DETERMINANTS OF JUROR BELIEF IN WITNESS TESTIMONY: THE ROLE OF
WITNESS UNCERTAINTY AND CERTAINTY

A thesis submitted
To Kent State University in partial
Fulfillment of the requirements for the
Degree of Master of Arts

by

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May, 2016
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PREFACE

Experiment 1 was presented in another form as part of my undergraduate Honors Thesis completed at Kent State University. Experiment 1 is included here because it is a necessary precursor to understanding the rationale for Experiments 2 and 3. The three experiments together constitute a package that will be submitted for publication as a single paper.
ACKNOWLEDGMENTS

I would like to first acknowledge my advisor, Maria Zaragoza, for her guidance and support, not only throughout the process of completing this thesis, but also throughout both my graduate and undergraduate academic careers. I would also like to express my appreciation and gratitude to my lab mates Patrick Rich and Eric Rindal for all of their assistance and recommendations along the way. In addition, I would like to thank research assistants Katelyn Kasula, Jessica Chapman, Serena Young, Matthew McCrystal, Angelina Shirey, Jenna Hoffman, Nicolette Tomazic, Leah Flaherty, Edward Kamody, Noura Barazi, and Jessica Land for their contributions to these studies.

I would also like to thank my family and friends for their continued support and love, particularly throughout this process.
CHAPTER I

INTRODUCTION

In a recent paper, Garrett (2011) reviewed 161 cases of individuals who had been exonerated by DNA evidence after serving long jail sentences. In over 70% of these wrongful convictions, the primary evidence was a confident, but mistaken, identification by an eyewitness. Given the importance of wrongful convictions, it is not surprising that much research effort has been devoted to understanding why convictions based on mistaken identifications might occur. In particular, many studies have examined factors that inflate witness confidence in mistaken identifications (Wells, Lindsay & Ferguson, 1981; Luus & Wells, 1994; Wells & Bradfield, 1998; Wells & Bradfield, 1999; Shaw, Zerr & Woythaler, 2001; Garrioch & Brimacombe, 2001; Steblay, Wells & Douglass, 2014), and there is a large literature documenting that participant-jurors give too much weight to witness confidence when making judgments about the accuracy of eyewitness identifications (Wells et al., 1981; Lindsay, Wells & Rumpel, 1981; Fox & Walters, 1986; Whitley & Greenberg, 1986; Cutler, Penrod & Stuve, 1988; Lindsay, Wells & O’Connor, 1989; Cutler, Penrod & Dexter, 1990; Bradfield & Wells, 2000; Brewer & Burke, 2002; Tetterton & Warren, 2005).

In addition to the research on jurors’ assessments of eyewitness identification evidence, other studies have sought to understand how jurors evaluate other kinds of witness testimony
(e.g., eyewitness accounts of how an accident or crime transpired). Similar to the literature on jurors’ evaluations of eyewitness identifications, this literature is characterized by a concern with the relationship between witness confidence and jurors’ perceptions of witness credibility. Many studies have shown that witnesses who are perceived as confident are judged by participant-jurors to be more credible than their uncertain counterparts (Scherer, London & Wolf, 1973; Erickson, Lind, Johnson & O’Barr, 1978; Fox & Walters, 1986; Whitley & Greenberg, 1986; Cutler et al., 1988; Lindsay et al., 1989; Cutler et al., 1990; Bradfield & Wells, 2000; Wise & Safer, 2004; Tenney, MacCoun, Spellman & Hastie, 2007; Tenney, Spellman & MacCoun, 2008). In addition, research has also found that confident witnesses are perceived as inherently more truthful (Tetterton & Warren, 2005) and less inconsistent in their testimony (Brewer & Burke, 2002) than low-confident witnesses, even when the content of the testimony provided by the high- and low-confident witnesses does not differ.

Other work has focused on understanding what factors contribute to perceptions of witness confidence. For example, there is evidence that both verbal and paralinguistic factors influence how confident a witness appears (Scherer et al., 1973; Erickson et al., 1978; Whitley & Greenberg, 1986). Whereas those witnesses who speak faster, make fewer pauses, and verbally express their surety are perceived by witnesses as more confident, witnesses are viewed as uncertain if they testify with longer pauses, slower speech, and an increased rate of hedges, hesitations, and inconsistencies (Scherer et al., 1973; Erickson et al., 1978; Whitley & Greenberg, 1986; Brewer & Burke, 2002).

An interesting and relatively recent development is the finding that other factors can override witness confidence as determinants of witnesses’ perceived credibility. According to Tenney and colleagues (Tenney et al., 2007; Tenney, et al., 2008, Tenney, Small, Kondrad,
Jaswal & Spellman, 2011), the primary determinant of jurors’ perceptions of witness credibility is not confidence per se, but whether witnesses’ confidence in their testimony is well calibrated with its accuracy. In these studies, participant-jurors were presented with event testimony from two witnesses: One who was very confident about all the information they presented, and one who was uncertain about several items, but confident about others (i.e., was more cautious). When participants were initially asked which witness they found to be more credible, most chose the confident witness, as expected. However, when researchers then informed the participants that each witness had made an error in their testimony, participants selected the cautious witness as more credible than the confident witness, but only when the cautious witness was well calibrated, and had expressed a lack of confidence in the erroneous testimony and confidence in the accurate testimony. In those conditions where the cautious witness lacked calibration (i.e., was confident in erroneous testimony and uncertain about accurate testimony) participants once again perceived the confident witness as more credible.

As evidenced by the foregoing review, the research on jurors’ perceptions of witness testimony is characterized by a focus on jurors’ global assessments of witness credibility. In other words, the topic of interest has been how jurors use witness testimony to make inferences about the witness’s overall accuracy and believability. As a consequence, these studies have not assessed what jurors remember and believe about the individual aspects of the testimony itself. However, even a credible and generally accurate eyewitness is likely to remember some aspects of a witnessed event better than others, and may even forget some aspects of the witnessed event altogether. Hence, even a highly accurate witness will likely be confident about the well-remembered aspects of the witnessed event, but express uncertainty about those aspects of the witnessed event that are remembered less well. What is not known is whether participant-jurors
accept all testimony provided by a credible witness as true, regardless of the confidence with which it is expressed, or whether participant-jurors instead accept as true only the confident testimony, and question the validity of uncertain testimony.

To address this gap in the literature, an overarching goal of the present study was to assess participant-jurors’ belief in individual aspects of the witness’s testimony, rather than assessing the overall believability (or credibility) of the witness. In particular, the present study sought to assess whether participant-jurors would trust information delivered more confidently by a witness, while simultaneously doubting the information the same witness delivered with uncertainty. Although research on witness calibration (Tenney et al., 2007; Tenney, et al., 2008; Tenney et al., 2011) shows that participant-jurors detect variations in witness confidence (i.e., participants were able to judge whether the witness’s confidence in a piece of testimony was calibrated with the accuracy of that testimony), these studies assessed jurors’ overall impressions of witness credibility only, and did not assess participant-jurors’ belief in individual pieces of testimony.

A second way in which the present study departs from the prior literature is that it focuses on participant-jurors’ evaluation of testimony provided with uncertainty. Whereas many studies have shown that participant-jurors find confident witnesses more believable than unconfident witnesses (Scherer et al., 1973; Erickson et al., 1978; Wells et al., 1981; Lindsay et al., 1981; Fox & Walters, 1986; Whitley & Greenberg, 1986; Cutler et al., 1988; Lindsay et al., 1989; Cutler et al., 1990; Bradfield & Wells, 2000; Brewer & Burke, 2002; Wise & Safer, 2004; Tetterton & Warren, 2005), the present study sought to assess whether participant-jurors would disbelieve testimony provided with uncertainty. Understanding how jurors perceive, remember, and evaluate uncertain testimony is important from both a theoretical and practical point of view.
Because prior research has focused on jurors’ overreliance on witness confidence, very little is known about how jurors perceive and evaluate uncertain testimony. However, there is good evidence that the uncertainty with which testimony is initially expressed is strongly and negatively correlated with its accuracy (Wixted, Mickes, Clark, Gronlund & Roediger, 2015\(^1\)). From a practical perspective, it is just as important for jurors to reject dubious evidence as it is for them to accept valid evidence. Hence, an accurate evaluation of eyewitness evidence involves attending to the uncertainty with which testimony is provided, and actively distrusting testimony that is provided with uncertainty.

Experiment 1 had two goals: (1) to assess whether participant-jurors would selectively disbelieve those aspects of a witness’s testimony that were provided with uncertainty, and (2) to assess whether participant-jurors’ belief in uncertain testimony would vary with the amount and type of uncertainty the witness expressed in that particular segment of testimony. To this end, participant-jurors first listened to an audio recording of a fictional eyewitness interview, where the witness answered some questions directly, but answered other questions with varying degrees of uncertainty. Both direct and indirect expressions of witness uncertainty were manipulated. Direct expressions of uncertainty were operationalized as the presence or absence of overt, verbal statements that expressed lack of knowledge (e.g., “I don’t remember”). Indirect expressions of uncertainty were manipulated by varying the witness’s reluctance to respond to the interviewer’s questions. Reluctance to respond was operationalized as the number of times the witness had to be prompted by the interviewer before providing a response to the question (either one or three times). Presumably, when witnesses respond to a question only after they have been prompted by the interviewer multiple times, they are less certain than when they

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\(^1\) With the passage of time, other factors can inflate witness confidence and reduce the confidence/accuracy correlation.
respond after minimal prompting by an interviewer. A factorial combination of these two indicants of uncertainty (verbal expressions of uncertainty and resistance to responding) resulted in four uncertainty conditions that varied in the number and type of uncertainty cues associated with the testimony provided by the witness. Participant-jurors then rated their belief in each response provided by the witness. Of primary interest was whether participants would disbelieve testimony provided with uncertainty selectively, and whether participants’ belief ratings would correspond to the amount and type of uncertainty expressed.
CHAPTER II

EXPERIMENT 1

Method

Participants. A total of 110 undergraduate students (80 female) took part in the study to fulfill a psychology course requirement (mean age = 20.3 years), and were tested in groups ranging in size from one to six.

Materials and procedure.

Phase 1: Witness Interview. Participants were informed that they would be hearing eyewitness testimony about a case involving the disappearance of two brothers who were attending a summer camp. As a cover for the real purpose of the experiment, participants were told that the boys’ parents were suing the camp for negligence, and that their task was to decide whether the camp should be held responsible for the boys’ disappearance. Participants were not informed that the testimony and the lawsuit were fictitious, but were debriefed at the end of the semester.

Participants then listened to a purported audio-recorded police interview with a staff member who had witnessed the events leading up to the boys’ disappearance. To ensure that all
participants were attending to the interview, they were also given a written transcript to read while they listened to the audio recording.

The interview consisted of 11 questions posed by the interviewer and the testimony provided by the witness in response to each question. Of these 11 questions, six questions were filler items, all of which were answered with neutral confidence (i.e., the response was neither overtly confident nor lacked confidence), and were identical for all participants (see Appendix A).

The remaining five interviewer question/witness response pairs were critical items, and these were interspersed with the filler items (see Table 1). For every participant, each of the five critical items served in a different uncertainty condition. The five conditions are illustrated in Table 2. To create conditions that varied in uncertainty, the witness’s responses to the questions varied on two dimensions of expressed uncertainty: Direct verbal expressions of uncertainty (yes or no) and an indirect, though salient, expression of uncertainty, resistance to responding (yes or no). Direct verbal expressions of uncertainty were explicit statements of uncertainty (e.g., “I don’t know”). Resistance to responding was manipulated by varying how many times the interviewer had to prompt the witness (after the question was posed initially) before the witness provided a response: Either three times (resistance), or one time (no resistance). A factorial combination of these two dimensions resulted in four uncertainty conditions that ranged from most expressions of uncertainty (both direct, verbal expressions and resistance to responding—hereafter, 2U) to fewest expressions of uncertainty (neither direct nor indirect expressions of uncertainty—hereafter 0U). The other conditions had an intermediate (i.e., one) expression of uncertainty, in that the response was accompanied by either direct, verbal expressions of uncertainty only (1U-D) or indirect expressions of uncertainty (i.e., resistance to respond) only
(1U – I) (see Table 2). The fifth critical condition, the no-prompt condition, was identical to the 0U condition, with the exception that the witness provided the response immediately after the question was posed, rather than after one prompt (see Table 2). As can be seen in Table 2, although the amount of uncertainty expressed varied across conditions, the witness’s final response to the question was identical across all five conditions, and always contained a hedge of some sort (e.g., “um, “maybe”, “I guess”). Hence, even responses in the 0U and control conditions had some paralinguistic expressions of uncertainty associated with them. Across the experiment, each of the five critical items (Table 1) served in each of the five conditions equally often.

**Phase 2: Cover Task.** After listening to the witness’s testimony, participants completed the cover task, which was a questionnaire that asked participants whether the case was solid enough for a prosecution to be made, and whether the summer camp should be held responsible for the boys’ disappearance from the camp. Because this task was merely a cover for the true purpose of the experiment, performance on this task will not be reported.

**Phase 3: Ratings of Belief in Testimony.** Immediately after completing the cover task, participants were informed that they would receive a list of items and events that had been provided by the witness during the interview they had just heard, and that their task was to indicate how much they believed the event had actually taken place. The instructions included the statement that eyewitness memory is not perfect, and that witnesses sometimes make mistakes.

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2 Preliminary analyses showed that belief ratings of items in the no-prompt condition did not differ significantly from belief ratings of items in the 0U condition (p = .45), thus showing that one prompt was not perceived as an indicant of uncertainty. Because participants did not perceive the no-prompt condition as different from the 0U condition, the no-prompt condition was not included in the analyses reported here.
Participants received a typed list of the 11 items/events reported by the witness in response to the interview questions (i.e., the witness’s responses to the five critical questions and the six filler questions) in chronological order. The 11 items/events were identical to the information provided by the witness, with the important exception that all indicants of uncertainty, including hedges, were removed from these responses (see Appendix B). For each item on the list, participants were instructed to indicate how much they believed the event had actually occurred, using a 7-point Likert type scale (1 = extremely unsure, 7 = extremely sure; see Appendix B for scale used). Participants’ belief ratings of the items in the four uncertainty conditions were the dependent variable of primary interest.

**Results and Discussion**

As illustrated in Figure 1, and supported by the statistical analyses reported below, participants’ belief ratings of the witness’s individual responses were well calibrated with the amount of uncertainty the witness had expressed in that particular response. Participants’ ratings of belief for the four uncertainty conditions were submitted to a 2 (Direct expressions of uncertainty: yes vs. no) x 2 (Indirect expressions of uncertainty: yes vs. no) repeated measures ANOVA. As illustrated in Figure 1, the results revealed main effects of both direct and indirect expressions of uncertainty, such that for both types of expressions of uncertainty, participants provided lower belief ratings when it was present than when it was not ($F(1,108) = 12.50$ and $F(1,108) = 18.78$, both $p’s < .001$, $\eta^2_p = .10$ and $\eta^2_p = .15$ for direct and indirect expressions of uncertainty, respectively). The interaction between direct and indirect expressions of uncertainty was not reliable ($F(1,108) = .15, p > .7$), thus showing that direct and indirect expressions of uncertainty had comparable and independent effects on participants’ belief ratings.
Planned comparisons confirmed that participant-jurors’ belief ratings of witness testimony were a function of the amount of uncertainty expressed by the witness when providing the individual response (see Figure 1). Belief ratings in the 2U condition were significantly lower than ratings in both the 1-UD and 1-UI conditions ($t(1,108) = -2.84, p < .01, d = -.27$ and $t(108) = -2.74, p < .01, d = -.26$), and belief ratings in the 0U condition were significantly higher than in the 1-UD and 1-UI conditions ($t(1,109) = 1.99, p < .05, d = .19$ and $t(1,109) = 2.63, p < .01, d = .25$). Ratings of testimony in the 1-UD and 1-UI conditions, were nearly identical, and did not differ reliably ($t(1,109) = -.20, p > .8$)\(^3\).

![Figure 1](image.png)

Figure 1. Participant-jurors’ belief ratings of witness testimony in Experiment 1, as a function of the number of uncertainty cues that accompanied the testimony (2, 1 or 0), and whether the uncertainty was expressed directly (D), indirectly (I) or both (2U). Error bars represent 95% confidence intervals.

\(^3\) One participant failed to provide a response to a single critical question (2U condition), but because the participant provided responses to all other critical questions, the data for this participant was included in all other analyses.
As further evidence that participant-jurors were sensitive to variations in the witness’s confidence, mean belief ratings of the filler items (overall mean = 5.7, between “slightly and moderately sure”) were numerically higher than their mean belief rating of the critical items (overall mean = 2.7, a rating between “slightly and moderately unsure”). Qualitatively, these mean ratings show that, overall, participants believed the testimony the witness provided in response to the filler questions, but disbelieved the testimony provided in response to the critical questions (even the 0U condition had a mean rating of 3.08, “slightly unsure”). Although there are probably several reasons why participants found the witness’s responses to the filler questions more believable (in addition to the absence of uncertainty cues in the responses, the filler questions were about a different set of events, and because the witness’s responses to the filler questions were much more extensive, they were probably perceived as more believable, see e.g., Bell & Loftus, 1989), the relevant finding for purposes of this study is that participants believed some aspects of the witness’s testimony, yet disbelieved others.

In sum, the results of Experiment 1 were clear-cut. Participants disbelieved testimony provided with uncertainty, and their belief ratings were well calibrated with the amount of uncertainty expressed, thus showing that participant-jurors were sensitive to variations in the witness’s uncertainty. In addition, the results showed that participant-jurors believed some aspects of the witness’s testimony while disbelieving other aspects of the same witness’s testimony.
CHAPTER III

EXPERIMENT 2

The results of Experiment 1 showed that when participant-jurors rated their belief in the witness’s testimony immediately after it was provided, their belief ratings were very well calibrated with the amount of uncertainty the witness expressed in their response. However, in real-world courtroom situations, it is very common for much longer periods of time to elapse between witness testimony and juror deliberations. Given the evidence that people are prone to forgetting the source of their memories (Johnson, Hashtroudi, & Lindsay, 1993), it is possible that participant-jurors’ ability to remember and use uncertainty cues diminishes over time. To assess whether the findings from Experiment 1 would generalize to situations where there is a longer delay between witness testimony and belief ratings, Experiment 2 was identical to Experiment 1, with the exception that there was a one-week delay between the witness interview and participant-juror’s belief ratings of the witness’s responses.

Method

Participants. A total of 109 undergraduate students (63 female) took part in the study to fulfill a psychology course requirement (mean age = 18.5 years).
**Materials and procedure.** The materials and procedure used in Experiment 2 were identical to those of Experiment 1, with the exception that, instead of being asked to provide belief ratings immediately after the cover task, participants returned one week later to complete the belief rating task.

**Results and Discussion**

As illustrated in Figure 2, when a one-week retention interval was inserted between the interview and belief rating task, participants no longer evidenced sensitivity to the uncertainty with which the testimony was provided. In contrast to Experiment 1, participants no longer endorsed disbelief in the witness’s testimony (overall mean belief rating = 4.77, between “neither unsure nor sure” and “slightly sure”). Moreover, participants endorsed the same level of belief in all four uncertainty conditions, thus showing that their belief ratings were not influenced by the amount of uncertainty the witness had expressed in that piece of testimony. A 2 (Direct: yes, no) x 2 (Indirect: yes, no) repeated measures ANOVA on belief ratings confirmed that neither of the main effects (direct expressions of uncertainty $F(1,108) = .54$, indirect expressions of uncertainty $F(1,108) = 2.11$, both $p$’s > .05), nor the interaction ($F(1,108) = .29$, $p > .29$) were reliable, thus verifying that there were no differences in belief ratings among the four uncertainty conditions.
Figure 2. Participant-jurors’ one-week delayed belief ratings of witness testimony in Experiment 2, as a function of the number of uncertainty cues that accompanied the testimony (2, 1 or 0), and whether the uncertainty was expressed directly (D), indirectly (I) or both (2U). Error bars represent 95% confidence intervals.

Although the results of Experiments 1 and 2 cannot be compared directly, when considered collectively, the evidence suggests that participants’ sensitivity to the uncertainty with which testimony was provided was short-lived. Relative to belief ratings of uncertain testimony provided shortly after the testimony (Experiment 1), when participants provided belief ratings one week after hearing the testimony (Experiment 2), their belief in uncertain testimony was inflated, and their belief ratings showed no sensitivity to the amount of uncertainty the witness had expressed. Rather, highly uncertain testimony (i.e., testimony accompanied by both direct and indirect expressions of uncertainty, 2U condition) was believed as much as testimony
accompanied by no clear indicants of uncertainty (0U condition). I interpret these findings as evidence that, after one week’s time, participants could not remember the uncertainty cues that accompanied the witness’s responses, and in the absence of uncertainty, were inclined toward believing it. It should be noted, however, that even after one week, participants’ belief ratings of critical items (overall mean = 4.77, between “neither unsure nor sure” and “slightly sure”) were still numerically lower than their belief ratings of filler items (overall mean = 5.5, between “slightly sure” and “moderately sure”). Although, as mentioned above, the filler items were a completely different set of responses that may have been perceived by participants as believable for other reasons. This finding raises the possibility that participants did not forget the witness’s uncertainty altogether.
CHAPTER IV

EXPERIMENT 3

One goal of Experiment 3 was to further test the hypothesis that participants forget witness uncertainty over time by manipulating the timing of the belief ratings in a single experiment. This was accomplished in two ways: First, in an effort to replicate the findings of Experiments 1 and 2, in Experiment 3 there was a between-subjects comparison between belief ratings provided immediately after testimony, and belief ratings provided for the first time after one week. The prediction was that, consistent with the results of Experiments 1 and 2, the one-week delayed ratings of uncertain testimony would be inflated relative to belief ratings of uncertain testimony provided immediately. In addition, as a second test of the hypothesis that participants are prone to forgetting witness uncertainty, Experiment 3 included a within-subjects manipulation where participants who provided belief ratings of witness testimony immediately following the witness interview were asked to provide belief ratings again, one week later. If participants who provide belief ratings of uncertain testimony immediately show inflated belief in uncertain testimony when assessed again after a delay, this would provide strong evidence that people are prone to forgetting witness uncertainty.

A second goal of Experiment 3 was to assess whether the finding that participants are prone to forgetting witness uncertainty extends to memory for witness certainty. Because
Experiments 1 and 2 manipulated witness uncertainty only, what cannot be discerned from these findings is whether participants are especially prone to forgetting uncertainty cues, specifically, or whether they might be prone to forgetting confidence cues more generally, both certain and uncertain. In other words, it is possible that the findings from Experiment 1 and 2 reflect a more general memory deficit that people have for the certainty with which testimony was provided. The latter hypothesis is consistent with the well-established finding that people are prone to forgetting the source of their memories (Johnson et al., 1993). If participants have a general deficit in memory for confidence cues, one would expect participants’ ratings of uncertain testimony to increase with the passage of time, but their ratings of highly confident testimony would be expected to decrease with the passage of time. In other words, if participants are prone to forgetting confidence cues more generally, over time, belief ratings in uncertain and certain testimony should start to converge over time. Alternatively, given the evidence that jurors rely so heavily on witness confidence (Wells et al., 1981; Lindsay et al., 1981; Fox & Walters, 1986; Whitley & Greenberg, 1986; Cutler et al., 1988; Lindsay et al., 1989; Cutler et al., 1990; Bradfield & Wells, 2000; Brewer & Burke, 2002; Tetterton & Warren, 2005), it may be the case that memory for certainty and uncertainty differs, such that witness certainty is more resistant to forgetting than witness uncertainty.

To investigate these possibilities, in Experiment 3, participants heard the witness provide two responses with certainty and two responses with uncertainty (rather than hearing the witness give four responses with varying degrees of uncertainty as in E1 and E2). To implement this change, the cues associated with the witness’s responses were manipulated across two dimensions that could be used to signal either certainty or uncertainty: Response latency (1 sec [certain] or 3 sec [uncertain]) and verbal expressions of certainty/uncertainty (e.g., “I’m positive”
[certain], or “I don’t remember” [uncertain]). As in Experiments 1 and 2, the number of certainty/uncertainty cues was also manipulated. A factorial combination of level of certainty (certain or uncertain) and number of cues (1 or 2) produced four experimental conditions: 1 Certainty Cue (1 sec latency only, 1C), 2 Certainty Cues (1 sec latency + verbal expression of certainty, 2C), 1 Uncertainty Cue (3 sec latency only, 1U) or 2 Uncertainty Cues (3 sec latency + verbal expression of uncertainty, 2U). A fifth “intermediate” confidence condition was included where the witness provided the response after 2 sec and with a verbal hedge.

Before conducting the experiment proper, a pilot study was conducted to verify that manipulating response latency and verbal expressions of certainty/uncertainty would affect participants’ perceptions of witness certainty/uncertainty as intended. To this end, 22 participants listened to the witness interview employed in Experiment 3. However, rather than giving belief ratings at the conclusion of listening to the entire 11-question interview, after each of 11 responses provided by the witness, the recording was stopped, and participants were asked to rate the witness’s confidence in that response, using a scale of 1 (extremely unsure) to 7 (extremely sure). As illustrated in Figure 3, the results of the pilot study confirmed that participants’ ratings of witness confidence were a function of the type and number of cues that accompanied the witness’s response. As expected, when collapsed across verbal expressions, a witness response following a short latency of 1 sec (Certain conditions) resulted in the witness being perceived as “sure” in his response (overall mean rating in the Certain conditions = 6.4), while a response following a long latency of 3 sec (Unconfident conditions) resulted in the perception that the witness was “unsure” in his response (overall mean rating in Uncertain conditions = 2.1), \( t(21) = 28.06, p < .001, d = 5.9 \). In addition, within the Certain (1 sec) condition, confidence ratings of items in the “intermediate” condition did not differ from confidence ratings of the 1U condition (\( p = .15 \)). Because participants did not perceive the “intermediate” condition as different from the 1U condition, the “intermediate” condition was not included in the analysis of belief ratings.
conditions, those responses that were also accompanied by overt verbal expressions of confidence (2C condition, $M = 6.8$) were rated as more confident than those that were not (1C condition, $M = 5.9$), $t(21) = 2.41, p < .05, d = .62$. Similarly, within the Uncertain (3 sec latency) conditions, those responses that were also accompanied by overt expressions of uncertainty (2U condition, $M = 1.1$) were rated as less confident than those that were not (1U condition, $M = 3.0$), $t(21) = -8.43, p < .001, d = -2.8$.

![Figure 3](image)

**Figure 3.** Participant-jurors’ confidence judgments in witness testimony in the pilot study for Experiment 3, as a function of confidence cues (1 or 2) and whether the testimony was delivered with uncertainty (U) or certainty (C). The intermediate condition included a hedge. Error bars represent 95% confidence intervals.
In sum, the results of the pilot study confirmed that the two cue manipulations employed in Experiment 3 affected participants’ perceptions of witness certainty/uncertainty in the expected manner.

Method

Participants. A total of 90 undergraduate students (62 female, 1 unspecified) took part in the study to fulfill a psychology course requirement (mean age = 20.2 years). Of these, 45 were randomly assigned to either the repeated or delayed rating group.

Materials and procedure. The materials and procedure used in Experiment 3 were identical to those of Experiments 1 and 2, with the exception of the modifications outlined below.

Phase 1: Witness Interview. The primary change was that the critical conditions consisted of two certain and two uncertain conditions. To manipulate certainty/uncertainty, the witness’s latency to respond to the interview question was either 1 sec (Certain conditions) or 3 sec (Uncertain conditions). In addition, whether or not the witness also provided overt, verbal expressions of his certainty (e.g., “I’m positive”) or uncertainty (e.g., “I don’t know”) was also manipulated, such that some conditions had two cues (latency + verbal expressions) and some conditions had only one cue (latency). A factorial combination of type of cue (Certain or Uncertain) and number of cues (1 or 2) produced four experimental conditions: 1 Certainty Cue (1C), 2 Certainty Cues (2C), 1 Uncertainty Cue (1U) or 2 Uncertainty Cues (2U).

Phase 2: Cover task. Identical to Experiments 1 and 2.

Phase 3: Belief rating task. The timing of the belief rating task was manipulated. Participants in the repeated rating group rated their belief in the witness statements twice: Both immediately after completing the cover task (as in Experiment 1), and again one week later, thus
permitting a within-subjects assessment of the effects of retention interval on belief ratings.

Participants in the delayed rating group completed the belief rating task only once, one week after listening to the witness interview (as in Experiment 2). A comparison of immediate ratings in the repeated rating group with ratings in the delayed rating group provided a between-subjects assessment of retention interval on belief ratings.

**Results and Discussion**

For both the between-subjects and the within-subjects analyses, the pattern of results was the same: Participants gave higher belief ratings to uncertain testimony after a one-week retention interval than they did immediately, but their ratings of confident testimony did not vary with delay. The results of the between- and within-subjects comparisons are reported separately, below.

**Effect of delay on belief ratings: Between-subjects comparison.** Belief ratings in the repeated rating group (immediate condition only) and the delayed rating group were submitted to a 2 (Level of confidence: certain vs. uncertain) x 2 (Confidence cues: 1 vs. 2) x 2 (Timing of ratings: immediate vs. one week) mixed ANOVA with timing manipulated between subjects (see Figure 4). Because the number of confidence cues had no reliable effect (neither the main effect, $F(1,88) = .46$, nor the interactions, were reliable, all $p$’s > .05), this variable will not be discussed further.

The main effects of both level of confidence ($F(1,88) = 50.71, p < .001, \eta_p^2 = .37$) and timing of ratings ($F(1,88) = 11.85, p < .001, \eta_p^2 = .12$) were highly reliable, thus showing that, overall, participants rated certain testimony higher than uncertain testimony, and gave higher
belief ratings in the delayed condition relative to the immediate condition. Importantly, these main effects were qualified by a significant interaction ($F(1,88) = 15.20, p < .001, \eta^2_p = .15$). As illustrated in Figure 4, post hoc analyses verified that belief ratings in the uncertain testimony conditions of the delayed group were inflated relative to those of the immediate group ($M$’s = 3.27 vs. 4.89 for immediate vs. delayed belief ratings of uncertain testimony (collapsed across the 2U and 1U conditions), respectively, $t(1,88) = 4.74, p < .001, d = .9$). In contrast, belief ratings in the certain testimony conditions of the delayed group did not differ from those of the immediate group ($M$’s = 5.17 and 5.44 for immediate and delayed belief ratings of certain testimony [collapsed across the 2C and 1C conditions], respectively, $t(1,88) = .90, p > .37$).

![Figure 4. Belief ratings in the repeated ratings group (immediate condition only) and the delayed ratings group of Experiment 3, as a function of confidence cues (1 or 2) and whether the testimony was delivered with uncertainty (U) or certainty (C). Error bars represent 95% confidence intervals.](image-url)
Although delayed ratings of uncertain testimony were inflated, it should be noted that participants nevertheless evidenced some ability to discriminate between uncertain and certain testimony even after one week: In the delayed rating group, overall mean belief ratings of testimony in the uncertain conditions were significantly lower than ratings of testimony in the certain conditions (overall \(M's = 4.88\) vs. 5.44, for uncertain vs. certain testimony, respectively, \(t(44) = -2.29, p < .05, d = -.48\)).

**Effect of delay on belief ratings: Within-subjects comparison.** The belief ratings of participants in the repeated rating group were submitted to a 2 (Level of confidence: certain vs. uncertain) x 2 (Confidence cues: 1 vs. 2) x 2 (Timing of ratings: immediate vs. one week) repeated measures ANOVA (see Figure 5). Because number of confidence cues had no reliable effects on belief ratings (neither the main effect, \(F(1,44) = .58, p > .45\), nor the interactions were reliable, all \(p's > .05\)), the results of this variable are not discussed further.

The main effects of level of confidence (\(F(1,44) = 36.46, p < .001, \eta_p^2 = .45\)) and timing of ratings (\(F(1,44) = 7.97, p < .01, \eta_p^2 = .15\)) were once again qualified by a significant interaction (\(F(1,44) = 28.08, p < .001, \eta_p^2 = .39\)). When participants re-rated their belief in the witness’s responses after one week, their belief ratings of uncertain testimony were inflated relative to their initial ratings (\(M's = 3.27\) and 4.27 for immediate and delayed belief ratings of items in the uncertain testimony conditions, respectively, \(t(44) = -6.29, p < .001, d = -.93\)), but their belief ratings of items in the certain testimony conditions remained nearly identical (\(M's = 5.17\) and 5.12, \(t(44) = .29, p > .77\), see Figure 5).
Figure 5. Belief ratings in the immediate and delayed conditions of the repeated ratings group in Experiment 3, as a function of confidence cues (1 or 2) and whether the testimony was delivered with uncertainty (U) or certainty (C). Error bars represent 95% confidence intervals.

Once again, although participants’ belief in uncertain testimony increased over one week, it was nevertheless the case that participants endorsed greater belief in certain testimony than uncertain testimony after the delay ($M’s= 4.27$ and $5.12$ for responses in the uncertain and certain testimony conditions, respectively, $t(44) = -3.39, p < .001, d = -.51$).

In summary, the results of Experiment 3 showed that when assessed immediately, participant-jurors’ belief in witness testimony was well calibrated with witness certainty: Participants disbelieved uncertain testimony (overall $M = 3.27$, “slightly unsure”) and believed
certain testimony (overall $M = 5.17$, “slightly sure”). When assessed after one week, participants evidenced inflated belief in uncertain testimony, but their belief in certain testimony remained unchanged. The latter finding provides evidence that inflated belief in uncertain testimony does not reflect a general impairment in memory for cues pertaining to confidence, but rather, a more selective impairment in memory for uncertainty.

Importantly, the finding of inflated belief in uncertain testimony was observed even when participants who had publicly endorsed low belief in uncertain testimony initially were asked to provide belief ratings in the same testimony again one week later. This latter finding provides strong evidence that belief in uncertain testimony increased with the passage of time. However, the results also showed that there were limits to this belief inflation effect. Although participants’ belief in witness testimony was less precisely calibrated with witness uncertainty after one week, participants retained some information about the uncertainty with which testimony was provided, as evidenced by the fact that they endorsed stronger belief in certain testimony than uncertain testimony, even at a one-week delay.
CHAPTER V

GENERAL DISCUSSION

The present study sought to assess whether participant-jurors’ belief in each item of a witness’s testimony was well calibrated with the amount of uncertainty (or certainty) with which it was expressed. The results showed that when participant-jurors made belief judgments shortly after listening to the testimony, they disbelieved uncertain testimony (Experiments 1 and 3) and believed certain testimony (Experiment 3). Moreover, participants’ disbelief in uncertain testimony was a function of the amount of uncertainty expressed (Experiment 1). Hence, a clear finding from the present studies is that participant-jurors are willing to believe some aspects of a witness’s testimony while disbelieving other aspects of the same witness’s testimony, and that at short retention intervals, participant-jurors’ disbelief in that uncertain testimony was well calibrated with the degree of uncertainty expressed. These are novel findings, as prior research has focused on jurors’ beliefs about the credibility of the witness, and consequently, has not assessed to what extent jurors believe the various pieces of information that comprise the witness’s testimony.

A second major finding was that the timing of participant-jurors’ belief ratings mattered for assessments of belief in uncertain testimony, but not for certain testimony. Relative to immediate ratings, when participants rated their belief in witness testimony after a delay of one
week, their belief in uncertain testimony was inflated (Experiments 2 and 3) and less precisely calibrated with the amount of uncertainty associated with the testimony. This inflated belief in uncertain testimony was observed even among participants who had endorsed disbelief in the uncertain testimony on the immediate assessment, and were asked to rate their belief in the same testimony one week later. In contrast, participants’ belief in certain testimony did not vary as a function of delay (Experiment 3). When assessed after a delay of one week, participants’ belief ratings of confident testimony were nearly identical to those of participants who provided ratings immediately.

Considered together, I interpret these findings as evidence that participants’ memory for uncertainty began to fade over a one-week retention interval, while their memory for certainty remained stable. If participants were prone to forgetting confidence cues in general (both certain and uncertain), one might have expected a shift in belief ratings of certain testimony when assessed after a delay, but there was no change in either direction. To the contrary, the pattern of results suggests a selective deficit in memory for uncertainty, such that relative to certainty, memory for the uncertainty with which testimony was expressed may be disproportionately susceptible to forgetting. It is important to note, however, that the present findings do not provide conclusive evidence for the hypothesis that memory for certainty is better preserved than memory for uncertainty. Whereas the finding that participants no longer disbelieve uncertain testimony after a delay provides clear evidence that they no longer remember the uncertainty (otherwise, they should continue disbelieving it), the finding that belief ratings of certain testimony do not change over a delay does not permit clear inferences about participants’ memory for certainty. Although undiminished memory for certainty can be expected to produce belief ratings that remain stable over a delay (the finding observed here), it is also true that
participants may endorse belief in a piece of testimony for reasons other than remembering that the witness was confident in that piece of testimony. For example, even in the absence of memory for the confidence with which a piece of testimony was expressed, participants may assume that it was delivered with certainty. Alternatively, after a delay, participants may rely on their global assessment of the witness’s credibility when making belief judgments, and—in the absence of evidence to the contrary—endorse belief in any testimony delivered by a credible witness. Hence, verifying whether memory for certainty is more durable than memory for uncertainty will require conducting studies where participants’ memory for the uncertainty and certainty with which individual pieces of testimony were delivered is directly assessed over several retention intervals.

The finding that people are prone to forgetting witness uncertainty fits with the related finding that people sometimes forget their own uncertainty. For example, studies of the forced fabrication effect have shown that witnesses who are initially highly uncertain in those aspects of their testimony that are mere guesses and speculation (as they should be), nevertheless come to develop confident beliefs and even false memories for their previously uncertain testimony in as little as one week’s time (Ackil & Zaragoza, 1998; Zaragoza et al., 2001; Frost et al., 2003; Hanba & Zaragoza, 2006; Chrobak & Zaragoza, 2008; Ackil & Zaragoza, 2011). Given the finding that people are prone to forgetting that they, themselves, were uncertain in their guesses and speculations, perhaps it is not surprising that people’s memory for others’ uncertainty is also tenuous.

It should be noted, however, that in the current experiments, participants listened to the witness’s testimony while reading a transcript, and hence had to rely on verbal information alone when making belief judgments. It is possible that if participants had been able to view the
witness providing testimony, there would have been visual cues to uncertainty and certainty (e.g., body language and demeanor) to augment and reinforce the verbal cues, resulting in better memory for witness uncertainty (see, e.g., Campos & Alonzo, 2006 for evidence that both auditory and visual information about a speaker leads to better memory for conversations than auditory information alone). Nevertheless, although there may be circumstances that enhance jurors’ memory for witness uncertainty relative to what was observed here, the novel finding was that after a delay of one week, participants no longer disbelieved uncertain testimony, thus providing evidence that memory for uncertainty faded quickly.

Why might people be especially prone to forgetting that a piece of testimony was provided with uncertainty? One potential explanation for this finding is that participants forgot this uncertainty to reduce cognitive discomfort. Uncertainty, or having gaps in our knowledge, can cause discomfort and even distress, and for this reason people are motivated to reduce uncertainty (Loewenstein, 1994; Sieff, Dawes & Loewenstein, 1999). Hence, it is possible that people are motivated to forget uncertainty and remember information as being more credible than it actually was.

Another potential explanation is that people may be biased to assume that information they remember well is valid, and because of this default assumption, they do not engage in the effortful search for cues that could raise doubts about its credibility. For example, it could be the case that if some piece of testimony is highly familiar or comes to mind readily, people assume that the information must have been delivered or presented in a confident manner, or they would not have taken the time or effort to encode it in the first place. Consequently, they fail to engage in a systematic search for information about the specific context in which the information was acquired (see, e.g., Johnson, Kounios, & Reeder, 1994, for evidence that retrieval of source
specifying is effortful and cognitively demanding). Understanding why people are prone to forgetting uncertainty remains an important question for future research.

The current findings underscore how the dynamic nature of memory can impact jurors’ beliefs about the credibility of witness testimony. Although over the short-term, participant-jurors were quite adept at disbelieving uncertain testimony, in the span of just one week, their belief in uncertain testimony was inflated. A review of the literature on jurors’ evaluations of witness testimony reveals that virtually all studies have assessed jurors’ perceptions of the witness almost immediately after the testimony has been provided. The present studies show that such findings may not generalize to situations where jurors’ assessment of a witness’s testimony is delayed. From a practical perspective, delayed judgments about a witness’s testimony are likely the norm for jurors, given that court cases typically span long periods of time. Hence, a critically important direction for future research is to assess the time course of participant-jurors’ memory for the various aspects of a witness’s testimony, especially those dimensions of the witness’s testimony (such as the uncertainty with which it was delivered) that bear directly on evaluating its validity. Moreover, it will be important to do so over retention intervals that exceed the one-week delay employed here.

Finally, it should be noted that the implications of the current findings extend beyond legal and courtroom scenarios. This issue of attending to, and remembering, a speaker’s uncertainty when delivering information is one that affects even the most routine aspects of our daily lives. In any given day, we receive information from people—both experts, like doctors or teachers, and laypeople, like our friends and family—that likely varies in the degree of confidence with which it is provided. Consider an instructor giving a lecture: As they give the lesson, they are very certain when reporting some information, such as definitions or core
concepts, but they are less certain in regards to other information, such as an answer to a complicated question posed by a student. Extrapolating from the current findings, we can predict that the students attending to the instructor’s lecture will likely have no problem perceiving these differences in the confidence with which the information is delivered. However, the current findings also predict that, over time, memory for these differences may be forgotten, and even the information presented with uncertainty may be accepted as valid by the students. These same variations in confidence are present whenever we have a conversation or listen to others speak. This is why it is so important to understand how people’s memory for a speaker’s confidence changes over time: If we fail to remember the confidence with which material was provided, we may be mistakenly accepting questionable information as truth.
REFERENCES


### Critical items and final responses

<table>
<thead>
<tr>
<th>Critical Item</th>
<th>Interviewer’s Question</th>
<th>Final Witness Response</th>
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<tbody>
<tr>
<td>1</td>
<td>Can you remember what type of hat Josh was wearing?</td>
<td>Maybe a baseball cap.</td>
</tr>
<tr>
<td>2</td>
<td>Can you remember what Timmy was wearing?</td>
<td>A bandana, I guess.</td>
</tr>
<tr>
<td>5</td>
<td>Do you know what [Josh and Timmy] were doing [at the camp’s trading post]?</td>
<td>They might’ve been buying a pocketknife.</td>
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</table>
Table 2

Illustration of the 5 conditions employed in Experiments 1 and 2. In this example, the same critical item is rotated through all conditions, but for each participant, a different critical item served in each of the 5 conditions.

2 Uncertainty Cues (2U): Overt expressions of uncertainty & 3 prompts
I: Can you remember what type of hat Josh was wearing?
W: No, I don’t remember him wearing a hat.
(1) I: It’s essential that you try to remember this. This information could help us identify him.
W: I don’t remember any hat.
(2) I: Take your time.
W: I really don’t know what kind of hat he was wearing.
(3) I: What kind of hat could it have been?
W: Maybe a baseball cap.

1 Uncertainty Cue–Direct (1U-D): Overt expressions of uncertainty & 1 prompt
I: Can you remember what type of hat Josh was wearing?
W: No, I don’t remember him wearing a hat.
(1) I: It’s essential that you try to remember this. This information could help us identify him.
W: Maybe a baseball cap.

1 Uncertainty Cue–Indirect (1U-I): 3 prompts & no overt expressions of uncertainty
I: Can you remember what type of hat Josh was wearing?
W: What hat Josh was wearing?
(1) I: It’s essential that you try to remember this. This information could help us identify him.
W: Oh. Um…what kind of hat?
(2) I: Take your time.
W: Um…it might’ve…no…
(3) I: What kind of hat could it have been?
W: Maybe a baseball cap.

0 Uncertainty Cues: (0U): 1 Prompt, no overt expressions of uncertainty
I: Can you remember what type of hat Josh was wearing?
W: What hat Josh was wearing?
(1) I: It’s essential that you try to remember this. This information could help us identify him.
W: Maybe a baseball cap.

No-prompt
I: Can you remember what type of hat Josh was wearing?
W: Maybe a baseball cap.

Belief Rating Task Item:
Josh was wearing a baseball cap, while he gave the tour.
Table 3

Illustration of the 5 conditions employed in Experiment 3. In this example, the same critical item is rotated through all conditions, but for each participant, a different critical item served in each of the 5 conditions.

2 Uncertainty Cues (2U)
I: Can you remember what type of hat Josh was wearing?
(3s) W: I really don’t remember…um, maybe a baseball cap.

1 Uncertainty Cue (1U)
I: Can you remember what type of hat Josh was wearing?
(3s) W: Um…maybe a baseball cap.

Intermediate
I: Can you remember what type of hat Josh was wearing?
(2s) W: Maybe a baseball cap.

1 Confidence Cue (1C)
I: Can you remember what type of hat Josh was wearing?
(1s) W: A baseball cap.

2 Confidence Cues (2C)
I: Can you remember what type of hat Josh was wearing?
(1s) W: Oh, I’m positive it was a baseball cap.

Belief Rating Task Item:
Josh was wearing a baseball cap, while he gave the tour.
APPENDIX A

FILLER QUESTIONS AND RESPONSES

1. **Interviewer question:** Can you remember what was happening, that morning?

   **Witness response:** Yeah, a group of ladies came to visit. Uh, they were gonna give money to the camp.

2. **Question:** What was it that [the head of the camp] had asked them to do?

   **Response:** Oh yeah, he wanted them to give the ladies a boat tour. To show them the camp.

3. **Question:** Did anything out of the ordinary happen during the tour on the lake?

   **Response:** Yeah, they found a snake on the boat, and the ladies started to freak out. Some of them even jumped out of the boat.

4. **Question:** So after the snake was found, and the group of women reacted to it, what happened?

   **Response:** Uh, the ladies swam to another boat, and then Josh killed the snake.

5. **Question:** Did anything else happen while the group of women was there? Anything else at all?

   **Response:** Well…oh, right! After Josh killed the snake, the ladies clapped and said he was a hero. And [the head of the camp] let him start a wrestling program, because he was proud.

6. **Question:** Okay, did anything happen between the boys after that?

   **Response:** [A bully] shoved Timmy into the water and started dunking his head under.
**APPENDIX B**

**BELIEF RATING TASK**

Eyewitness memory can be incomplete because people forget or are not paying enough attention. Sometimes, eyewitnesses make mistakes. Below, you will find statements that were provided in the testimony you just listened to. We will now ask you to rate your confidence that the events described in each statement actually happened. Please circle one number to best represent your certainty that each item actually took place.

1. A group of women visited the camp with the intention to donate money.

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2. The camp counselors took the ladies on a tour of the camp, on canoes.

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3. Josh was wearing a baseball cap, while he gave the tour.

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4. Nothing out of the ordinary happened during the boat tour.

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5. Josh killed a snake.

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6. Timmy was wearing a bandana around his neck, when he was on the dock.

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7. The camp started up a wrestling program.

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8. Timmy was accused of stealing Moose’s watch.

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9. Moose dunked Timmy in the lake, when he got angry at him.

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10. Josh gave Timmy a blanket to keep warm.

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11. Timmy and Josh bought a pocketknife at the camp’s trading post.

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