer to this question, and thus, cannot rely on their memory to make this judgment. Therefore, the truth value of the statements remains unknown. As a result of their uncertainty, people may employ mental shortcuts (heuristics) to aid their decision-making (Tversky & Kahneman, 1974). In empirical studies, participants were more inclined to say that the macadamia statement was true when presented alongside a photo of salted macadamias compared to when no photo was present. However, when the photo was completely irrelevant to the true-or-false statement (e.g., a photo of a giraffe), participants were more inclined to say that the statement was false compared to when no photo was present (Newman et al., 2015).

Accumulating evidence suggests that the truthiness effect likely results from the ease with which a person processes the accompanying claims (fluency). First, I will discuss this proposed mechanism for truthiness. Next, I will discuss the implications of truthiness being a decision-making heuristic. Finally, I will discuss the relevance of truthiness to the legal system.

1.1. The Mechanism of Truthiness

The simplest explanation for the truthiness effect involves information search: participants erroneously search for and use information from the photo that is not useful for judging the truth value of the claim. According to Newman and colleagues (2015), pairing related but non-probative photos with obscure trivia statements may activate semantically-related knowledge, which is non-probative, but mistakenly used as evidence when judging the truth value of the statement. For example, Newman and colleagues suggest that the non-probative photo may provide an opportunity to search for confirmatory evidence (Klayman & Ha, 1987; Masnick & Zimmerman, 2009;

Nickerson, 1998). Imagine that participants viewed a photo of a peach when deciding whether the macadamia nut comes from the same evolutionary family as a peach. In this case, Newman and colleagues suggest that the participant might decide that the peach pit looks like a macadamia nut.

However, this explanation cannot fully explain the truthiness effect. Newman and colleagues (2015) observed two findings that challenge the information search explanation: (1) truthiness effects reverse when the non-probative photos are irrelevant, and; (2) the truthiness effect is only robust in within-subject designs. Information search would predict a null effect if the photo was irrelevant, but not a reverse effect. Further, the truthiness effect should operate in both within-subject and between-subject designs if information search was the only operating mechanism[1].

Another mechanism proposed to explain truthiness is fluency, defined as the subjective experience of how easily information is processed (Jacoby & Dallas, 1981; Whittlesea, 1993). For example, large text in an easy-to-read font has high fluency compared to small, difficult to read font. Further, a clearly written manuscript on a familiar topic would have higher fluency than a jargon-filled manuscript written on an unfamiliar topic. In both cases, high-fluency items create the subjective feeling of ease compared to their low-fluency counterparts. Fluency influences many judgments. Among these are increases in judgements of truth, liking, confidence, frequency, and value (among others) following subjective ease of processing (Alter & Oppenheimer, 2009). Fluent items can be subjectively easier to process than other similar items (absolute fluency), or subjectively easier to process than one expects (relative fluency; Whittlesea & Leboe, 2003). Newman and colleagues (2015) suggest that the reason the truthiness effect may only be observed in within-subject designs is because the bias results from a discrepancy between experienced fluency and expected fluency (i.e., relative fluency). Subjects must therefore be exposed to both photo-present trials and photo-absent trials. Participants may misinterpret the feeling of ease experienced in the photo-present trials (relative to the photo-absent trials) to mean that the statements are more likely to be true (see also, discrepancy-attribution; Whittlesea & Williams, 1998; 2000). Thus, fluent processing biases their judgements. If this is the case, the truthiness

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[1] It should be noted that no truthiness studies using between-subject designs have been powered appropriately to detect a small effect size. Thus, it is possible that the truthiness effect would emerge in adequately-powered between-subject designs.

bias may occur in any situation where there is a discrepancy between expected and actual processing ease, and this feeling is misattributed to the judgment[2].

The relationship between fluency and truthiness is illustrated in work by Cardwell, Henkel, Garry, Newman, and Foster (2016). Cardwell and colleagues showed that non-probative, related photos can increase the propensity to develop false memories for positive past events (e.g., giving food to an animal), but not negative ones (e.g., taking food from an animal). Because the feeling of ease that arises when highly fluent items are processed is often (but not always) a positive feeling compared to when items are disfluently processed, the authors suggest that the non-probative, related photos may selectively bias judgements for positive experiences and not negative ones (See Reber, Schwarz, & Winkielman, 2004; Reber, Winkielman, & Schwarz, 1998). Indeed, non-probative, related photos have been found to make positive future prospects (such as an increase in profit) seem more likely, while having no influence on negative future prospects (Newman, Azad, Lindsay, & Garry, 2016). However, Newman and colleagues (2016) also showed that unlike claims about the future, claims about the past are more likely to be rated "true" when they appear with a non-probative photo (compared to when no photo is present) regardless of whether the claims are positive or negative. Thus, perhaps it is more accurate not to conceptualize truthiness as only operating for future judgements, but rather that people view the future with rose-coloured glasses. These mixed findings suggest that more research is needed in this area to establish under what circumstances fluency misattribution occurs in truthiness claims. However, it is clear that the context, such as the study design or nature of the manipulation, may influence whether and how truthiness biases judgements.

While some research illustrates the relationship between fluency and truthiness, it is important to understand that fluency is not separate from the information search explanation provided above. Rather, the two concepts are intimately connected. The information search spurred by the photo likely leads to more fluent processing.

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[2] It should be noted that though fluency seems to be the best-fitting explanation for the truthiness effect, the relationship between truthiness and fluency remains speculative. To date, no study has included independent measures of fluency in truthiness paradigms to see how the two measures relate.

Therefore, it is more accurate to consider information search and fluency as a single, sequential process rather than as two separate and distinct mechanisms.

If truthiness results from a misattribution of fluent processing, one can conceptualize the bias as resulting from the misuse of a decision-making heuristic: a mental shortcut used to calculate the probability of an event in situations of uncertainty (Tversky & Kahneman, 1974). In this view, non-probative, related photos increase the ease with which statements are processed relative to an individual's expectation. This ease of processing is then used as a decision-making heuristic for deciding how likely it is that a statement is true. Other research investigating when heuristic-based decision-making strategies are employed suggests that people rely on heuristics when under time pressure, or when limited knowledge is available (Gigerenzer, Todd, & The ABC Research Group, 1999). It has also been noted that when people are under stress, they sometimes behave as though they are under time pressure, and may adjust their decision-making strategies (Orasanu, 1997).

Other researchers have proposed an effort-accuracy tradeoff (Payne, Bettman and Johnson, 1993). Specifically, different decision-making strategies are employed based on the required effort, or the need for accuracy. Further, ambiguity may increase effort by forcing additional assessment of the situation or problem (Orasanu, 1997). It is not surprising, therefore, that truthiness effects often occur when nonprobative photos appear alongside unknown trivia statements rather than familiar claims that are easier to answer. The lack of information may naturally initiate a search for confirming evidence in the photo.

Viewing truthiness as a decision-making heuristic is informative when investigating the judgement contexts in which truthiness may operate. This is especially important because, to my knowledge, truthiness has been investigated in limited applied settings (however, see Fenn, Ramsa, Kantner, Pezdek, & Abed, 2019). In sum, if truthiness results from the misuse of a decision-making heuristic, it is reasonable to assume that truthiness may operate in contexts where we normally see heuristics operate: high-stress situations, situations where time pressure is a factor, and/or situations where limited information is available. Many legal cases are high stress, and unfortunately, it is often the case that limited information is available.

1.2. Truthiness in a Legal Context

The legal setting is rich and complex with many pieces of evidence to consider. It is therefore very different from the true-or-false trivia which populates much of the truthiness literature. My first question was whether the truthiness effect would operate in the legal setting. Given that legal cases generally have a lot of contextual information, truthiness may not apply in legal settings because providing context has been shown to reduce or even eliminate the truthiness effect.

Abed, Fenn, and Pezdek (2017) showed that when judging the personality traits of a hypothetical person, participants were biased by the presence of non-probative photos. However, when participants received some contextual information about the hypothetical person (e.g., his interests and routine which provided some insight into his personality), the biasing effect of non-probative related photos was reduced or, in some cases, eliminated. The authors suggest that information primed from the photo may be evaluated relative to information from other sources. Thus, the addition of contextual information may change the relative fluency of the statement, reducing the truthiness effect. It is also possible that the increased fluency created by the photo was attributed correctly to the available contextual information rather than being misattributed to the personality judgment (see Jacoby & Whitehouse, 1989).

The findings by Abed and colleagues (2017) raise the question of whether non-probative information still biases judgements made in contextually-rich settings, such as in court. There is reason to believe, however, that the bias may still operate in this setting. Abed and colleagues' findings represent a single study with a single judgement domain (personality traits). Most importantly, the contextual information that participants received in Abed and colleagues' study was probative to whether the hypothetical person displayed a particular personality trait. It is unknown whether the presence of non-probative but related contextual information would have a similar effect as probative contextual information.

Visual aids and computer simulations are increasingly being used in court to supplement judges and juries, who may lack knowledge of the subject at hand (Babcok & Bloom, 2000). For example, lawyers may use a PowerPoint presentation to summarize their arguments or use an animation to recreate an accident (see Feigenson

& Dunn, 2003). Even contextual information such as the setting (i.e., time and place that an event occurred) is not necessarily probative to judgements of truth or guilt. However, these details are relevant and admissible for the purpose of constructing a narrative around an alleged event. Because these details are non-probative, it is possible that they will have a similar effect as non-probative photos. Theoretically, any non-probative details that increase the ease with which people understand, imagine, or perceive legal arguments might have similar effects to non-probative photos.

The concern of truthiness influencing legal judgements has been raised by scientists and legal scholars (Newman & Feigenson, 2013; Robertson, 2016). Though some work has been conducted investigating the impact of non-probative media on legal judgements (see Feigenson & Dunn, 2003), to my knowledge there has been no empirical investigation of whether truthiness biases legal judgements. If truthiness operates in legal contexts, this should be of great concern. Recall that the subjective experience of processing (fluency) influences many different judgment domains. If truthiness operates through a fluency mechanism, it is probable that diverse judgement domains could be affected. Of particular interest is perceived credibility of witnesses. Often, the credibility of a single witness may be pivotal to a legal case. Even a small change in the perceived credibility of the witness could change the outcome of the case. Therefore, we need research that empirically investigates the influence of truthiness in the courtroom.

Chapter 2.

The Current Study

My goal in the current study was to determine whether non-probative information biases the perceived credibility of witnesses in legal vignettes. To this end, I ran two experiments. In Experiment 1, I closely mirrored prior published truthiness studies, changing only the judgement context to reflect a legal decision. Experiment 1 investigated the influence of non-probative, related photos on participants' judgements of a witness' credibility. I used short ambiguous vignettes which provided no relevant contextual information. The aim of Experiment 2 was to replicate and extend the main findings of Experiment 1. Importantly, in Experiment 2, I manipulated the amount of additional non-probative contextual information (in the form of written text) provided in each vignette. Across these two experiments, I addressed two questions: (1) Do non-probative, related photos increase the credibility of witnesses in forensically-relevant contexts? (2) Does additional non-probative contextual information present in many witness statements influence the perceived credibility of witnesses in a similar way to a non-probative, related photo?

2.1. Experiment 1

In Experiment 1, I investigated whether the truthiness effect extends to forensically-relevant materials and judgements. In past studies of the truthiness effect, participants read arcane, true-or-false trivia statements either with or without a non-probative, related photo. In these studies, participants made judgements of truth (see Fenn et al., 2013; Newman et al., 2015). I attempted to partially replicate the design of these earlier studies while changing the stimuli from obscure trivia statements to obscure witness statements in forensically-relevant vignettes. Further, I changed the dependent measure from judgements of truth to judgements of credibility. Specifically, participants indicated to what extent they believed the witness in each vignette. I used a within-subject design in Experiment 1. Recall that relative fluency is likely a mechanism for the truthiness effect (see Newman et al., 2015). Therefore, participants must be exposed to both photo-present and photo-absent trials to detect an effect.

2.1.1. Method

I pre-registered this experiment prior to data collection: DOI: 10.17605/OSF.IO/E2MPF.

Design. Experiment 1 was a one-factor (photo: present; absent) within-subject design. I compared judgements of credibility in the photo-present condition to those in the photo-absent condition.

Participants. To ensure a sufficiently-powered design, I chose d = .2 as a conservative estimate of my effect size for the truthiness effect.[3] I conducted a power analysis using G*Power 3.1 (Faul, Erdfelder, Lang, & Buchner, 2007). The analysis indicated that I required 199 participants to observe a small effect (d = .2; α = .05; (1 − β) = .8). After data exclusions, the final sample consisted of 206 participants (see data exclusions below).

I recruited participants through Amazon's Mechanical Turk, an online participant recruitment service. Previous studies have shown that participants recruited through this service perform similarly to populations recruited from lab settings (Germine, Nakayama, Duchaine, Chabris, Chatterjee, & Wilmer, 2012; however, see McDuffie, 2019). Participants received $1.50 USD for their participation.

Materials. I created a total of 40 vignettes. For my first experiment, I tried to create appropriate contexts for credibility judgments, while creating stimuli that were as close to the original truthiness paradigm as possible. Because past truthiness studies have used no contextual information in their stimuli (opting instead for true-or-false trivia statements), I did not add contextual information to the vignettes in Experiment 1. Each vignette included only information sufficient to understand the crime that was allegedly

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[3] I ran two consecutive pilot studies. Both studies were powered for a medium effect size. The first pilot study was a one-factor (photo: present, absent) within-subject design, and the second was a one-factor (photo: present, absent) between-subject design. Though the stimuli worked as intended, neither the within-subject design ($M_{PHOTO-PRESENT}$ = 5.74; $SD_{PHOTO-PRESENT}$ = 0.71; $M_{PHOTO-ABSENT}$ = 5.65; $SD_{PHOTO-ABSENT}$ = 0.74), $t(34)$ = 1.03, p = 0.31) nor the between-subject design ($M_{PHOTO-PRESENT}$ = 5.42; $SD_{PHOTO-PRESENT}$ = 0.73; $M_{PHOTO-ABSENT}$ = 5.38; $SD_{PHOTO-ABSENT}$ = 0.83), $t(147)$ = 0.32, p = 0.75) produced significant results with sufficient power to detect a medium effect. For subsequent experiments, I powered for a more suitable, small effect. I decided not to pursue the theoretical question of whether a truthiness effect could be detected in a between-subject design (large samples are required to detect small between-subject effects) and used within-subject designs for all subsequent experiments.
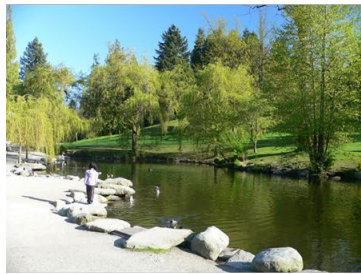
committed. I did not provide enough information for participants to assess the credibility of the supposed witness. For each vignette, I used the following template, "[witness name] said they saw the accused [doing something illegal or unsavory]. To what extent do you believe [witness name]?".

Each vignette appeared alongside a photo (photo-present), or it appeared by itself (photo-absent). The photos were contextually related to the claims but were as non-probative as possible to the credibility judgements. For example, consider the following vignette: "Mr. Bhatt said the accused left his supermarket with groceries and other merchandise in his cart without paying." I used a picture of a full shopping cart for the non-probative photo. If I had shown a picture of a man fleeing the store with a shopping cart this could be mistaken for actual physical, probative evidence. As such, each photo was chosen carefully to limit the probative value of the photograph while maintaining contextual relevance. A full list of the vignettes and photos used in Experiment 1 can be found on OSF.
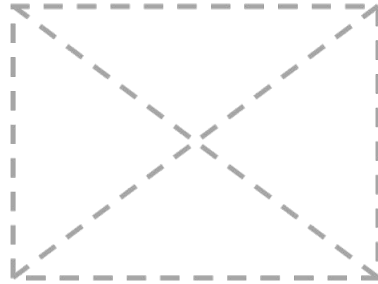
Procedure. From the Amazon Mechanical Turk website, participants followed a link to a Qualtrics form. Participants read the following instructions: "You will now view a series of stories about hypothetical court cases. After each story, please indicate to what extent you believe the individual's testimony. Please indicate on a scale from 1 (I Don't Believe This Individual At All) to 8 (I Believe This Individual Completely). At the bottom of each page, (including this one) there will be an option to withdraw from the study early. Do not click this button UNLESS you wish to withdraw. Click the RED ARROW at the bottom of each screen to continue to the next scenario." Participants then read 42 vignettes (including two attention-check vignettes). Each vignette contained a hypothetical witness who claimed to have seen an accused person commit an unsavory act (e.g., "Mrs. Anderson said the accused pushed the bus driver, causing the bus to swerve into oncoming traffic"). Each vignette was presented alone, or alongside a non-probative, related photo (e.g., a picture of a bus). Participants indicated on a scale from 1 (I do not believe this individual at all) to 8 (I believe this individual completely) whether they thought the testimony in the vignette was believable (see Figure 1). The two attention-check questions resembled the others, but instead of the witness statement, the question read, "This question has been included to ensure that participants are paying attention. Please ignore this question, and do not click a response on the scale." As the "next" button was visible in all trials, participants could simply click the arrow to

proceed to the next trial without choosing a response on the scale. This type of question has been validated as an appropriate attention check (Oppenheimer, Meyvis, & Davidenko, 2009). Participants who failed one or both attention-check questions were excluded from analysis. The procedure took participants approximately eight minutes to complete (*M* = 8.26; *SD* = 4.15). Exact completion times were not recorded. Each participant's completion time was rounded to the nearest minute.

Mr. Yves said the accused grabbed his phone out of his hands, and threw it into the duck pond.

OR

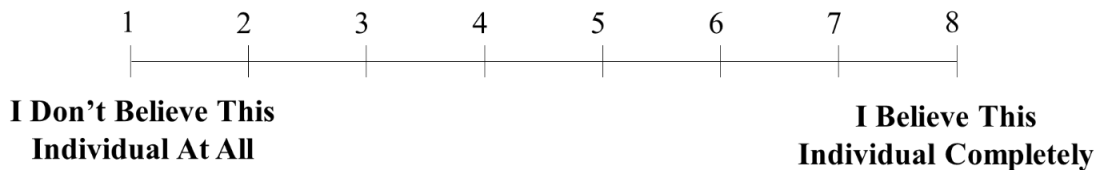To what extent do you believe Mr. Yves?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

I Don't Believe This Individual At All

I Believe This Individual Completely

Figure 1.   Example of stimuli used in Experiment 1.
Image Source: (Nagy, 2006). Image contains CC BY (Attribution) License.

The order of vignette presentation was randomized. However, I semi-randomly assigned[4] participants to one of two versions of the task. In version A, vignettes were randomly assigned to either the photo-present or photo-absent condition, while keeping the group sizes equal. This resulted in 20 photo-present trials and 20 photo-absent trials. In version B, the trials reversed, such that the photo-present trials in version A were photo-absent trials in version B, and vice versa. Thus, I did not use full counterbalancing, but participants had an equal chance that each vignette would be a photo-present

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[4] The randomization feature in Qualtrics allows for semi-randomization with equal group sizes instead of true randomization. This was selected to ensure equal group sizes. An unfortunate bi-product of this function is that with two groups, equal group sizes are achieved in Qualtrics by a simple ABAB assignment into conditions. In hindsight, true randomization would have been a better option. I remedied this problem in Experiment 2.

version or a photo-absent version. In both versions, the two attention-check questions were photo-absent trials.

2.1.2. Results

Data Exclusions. I collected data in three small batches over the course of several hours using Amazon Mechanical Turk (100 participants; 120 participants; 10 participants). I calculated data exclusions after each batch with the aim of stopping once I had reached the required sample size from my power analysis (N = 199). I collected data from a total of 230 participants. I excluded 16 participants due to failing at least one of the attention-check questions. I excluded another eight participants due to withdrawing before the end of the study. Two outliers (> 3 SD from the mean) did not affect the overall data pattern, so they remained in all analyses. This resulted in a total sample of 206 participants.

Assumption Checks. Examination of Q-Q plots suggested that both photo-present and photo-absent conditions were normally distributed. Skewness and kurtosis were within appropriate ranges (Cain, Zhang, & Yuan, 2017).

Analysis. I conducted a paired samples t-test comparing mean ratings of credibility in photo-present trials with mean ratings of credibility in photo-absent trials. Overall, participants rated witnesses in photo-present vignettes as more credible ($M_{PHOTO-PRESENT}$ = 5.34; $SD_{PHOTO-PRESENT}$ = 0.92) than witnesses in photo-absent vignettes ($M_{PHOTO-ABSENT}$ = 5.26; $SD_{PHOTO-ABSENT}$ = 0.91), $t(205)$ = 2.19, p = .029, dz = 0.15)[5]. Boxplots with individual datapoints added can be found in Appendix A.

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[5] To investigate possible differences between version A and version B of the task, I conducted a 2 (photo presence: present; absent) x 2 (version: A; B) mixed measures ANOVA. There was an effect of photo presence ($F(1, 204)$ = 4.91; p = .03; partial η^2 = .023). There was also an interaction between photo presence and version (F = 5.01; p = .026; partial η^2 = .024). Because the trial presentation was randomized, the only difference between the versions was which vignettes had a photo present. An analysis of version requires a between-subject analysis, thus cutting the sample size in half for within-subject comparisons. It should also be noted that the analysis of version was not pre-registered. As such, I do not discuss it further.

2.2. Discussion

Experiment 1 revealed that non-probative, related photos biased the perceived credibility of witness statements compared to when photos were absent. Theoretically, non-probative related photos likely increased the processing fluency of the photo-present vignettes relative to the photo-absent vignettes. Participants then misattributed this discrepancy in fluent processing to the credibility of the witness rather than to the presence of the photo.

The truthiness effect that I observed in Experiment 1 had a small effect size. It was also the first study to manipulate and measure truthiness in a legal setting. For these reasons, it is important to replicate Experiment 1's results. I designed Experiment 2 to be a partial replication of Experiment 1, with an extension. Recall that the legal setting is contextually rich. In Experiment 2, I wanted to add the type of non-probative contextual details that are often part of a narrative surrounding a witness statement. If I still observed a truthiness effect when these details were present, this would add further ecological validity to Experiment 1's findings.

2.3. Experiment 2

I wanted to study the effect of context on truthiness. I addressed this in Experiment 2 by modifying the design of Experiment 1 to include two levels of contextual information: high and low. An important feature of the added contextual information in Experiment 2 was that I designed it to be non-probative to the question of credibility; that is, it did not provide any information about the truth value of the witness' statement. I did not, therefore, expect that the added, non-probative context would reduce or eliminate the truthiness effect. Rather, I expected to observe two main effects (a main effect of photo presence and a main effect of contextual information), and no interaction (Figure 2). I hypothesized this because of the differences between the type of contextual information provided by Abed and colleagues (2017; Experiment 1), and information provided in Experiment 2. Abed and colleagues provided probative information which was useful in making the necessary judgement. The contextual information in Experiment 2 was non-probative information that one might normally find in a witness statement. Recall that the truthiness effect has been observed with both non-probative photos and non-probative verbal descriptions. For this reason, I expected that additional

contextual information would have a similar effect on perceived credibility as the presence of a photo. Thus, I expected that both additional non-probative contextual information and the addition of non-probative photos would both increase the perceived credibility of witness statements.
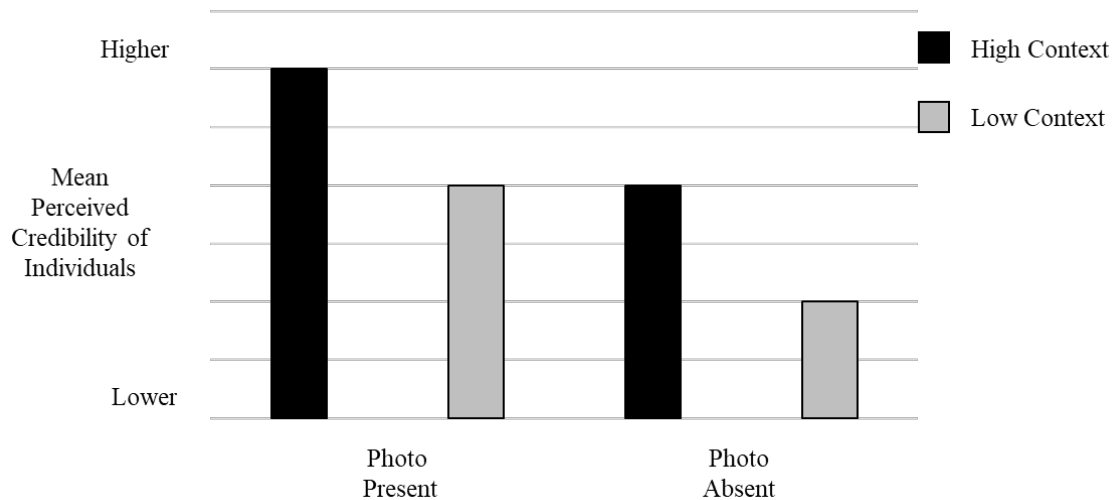

Figure 2. **Hypothetical data for Experiment 2: The influence of photo (present, absent) on context (high, low).**

Like Experiment 1, I used a within-subject design in Experiment 2. Recall that relative fluency is the most likely mechanism for the truthiness effect (see Newman et al., 2015). Therefore, participants must be exposed to both photo-present and photo-absent trials to detect an effect.

2.3.1. Method

Experiment 2 was pre-registered prior to data collection: DOI: 10.17605/OSF.IO/CG74S

Design. In Experiment 2, I conducted a 2 (photo: present; absent) x 2 (context: high; low) within-subject design.

I changed the trial order from randomized (Experiment 1) to a single fixed order. This was meant to reduce variance due to trial order and allowed for more appropriate counterbalancing of conditions. I then used a partial Latin-Square design, in which I created four versions of the task. In each version, all four conditions were equally represented (10 trials/condition). Across all four versions, the four conditions were

represented for every vignette. As such, through random assignment, participants had an equal chance that any one vignette would be in any one of the four conditions.

Participants. I conducted a power analysis using G*Power 3.1 (Faul et al., 2007). Though I hypothesized two main effects, I left open the possibility for an interaction. Specifically, given findings by Abed and colleagues (2017) discussed above, the difference in credibility ratings between photo-present and photo-absent trials may depend on the context condition (high/low). As such, I chose to run a conservative power analysis using a mixed design (one factor within-subject, one factor between-subject) despite the fact that both factors were actually within-subject factors. Doing so provided me with more power to detect an interaction between the two factors. Because G*Power cannot estimate the required power to detect an interaction in a within-subject design, the mixed measures power analysis was used as a conservative alternative, despite being imperfect. G*power suggested a sample size of 200 participants to achieve sufficient power under these conditions (F = .10; α = .05; $(1 - β)$ = .8; number of groups = 2; repetitions = 2). After data exclusions, the final sample consisted of 200 participants (see data exclusions below)**.** Like Experiment 1, participants were recruited through Amazon Mechanical Turk and compensated $1.50 USD for participation.

Materials. In the high-context condition, the vignettes contained all of the information from the vignettes from Experiment 1, with the following additional contextual information: (1) one detail regarding the time of year or day of the event (e.g. "the following allegedly occurred on a Friday afternoon"); (2) one detail placing the witness at the scene of the offense (e.g. "Ms. Anthony's car had recently broken down and she had to take the bus"), and; (2) two contextual details unrelated to the alleged offense (e.g. "She was heading to a friend's house. She had not seen the friend for several months"). The low-context condition acted as a replication of Experiment 1, with no additional contextual information added. Thus, low context vignettes were identical to Experiment 1. Photo-present trials used the same photos as Experiment 1. A full list of vignettes used in Experiment 2 can be found on OSF.

Procedure. The procedure was similar to Experiment 1. Participants were directed from the Amazon Mechanical Turk website to Qualtrics via a link. Like Experiment 1, participants read 42 vignettes including 2 attention-check vignettes. Unlike Experiment 1, in Experiment 2, vignettes varied in length. Low-context vignettes were

identical to the vignettes used in Experiment 1. However, high-context vignettes contained additional non-probative information. Participants indicated on a scale from 1 (I do not believe this individual at all) to 8 (I believe this individual completely) whether they believed the testimony of the witness in the vignette. Attention-check vignettes were the same as those used in Experiment 1, but they appeared as the final two vignettes for every participant. I made this change due to concern that the attention-check questions may change the way that participants naturally approach the task (Hauser & Schwarz, 2015). Specifically, participants in truthiness studies likely rely on heuristic decision-making (discussed above). Because research has suggested that attention-check questions may trigger non-heuristic decision-making, I opted to move the attention-check questions to the end such that they were always the final two vignettes for each participant. The procedure took approximately 10 minutes for participants to complete (M = 10.49; SD = 6.22). Exact completion times were not recorded. Each participant's completion time was rounded to the nearest minute.

2.3.2. Results

Data Exclusions. I collected data in 5 small batches over the course of several hours using Amazon Mechanical Turk (20 participants; 100 participants; 100 participants; 20 participants; 6 participants). I determined data exclusions after each batch with the aim of stopping once I reached the required sample size from my power analysis (N = 200). I collected data from a total of 246 participants. I excluded 34 participants due to failing at least one attention-check question. I excluded an additional 10 participants due to participants withdrawing before the end of the study. Finally, I excluded two participants for having 100% of their responses the same throughout all vignettes (e.g. responded "5" to every question). These exclusion criteria were pre-registered prior to data collection. One outlier (> 3 SDs from the mean) did not affect the overall data pattern, so it remained in all analyses. This resulted in a total sample of 200 participants, exactly that required by my power analysis.

Assumption-Checks. Examination of Q-Q plots suggested that all conditions were normally distributed. Skewness and kurtosis were within appropriate ranges (Cain et al., 2017).

Analysis. I conducted a 2 (photo presence: present, absent) x 2 (context: high, low) repeated measures ANOVA comparing differences between credibility in the photo-present and photo-absent conditions within different context conditions (high, low). I observed a main effect of photo presence. Participants rated witnesses in photo-present vignettes as more credible than participants in the photo-absent vignettes ($M_{PHOTO-PRESENT}$ = 5.56; $SE_{PHOTO-PRESENT}$ = 0.06; $M_{PHOTO-ABSENT}$ = 5.47; $SE_{PHOTO-ABSENT}$ = 0.07; $F(1, 199)$ = 5.51; p = .020; partial η^2 = .027). The main effect of context was not significant (M_{HIGH} = 5.52; SE_{HIGH} = 0.06; M_{LOW} = 5.51; SE_{LOW} = 0.06; $F(1, 199)$ = 0.01; p = .916). The interaction between photo and context was not significant ($M_{PHOTO-PRESENT,HIGH}$ = 5.53; $SD_{PHOTO-PRESENT, HIGH}$ = 0.98; $M_{PHOTO-ABSENT, HIGH}$ = 5.50; $SD_{PHOTO-ABSENT, HIGH}$ = 0.94; $M_{PHOTO-PRESENT, LOW}$ = 5.59; $SD_{PHOTO-PRESENT, LOW}$ = 0.92; $M_{PHOTO-ABSENT, LOW}$ = 5.44; $SD_{PHOTO-ABSENT, LOW}$ = 1.01; $F(1, 199)$ = 2.81; p = .095). See Figure 3.[6] Boxplots with individual datapoints added can be found in Appendix B.

2.3.3. Discussion

In Experiment 2, I replicated the main findings of Experiment 1. On average, participants gave higher credibility ratings to witnesses when vignettes contained a non-probative, but contextually related photo compared to when vignettes did not contain a photo. Contrary to my hypothesis, I did not observe an effect of context. There were no significant differences in credibility ratings between vignettes with added, non-probative contextual information and low-context vignettes. The lack of a context effect was unexpected, but in hindsight not all-together surprising. Recall that one of the functions of the additional contextual information was to increase ecological validity by providing vignettes that more closely (though not entirely) resembled witness statements in a legal

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[6] Like Experiment 1, I conducted a 2 (photo presence: present, absent) x 2 (context: high, low) x 4 (version: A, B, C, D) mixed measures ANOVA to investigate possible version effects in Experiment 2. There was an effect of photo presence. Participants rated witnesses in photo-present vignettes as more credible than participants in the photo-absent vignettes ($F(3, 1, 196)$ = 5.47; p = .02; partial η^2 = .03). The effect of context was *ns*. There was also an interaction between context and version ($F(3, 1, 196)$ = 4.03; p = .001; partial η^2 = .08) as well as a 3-way interaction between photo-presence, context, and version ($F(3, 1, 196)$ = 3.71; p = .001; partial η^2 = .08). Similar to Experiment 1, the analysis of version was not pre-registered and was done for completeness. As noted above, an analysis of version requires a between-subject comparison; thus, dividing the sample size by four for any within-subject comparisons. As such, version effects, though concerning, are likely artifacts of multiple comparisons and small sample sizes. As such, they will not be discussed further.

setting. To this end, the results of Experiment 2 support the notion that truthiness may operate in legal settings. That is, a photo effect emerged, regardless of the amount of contextual information provided.
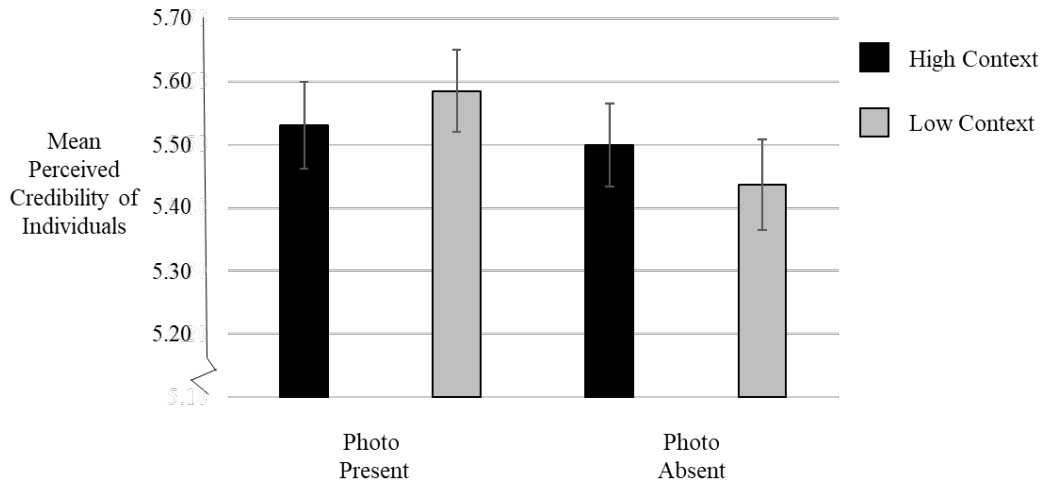

Figure 3. **Experiment 2: The influence of photo (present, absent) on context (high, low).**

From a theoretical perspective, the non-probative context manipulation neither increased nor decreased the perceived credibility of witness statements. A context effect would emerge if the non-probative information in the high-context vignettes increased the processing fluency relative to the low-context vignettes. A null effect suggests that the non-probative information in the high-context vignettes did not make the witness statements significantly easier (or harder) to process relative to the information in the low-context vignettes, or that participants correctly attributed any increased fluency to the added context in the high-context vignettes.

2.4. General Discussion

Truthiness, a tendency to report claims as true when the claims appear with related but non-probative information, such as a photograph, has been studied in limited contexts. I aimed to investigate whether non-probative related photos could similarly bias credibility judgements in legal contexts. In two experiments, participants showed truthiness for legal judgments by rating witnesses as more credible when non-probative, but contextually-related photos appeared with witness statements in vignettes than when no photo appeared with vignettes. In Experiment 2, I replicated the findings of

Experiment 1, while also manipulating the amount of additional contextual information provided in the vignette. Unlike the contextual information used by Abed and colleagues (2017), the contextual information in Experiment 2 was non-probative to the judgement of credibility. This is common in the legal system when narrative details surrounding an event are included, despite being non-probative to the credibility of the witness. Because the information was non-probative, I hypothesized that contextual information would act similarly to the presence of a photo. Contrary to my hypothesis, in Experiment 2 participants did not rate witnesses as more credible in vignettes with added, written, non-probative contextual information compared to witnesses in low-context vignettes. However, the added contextual information did not significantly reduce the effect of photo presence on perceived credibility either. The results of both experiments revealed truthiness for legal judgements.

Theoretically, truthiness emerges through the following process: (1) a person views non-probative, related information (e.g., a photo); (2) the person engages in information search as the related information primes other information in mind; (3) the person processes the statement more fluently relative to statements for which non-probative related information is absent; and (4) the person misattributes this feeling of fluency to the relevant judgement at hand (e.g., credibility of the witness or truth of the statement; see Figure 4). In our experiments, this misattribution made the witness seem more credible. Importantly, to observe a truthiness effect, fluency misattribution must occur (see Jacoby & Whitehouse, 1989). The entire process outlined above must be completed in full to get to the misattribution stage.

Failure to observe a truthiness effect would result if any point in the process was interrupted. The person may not attend to the information (step 1 interruption), the information may not effectively prime other related information (step 2 interruption), the processing fluency when the non-probative, related information is present may not be compared to the processing fluency when such information is absent (step 3 interruption), or the processing fluency may be correctly attributed to its source (step 4 interruption). This makes it difficult to determine why I did not observe a context effect in Experiment 2. Step 1 could be interrupted if participants did not attend to the additional contextual information. A photo is something that can be seen in an instant, while a block of text must be read and comprehended. Thus, participants may not have attended to the context. Experiment 2 was a within-subject design, and the critical information

(the witness's statement) was always the last sentence of the vignette. Participants could have realized this over several trials and begun to ignore the first few sentences of every vignette. Step 2 could have been interrupted if the added contextual information was not related enough to prime relevant information. An interruption at step 3 is unlikely, given the within-subject design of Experiment 2. Finally, step 4 could have been interrupted if participants correctly attributed the added fluency in high-context trials to the added non-probative contextual information in that condition rather than to the credibility of the witness.
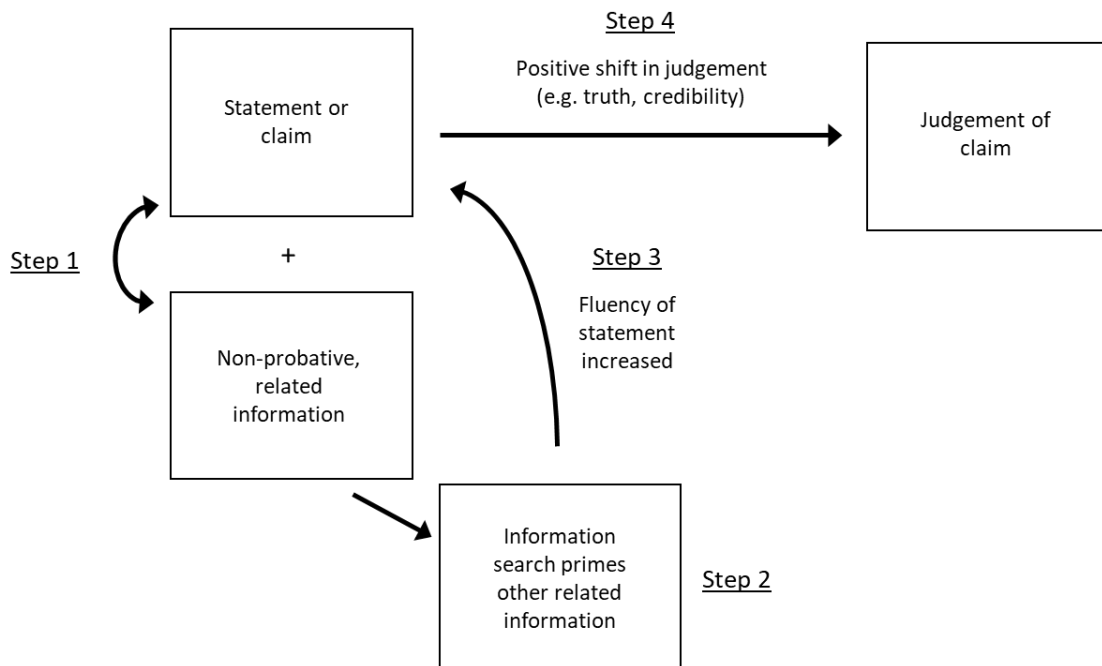

Figure 4.   Proposed mechanism for truthiness effects.

Contrary to my hypothesis, the context manipulation did not influence the perceived credibility of witness statements. The only other study which used a word-based truthiness manipulation did so by providing verbal descriptions of photos of faces (as opposed to simply showing photos of faces; see Newman et al., 2012). As such, the verbal description was likely closer to the photo manipulation than my written context manipulation was. My context manipulation was not meant to act as an analog to the photo manipulation. Instead it was used to establish whether truthiness could operate in contextually rich legal settings and increase the ecological validity of our findings in Experiment 1. As such, the context manipulation was meant to resemble the type of superfluous details that would be included in a witness' testimony, but that are irrelevant

to a judgement of credibility, such as the time and place of an alleged offence. With this in mind, the pair of experiments here presented a consistent and important finding: non-probative photos biased judgements of credibility in legal settings regardless of whether this contextual information was present.

Even though the observed effect size across both experiments was expectedly small, small effects can have large consequences for legal decision making. In some cases, a verdict may hinge entirely on whether a key witness is believed. In *R. v. Frumusa* (1996) the accused was convicted of the first-degree murder of two individuals based solely on the testimony of a police-informant seeking bail. In these situations, there is often little information available to make the necessary judgement. A small nudge may be enough to tip the scales from acquit to convict (see Thaler & Sunstein, 2009). That said, it is currently unclear whether truthiness will operate in contexts like a childhood sexual abuse case where the stakes are high. Future research will be required to investigate truthiness in specific legal contexts.

It's concerning that exposure to a single non-probative photo can influence participants' judgements. The small magnitude of the effect observed in the current experiments may be partly a consequence of the stimuli that I used. It is currently unknown whether other non-probative information types will have similarly small effects. New audio and video technology are increasingly being used in the courtroom, prompting some researchers to investigate the biasing effects of their use (Feigenson & Dunn, 2003). Consider, for example, evidence such as computer animations that illustrate a car crash, or rich, non-probative information recorded by a body-worn camera. The biasing effects of these types of computer-generated evidence is varied and debated (See Feigenson, 2010 for a review; Norris, 2015). Future research is necessary to determine whether the effect size created from rich, non-probative information is greater than the small effects observed in the current work which used relatively pallid, non-probative photos.

Another avenue for future research is to investigate whether non-probative information continues to bias judgements when it is mixed with probative information. Recall that the contextual information provided by Abed and colleagues (2017) was probative to the judgement context and reduced the magnitude of the truthiness effect. The current work began to answer the question of whether truthiness can bias relevant

judgements in legal settings by changing the judgement context to credibility and adding superfluous contextual details common to a case. Under these conditions, I still observed a truthiness effect. Future research could take this one step further by including probative information which speaks to the credibility of a witness with the non-probative photo, to see if the non-probative photos still biased judgements despite the presence of probative details. This would be the logical next step, as a combination of probative and non-probative information is present when legal judgements are made.

Of great concern at the outset of this research was whether truthiness operates in legal settings on forensically-relevant judgments, specifically credibility. Credibility is synonymous with worthiness of belief (Black, Garner, McDaniel, Schultz, & West Publishing Company, 1999) and is especially relevant if there is a lack of physical evidence available. Understanding the biasing effects of non-probative information on credibility is therefore very important. By studying truthiness for legal judgements, I hope to identify potential bias, and work towards reducing/eliminating it. As discussed above, truthiness occurs following misattribution of processing fluency. Indeed, errors due to fluency misattribution can be reduced by increasing awareness of the source of the fluency. That is, if participants are made aware of why they find a certain stimulus easy or difficult to process, misattribution errors can be reduced (see Jacoby & Whitehouse, 1989). If truthiness effects do indeed influence legal judgements, eliminating this bias will be a promising and necessary area for future research.

To study whether truthiness biased legal judgements, I first needed to understand truthiness' reach. By understanding the kinds of judgements that truthiness influences, I could determine the settings under which it operated (i.e., legal settings). My thesis set out to address this concern. In sum, the results of my experiments suggest that truthiness may influence legal judgements (e.g., credibility) in forensic contexts. I hope that this work prompts future research in this important area.

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Appendix A.

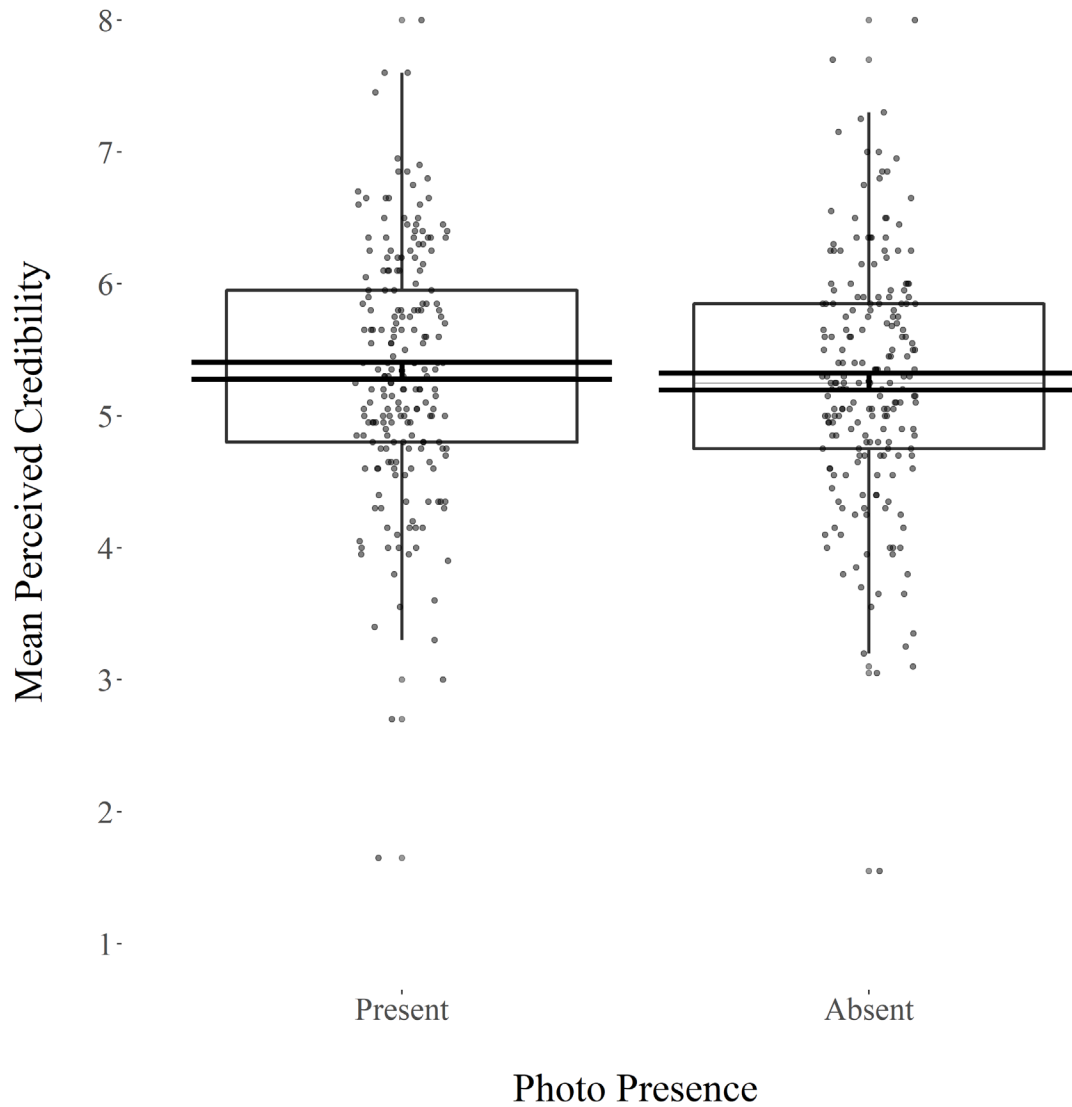## Experiment 1 boxplots with jittered scatterplot overlay

Figure A1. The two lines near the centre of each box represent + or − standard error. The edges of each box represent the 1st and 3rd quartile. The jittered data points represent individual participant means.

Appendix B.

Experiment 2 boxplots with jittered scatterplot overlay

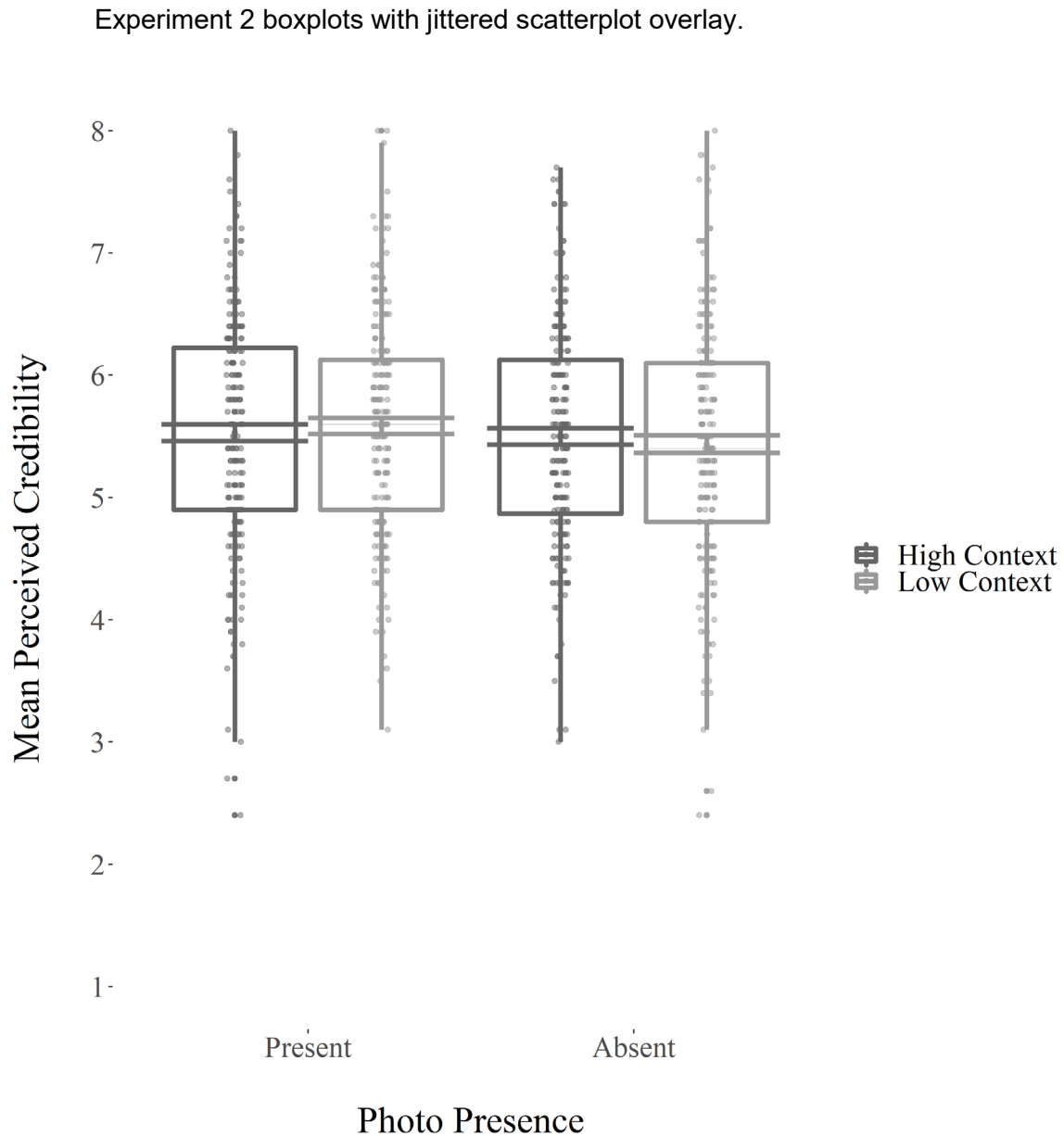Experiment 2 boxplots with jittered scatterplot overlay.

Figure B1. The two lines near the centre of each box represent + or – standard error. The edges of each box represent the 1st and 3rd quartile. The jittered data points represent individual participant means.