



Empirical article

Do Multiple Doses of Feedback Have Cumulative Effects on Eyewitness Confidence?



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We tested whether multiple doses of feedback have cumulative effects on eyewitness-identification confidence. In Experiment 1, participants made mistaken identifications and received or did not receive three forms of confirming feedback: (1) co-witness feedback; (2) vague feedback from the experimenter (“You’ve been a good witness”); and (3) inference-based feedback, in which eyewitnesses were led to infer that their identification was accurate. Co-witness feedback and inference-based feedback independently inflated eyewitness confidence, providing some evidence of cumulation. In Experiment 2, participants received or did not receive co-witness feedback and/or inference-based feedback following their mistaken lineup identifications. Two doses of feedback produced significantly higher confidence than did one dose of feedback, demonstrating significant cumulation. These findings suggest that multiple doses of subtle post-identification feedback can cumulate to have large distorting effects on later testimony.

Keywords: Eyewitness identification, Post-identification feedback, Eyewitness confidence, Eyewitness testimony

General Audience Summary

Eyewitness-identification testimony from highly confident, yet mistaken eyewitnesses has contributed to hundreds of wrongful convictions in the United States (www.innocenceproject.org, 2020). But this fact is somewhat puzzling because controlled laboratory studies show that eyewitnesses rarely make mistaken identifications with high confidence. A plausible explanation for this discrepancy is that eyewitnesses become increasingly confident leading up to trial because they are exposed to confirming post-identification feedback following their identifications. Confirming post-identification feedback is information communicated to an eyewitness that the eyewitness correctly identified the culprit. Although extensive research has demonstrated that confirming feedback inflates eyewitness confidence, this research has not yet fully accounted for the extremely high confidence levels sometimes observed in real cases of eyewitness misidentification (e.g., [Garrett, 2011](#)). The goal of the current research was to test whether exposing eyewitnesses to multiple doses of confirming post-identification feedback, as typically occurs in real cases, cumulatively inflates eyewitness confidence beyond the levels of confidence inflation produced by a single dose of feedback. In two experiments, participant-eyewitnesses watched a video of a mock-crime and then made mistaken identifications from a lineup that did not contain the actual culprit. These mistaken eyewitnesses then received no confirming feedback, one dose of confirming feedback, or multiple doses of confirming feedback, after which they reported their confidence in their

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Data for this research are available at <https://osf.io/3xy6g/>.

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identification and answered a number of testimony-relevant questions typically asked of witnesses at trial. The results indicated that multiple doses of feedback independently inflated eyewitness confidence (Experiments 1 & 2) and led to significantly greater levels of confidence compared to a single dose of feedback (Experiment 2). These findings suggest a process by which initially-unconfident eyewitnesses come to express extremely high levels of confidence at trial, as is often observed in wrongful conviction cases involving mistaken eyewitness identification.

Eyewitness-identification testimony from highly confident, yet mistaken eyewitnesses has contributed to hundreds of wrongful convictions to date in the United States (innocence-project.org, 2020). This is somewhat puzzling, however, because controlled laboratory studies show that when eyewitnesses make a mistaken identification they rarely do so with high confidence (see [Wixted & Wells, 2017](#)). The key to this puzzle is to recognize the sharp distinction between eyewitness confidence measured at the time of the identification and confidence measured at a later point in time. Indeed, a review of the first 250 DNA exonerations indicates that eyewitnesses whose mistaken identifications ultimately led to wrongful convictions were not confident in their identifications at the time they made them: Some expressed uncertainty during the identification procedure; some reported not having been able to see the culprit's face at the time of the crime; and still others identified someone else prior to identifying the defendant. Yet time and again, these eyewitnesses went on to provide highly compelling trial testimony, with many reporting absolute confidence in their identifications ([Garrett, 2011](#)). How did these eyewitnesses become transformed from uncertain witnesses to highly confident and compelling witnesses on the stand?

Perhaps the single best explanation for the inflation of eyewitness confidence is the post-identification feedback effect ([Smalarz & Wells 2015](#); [Wells & Bradfield, 1998](#)). Post-identification feedback is information shared with an eyewitness following an identification decision that implies the eyewitness's decision was correct or incorrect. Confirming post-identification feedback (e.g., "Good job, you identified the suspect") has been shown to inflate eyewitnesses' reports of their identification-time confidence as well as distort their recollections of other testimony-relevant judgments, such as how good of a view they had during witnessing and how easily they were able to make an identification from the lineup (see meta-analysis by [Stebly, Wells, & Douglass, 2014](#)). Post-identification feedback effects have been documented among eyewitnesses as well as ear-witnesses ([Quinlivan et al., 2009](#)); among children, college students, and older adults ([Hafstad, Memon, & Logie, 2004](#); [Neuschatz et al., 2005](#), respectively); for affirmative identifications as well as non-identifications ([Semmler, Brewer, & Wells, 2004](#)); following a forensically-relevant instruction to ignore the feedback ([Lampinen, Scott, Pratt, Leding, & Arnal, 2007](#)); and, importantly, among real crime eyewitnesses ([Wright & Skagerberg, 2007](#)).

Although post-identification feedback effects have been widely documented in the empirical literature, research has not yet fully accounted for the extremely high confidence levels

sometimes observed in real cases of eyewitness misidentification. As documented by [Garrett's \(2011\)](#) analysis of the first 250 DNA exonerations, it is not unusual for mistaken eyewitnesses to report at trial that they were 100% confident, or even more than 100% confident, about their identification. Yet in most post-identification feedback studies, fewer than a third of eyewitnesses who have received confirming feedback report such extreme confidence levels (i.e., 8 and above on a 10-point scale; [Stebly et al., 2014](#)). One possibility is that extremely high-confidence eyewitnesses observed in real cases are relatively rare, even following confirming post-identification feedback. Another possibility is that post-identification feedback studies to date have not operationalized feedback in a manner that captures what occurs in real cases.

It has been argued that witnesses are exposed to multiple, repeated forms of feedback over the duration of a case ([Stebly et al., 2014](#)). Varied sources of feedback include lineup administrators' verbal or nonverbal behaviors during non-blind lineup procedures (e.g., [Charman & Quiroz, 2016](#); [Greathouse & Kovera, 2009](#)); remarks made by a case detective following the conclusion of a blind lineup procedure; comments from co-witnesses (e.g., [Skagerberg & Wright, 2008](#)); conversations with prosecution and defense attorneys; and media coverage of the case. Still other forms of feedback may occur in real cases but have received little empirical attention, such as when the eyewitness learns about other evidence against the suspect (e.g., a confession; an incriminating statement from an informant or co-conspirator). Even in the absence of these explicit forms of feedback, witnesses will likely make inferences about whether or not their identification was correct based on how the case progresses. For example, an eyewitness whose testimony is solicited in a pre-trial hearing is likely to infer that the person they identified is the culprit whereas an eyewitness who is asked to return the police station to attempt a new identification is likely to infer that the prior identification was inaccurate. To date, we know very little about the potential effects of multiple forms of feedback on eyewitness confidence.

There are reasons to predict that the multiple doses of feedback could increase eyewitness confidence beyond the level produced by a single dose. Research on repeated exposure to misleading post-event information indicates that misinformation presented multiple times is more likely to be misremembered than misinformation presented only once ([Mitchell & Zaragoza, 1996](#); [Zaragoza & Mitchell, 1996](#)). A number of studies have also shown that questioning someone repeatedly about their memory of an event increases confidence in that memory, regardless of whether or not the memory is accurate (e.g., [Shaw,](#)

1996; Shaw & McClure, 1996). Accordingly, we predicted that repeated reinforcement of a witness's identification through the delivery of multiple doses of confirming feedback will inflate eyewitness confidence beyond the levels of inflation produced by a single dose.

One study provides some evidence in support of our feedback-cumulation hypothesis. In their research examining the effects of source credibility on post-identification feedback effects, Skagerberg and Wright (2009) conducted an online study that tested whether outcome feedback from the computer (e.g., "Good, you identified the suspect.") or statistical co-witness feedback (e.g., "92% of other participants gave the same response") had a stronger effect on participants' self-reports. The results indicated independent effects of the two forms of feedback, though exploratory analyses suggested that statistical co-witness feedback inflated witnesses' judgments only in the absence of outcome feedback, perhaps because the outcome feedback stated definitively that the witness was correct and thus overpowered the effects of the co-witness feedback. In real cases, confirming post-identification feedback may often be less definitive, thus warranting further investigation of the possibility of cumulative feedback effects.

Although we predict that there will be dosage cumulation for the post-identification feedback effect, there are legitimate theoretical reasons to speculate that multiple doses of post-identification feedback will not cumulate. The feedback effect is thought to occur only under conditions in which the eyewitness did not already form a retrievable memory trace for confidence, view, attention, and other retrospective self-reports prior to receiving feedback (Wells & Bradfield, 1998). The idea is that eyewitnesses do not think about their confidence and other retrospective judgments until they are asked about them, which makes their recollections malleable (Charman, Carlucci, Vallano, & Gregory, 2010; Wells & Bradfield, 1998). Consistent with this conceptualization, having eyewitnesses think privately about their confidence prior to manipulating feedback moderates the post-identification feedback effect (e.g., Neuschatz et al., 2007; Quinlivan et al., 2009; Wells & Bradfield, 1999). It is possible that an initial dose of feedback triggers eyewitnesses to think about their confidence, which gives them a retrievable memory trace for how confident they were after the first dose. As a result, a second feedback dose might produce little or no additional retrospective distortion.

Most experiments on the post-identification feedback effect have operationalized feedback as a comment from the lineup administrator that the witness identified the suspect (Stebly et al., 2014). Although this feedback operationalization captures statements realistically made by police, such feedback may be perceived as a definitive confirmation of identification accuracy in a lab setting in which participants know that the experimental materials were created by the researchers and hence the correct response is known. And yet, we know that definitive confirmation is not necessary for showing the post-identification feedback effect. For example, we know that the effect occurs in actual cases as soon as the witness is told that they identified a filler or identified the suspect (Wright & Skagerberg, 2007) or even in response to the comment "You have been a really great wit-

ness" (Dysart, Lawson, & Rainey, 2012). To test the hypothesis that distinct forms of feedback exert cumulative effects on eyewitnesses' retrospective confidence, we utilized three different forms of feedback that are individually less definitive than what is typically used as feedback: (1) feedback from a co-witness who remarked that they had identified the same person as the participant (e.g., Luus & Wells, 1994), (2) feedback from the lineup administrator that the participant had been a "good witness" (e.g., Dysart et al., 2012) and (3) feedback that was implied based on the participant's understanding of how the experiment was to progress following their identification.

Despite its ubiquity in real eyewitness identification cases, the third form of feedback utilized in the current research, which we will term *inference-based feedback*, has never to our knowledge been examined in the literature. As described above, it has been theorized that witnesses infer feedback about their identification accuracy based on how the case progresses following their identification decision. We attempted to approximate this type of inference-based feedback by manipulating participants' expectations about how the experiment would proceed following their identification. In all experimental sessions, the experimenter invited the participant to return to the lab for a second session, ostensibly to answer additional questions about their identification decision (no second session actually occurred). In the control *no-inference* condition, participants were led to believe that all witnesses were invited back for a second session, regardless of their identification accuracy. In the *accurate-inference* condition, however, participants were led to believe that only witnesses who made an accurate identification were invited back for a second session. As described in the Method section, this manipulation was delivered by the confederate co-witness and thus did not provide conclusive information about the implication of the experimenter's invitation to return for a second session. This operationalization was designed to capture the implied yet uncertain confirmation inferred by eyewitnesses in response to various events that occur in real cases (e.g., meeting with a prosecutor; testifying in a pre-trial hearing; etc.).

Statistical Hypotheses

Statistical evidence of cumulative feedback effects could manifest in one of two ways. One possibility is that different forms of feedback have simultaneous main effects on eyewitness confidence. Such a pattern would suggest that distinct forms of feedback independently (and potentially cumulatively) affect eyewitnesses' confidence. A second possibility is that different forms of feedback interact such that one form of feedback has larger effects in the presence of another form of feedback. Such a pattern would suggest not only that multiple forms of feedback cumulate but also that additional doses of feedback strengthen the impact of a single dose of feedback. We did not have any theoretical reason to predict that multiple doses of feedback would strengthen the effect of a single dose of feedback; therefore, we expected evidence of cumulation to take the form of significant main effects in the absence of an interaction. In addition to testing for main and interactive effects of multiple doses of feedback, we conducted pairwise compar-

isions of eyewitnesses' reports following multiple doses versus a single dose of feedback to more directly test for cumulation effects. Finally, we examined the effects of multiple doses of feedback on eyewitnesses' identification confidence as well as other testimony-relevant judgments (e.g., witnesses' reports of the quality of their view and willingness to testify about their identification).

Experiment 1

Method

Design and participants. The study used a 2 ("Good witness" comment: Confirming feedback vs. No feedback) \times 2 (Co-witness feedback: Confirming feedback vs. No feedback) \times 2 (Inference-based feedback: Accurate inference vs. No inference) between-participants design. A power analysis conducted using GPower (Erdfeider et al., 1996) indicated that 191 participants were needed to achieve at least 80% power to detect main effects of our feedback manipulations equivalent to the approximate size of the statistical co-witness feedback effect observed in Skagerberg and Wright (2009). We continued data collection until the end of the semester and concluded the study with a total of 286 participants. Participants were undergraduates at a large Midwestern university who participated in the experiment to satisfy a course requirement.

Materials and measures.

Stimulus video. The stimulus video depicted an airport scene in which a suspicious individual switched his luggage bag with another passenger's bag at the check-in line. After switching the bag, the culprit exited the airport. The video lasted 1 min 28 s and showed multiple clear views of the culprit's face.

Photo lineup. We used a culprit-absent lineup and instructions that implied the presence of the culprit in the lineup ("Do your best to identify the person who you saw switch the bags.") in order to secure as many mistaken identifications as possible (Stebly et al., 2014). The culprit-absent lineup consisted of six photos of individuals who fit the description of the man who switched the bags in the video and was presented on an 8.5" \times 11" sheet of paper.

Dependent measures. Participants completed measures of their identification confidence and their recollections of the witnessing experience. Confidence was collected on a ten-point scale ranging from 10% confident to 100% confident (*confidence*). The other retrospective self-report questions asked participants about the quality of their view during witnessing (*view*), how well they were able to make out specific features of the culprit's face (*face*), how much attention they paid to the culprit's face during witnessing (*attention*), the extent to which they had a good basis to make an identification (*basis*), how easy or difficult it was for them to figure out which person in the lineup was the culprit (*ease*), how long it took them to make their identification (*time*), how willing they would be to testify in court about their identification (*willing*), how good their recognition memory tends to be for faces of strangers (*strangers*) and how clear of an image they had in their memory of the culprit (*image*).

These retrospective self-reports were measured on eleven-point scales ranging from 0 to 10.

Suspicion check. Participants responded to a suspicion check question that stated, "Sometimes experiments study questions that are not obvious. Do you believe that is the case in this experiment?" Participants were able to select either "Yes" or "No." Participants who selected "Yes" were then asked to indicate what they believed might be under investigation in the experiment. Due to a programming error, 29 participants did not respond to this suspicion-check question. These participants were not differentially distributed across the experimental conditions and thus were retained in the sample, $\chi^2(7) = 4.56, p = .714$.

Manipulation checks. Participants responded to three manipulation check questions pertaining to each of the experimental manipulations. For the co-witness feedback manipulation check, participants responded "Yes" or "No" to a question about whether the other participant told them that they had picked the same person from the lineup. For the inference-based feedback manipulation check, participants were asked to select from two options indicating what they had been told by the other participant in this study: (1) *That witnesses who made a correct identification would be asked to return for a second session* or (2) *That all witnesses would be asked to return for a second session, regardless of whether or not they made a correct identification*. For the "good witness" feedback manipulation, participants were asked, "When the experimenter collected your lineup right after you made an identification, did s/he give you the impression that you made a correct identification?" with the option to select "Yes" or "No."

Procedure. Participants arrived at the lab along with a research confederate who was posing as a fellow participant. The experimenter welcomed both students into the lab and explained that the purpose of the study was to examine people's tendencies to form impressions about other people, even after viewing them for a short time. The experimenter explained that the students would watch a short video and then answer questions about what they watched. After obtaining informed consent, the experimenter directed the two students into separate lab cubicles to watch the video privately. After the video ended, the experimenter re-entered each student's cubicle and explained that the study was actually about eyewitness identification. The experimenter further explained that the students would be shown a photo lineup of individuals who matched the description of the culprit from the video and that the students' task was to identify the culprit from the lineup.

"Good witness" manipulation. All participants were left alone in their cubicle to complete the lineup identification form. Participants in the "good witness" no-feedback condition were instructed to place their lineup sheet inside a mailing envelope whereas participants in the "good witness" feedback condition were not given an envelope. Participants were instructed to open the cubicle door when they were finished. Upon re-entering the room, the experimenter asked, "So you've made your identification?" After participants responded that they had, the experimenter collected the lineup sheet (or the mailing envelope containing the lineup sheet) and remarked, "Thanks, you've been a good witness." In the confirming "good witness" feed-

back conditions, the “good witness” remark was made after inspecting the eyewitness’s identification response on the lineup sheet. In the “good witness” no feedback conditions, the lineup sheet was not visible to the experimenter. Hence, consistent with [Dysart et al. \(2012\)](#), the experimenter’s remark that the participant had been a “good witness” should have been perceived as potentially informative feedback regarding accuracy only when the experimenter was able to view the witness’s lineup response.

Co-witness feedback. Following the experimenter “good witness” feedback manipulation, the experimenter directed both students to return to the main lab room under the guise of needing to set up their computers for the next portion of the study. Once the two students were alone in the main room, the confederate initiated an ostensibly spontaneous conversation with the participant by asking if the participant had seen the video “with the guy in the airport.” In the co-witness feedback conditions, the confederate then asked the participant who they had picked and replied “Nice, me too.” following the participant’s response. In the no co-witness feedback conditions, the confederate did not ask the participant who they picked and was instructed to provide the following response if the participant asked who the confederate had identified, “*I can’t remember the number, but my roommate did this study and s/he said that they switch the order of the pictures every time, so we might not have even had the same lineup.*” Three participants asked the confederate who they had identified.

Inference-based feedback. Participants’ inferences about their identification accuracy were manipulated through comments from the confederate. In the accurate-inference conditions, participants were led to believe that witnesses who made an accurate identification would be asked to return to the lab for a second session. In the no-inference conditions, participants were led to believe that all witnesses in the study would be asked to return to the lab for a second session, regardless of whether their identification decision was correct. This information was delivered by the confederate while the experimenter was out of the room. In the accurate-inference condition, the confederate said:

“My roommate did this study and s/he told me that if you identify the right guy, they ask you to come back for a second session. S/he just came back to do it yesterday and I guess s/he had to get videotaped talking about who s/he identified or something.”

In the no-inference condition, the confederate said,

“My roommate did this study and s/he told me that they’re going to ask us if we’ll come back for a second session. S/he didn’t even pick the right guy and they still asked him/her to come back. S/he just did the second session yesterday and I guess s/he had to get videotaped talking about who s/he identified or something.”

In both conditions, the experimenter returned to the main lab room shortly after the conversation between the participant and the confederate had ended and announced that the computers were ready for the next part of the study. After bringing the participant back into their individual cubicle, the experimenter

asked the participant if they would be willing to return to the lab in a week to answer some additional questions. Thus, all participants were invited to return for a second session, but participants should have made an inference about their accuracy only when the confederate had informed them that accurate eyewitnesses are invited to the second session. When the confederate informed them that all eyewitnesses are invited to the second session, participants should not have drawn any inferences about their accuracy from the invitation to participate in the second session.

Finally, the experimenter left the participant alone to complete the dependent measures followed by the suspicion check question and manipulation check questions. After completing these questions, the participant returned to the main lab room. The experimenter provided a full debriefing regarding the purpose of the study, informed the participant that there would not be a second session, and asked the participant not to tell other students at the university about the purpose of the study until the semester had ended.

Results

Exclusions and manipulation checks. We excluded participants who did not make an identification from the lineup ($n = 6$), participants in the co-witness feedback condition who refused to tell the confederate who they picked ($n = 9$), and participants for whom the experimental manipulations were not properly administered because of session issues ($n = 7$). We also excluded a participant who correctly guessed the true purpose of the study during the suspicion probe (i.e., indicated they believed the study was testing the effect of comments from the experimenter or confederate on their confidence; $n = 1$) or participants who indicated having knowledge of the effects of confirming feedback on eyewitness confidence ($n = 3$). Analyses were conducted on the final sample of 260 participants.

The majority of participants responded correctly to the manipulation check question regarding co-witness feedback (96.5%) and to the question regarding the reason for being invited back for a second session (83.8%). Fewer participants (61.5%)—though still the majority—responded correctly to the manipulation check question about the “good witness” feedback. All participants were retained for analyses.

Primary analyses.

Identification confidence. We tested the hypothesis that multiple doses of feedback have cumulative effects on eyewitness confidence using a 2 (“Good witness” comment: Confirming feedback vs. No feedback) \times 2 (Co-witness feedback: Confirming feedback vs. No feedback) \times 2 (Inference-based feedback: Accurate inference vs. No inference) univariate analysis of variance (ANOVA). The results indicated that the good-witness manipulation did not significantly affect eyewitness confidence, $F(1, 252) = 0.84, p = .362$. There was, however, a significant main effect of co-witness feedback, such that witnesses who received confirming feedback from the co-witness were more confident in their identifications ($M = 67.72, SD = 22.61$) than were witnesses who did not receive feedback from the co-witness ($M = 59.85, SD = 23.67$), $F(1, 252) = 7.09, p = .008, d = .33, 95\% CI [.09, .58]$. There was also a significant main

effect of inference-based feedback, such that witnesses who were led to believe that only accurate eyewitnesses would be invited back for a second session were more confident in their identifications ($M = 67.36$, $SD = 20.60$) than were witnesses who were led to believe that all eyewitnesses—whether accurate or inaccurate—would be invited back for a second session ($M = 60.07$, $SD = 25.41$), $F(1, 252) = 5.91$, $p = .016$, $d = .30$, 95% CI [.06, .55]. None of the interactions were significant, $F_s \leq 3.85$, $p_s \geq .051$. Consistent with our prediction, the presence of multiple significant main effects of feedback in the absence of an interaction indicate that distinct forms of feedback can simultaneously and independently inflate eyewitness confidence.

We conducted a more direct test of the cumulation hypothesis by examining whether witnesses who received both co-witness feedback and inference-based feedback exhibited greater confidence inflation than that produced by either form of feedback on its own. Because the “good witness” manipulation was not significant, we collapsed over that manipulation and performed two contrast analyses: one that compared the confidence levels of witnesses who received *either* co-witness feedback *or* inference-based feedback to those of witnesses who received no feedback, and a second contrast that compared the confidence levels of witnesses who received *both* co-witness feedback and inference-based feedback to those of witnesses who received only one or the other form of feedback. Consistent with past findings on the post-identification feedback effect, witnesses were more confident in their identification following a single dose of confirming feedback ($M = 66.80$, $SD = 23.07$) than when they received no feedback ($M = 53.89$, $SD = 24.30$), $t(256) = 3.84$, $p < .001$, $d = .57$, 95% CI [.27, .86]. Contrary to the cumulation hypothesis, however, witnesses who received two doses of feedback ($M = 68.33$, $SD = 20.01$) were not significantly more confident in their identification than were witnesses who received only one dose of feedback, $t(256) = .43$, $p = .668$.

Other self-reports. We conducted a multivariate analysis of variance (MANOVA) on the nine remaining eyewitness self-report measures (e.g., attention, view, etc.). Means and standard deviations for these measures are shown in Table 1 of the Supplemental Materials. Only the main effect of the inference-based feedback was significant, $F(9, 244) = 3.52$, $p < .001$, partial $\eta^2 = .12$. Participants who were led to believe that only accurate eyewitnesses would be invited back for a second session tended to provide higher ratings on the self-report measures than did participants who were led to believe that all participants would be invited back for a second session. Neither the main effect of the “good witness” feedback nor the main effect of co-witness feedback was significant, $F_s \leq 0.87$, $p_s \geq .556$. There were no significant interactions, $F_s \leq 1.51$, $p_s \geq .143$.

We conducted an additional, stringent test of cumulation for eyewitnesses’ other self-reports by computing a composite measure of those self-reports and performing a one-way ANOVA with two contrast analyses—one that compared the averaged self-reports of witnesses who received one dose of feedback to those of witnesses who received no feedback, and a second contrast that compared the averaged self-reports of witnesses who received two doses of feedback to those of witnesses who received only one dose of feedback. A single dose of feedback

led witnesses to report significantly higher standing on the self-reports ($M = 6.05$, $SD = 1.48$) relative to when no feedback was delivered ($M = 5.36$, $SD = 1.73$), $t(256) = 2.97$, $p = .003$, $d = .44$, 95% CI [.15, .73]. However, witnesses who received two doses of feedback ($M = 6.28$, $SD = 1.57$) did not report significantly greater standing on the self-reports than witnesses who received only one dose of feedback, $t(256) = .94$, $p = .350$.

Discussion

In Experiment 1, we tested the potential cumulative effects of three forms feedback: (1) “good witness” feedback from the lineup administrator, (2) co-witness feedback, and (3) inference-based feedback. The “good witness” feedback did not significantly affect eyewitness confidence, though previous research has shown that the good-witness comment can have an effect (Dysart et al., 2012). A possible reason for this is that it was not made perfectly clear that the lineup administrator knew which lineup member was the correct one. Hence, participants might not have interpreted the “good witness” comment as confirming feedback. Another possibility is that participants in the good-witness control condition did not notice that the experimenter had no way of knowing their identification response. Either way, for current purposes, it is not essential to use three forms of feedback to test the cumulation hypothesis; it can be tested using two forms of feedback. Consistent with the cumulation hypothesis, co-witness feedback and inference-based feedback independently inflated eyewitnesses’ recollections of their confidence. The test comparing confidence among eyewitnesses who received two doses of feedback to that of eyewitnesses who received only one dose of feedback, however, failed to produce significant evidence of cumulation.

One interpretation of this null effect on the stringent test of cumulation is that multiple doses of feedback do not have cumulative effects on eyewitness confidence for the reason that we mentioned in the introduction, namely, that the initial dose triggers a memory trace for confidence and makes witnesses less susceptible to subsequent feedback effects. As mentioned above, however, the presence of significant main effects of both co-witness feedback and inference-based feedback suggest that cumulative feedback effects are possible. An alternative interpretation of this null effect is that the feedback manipulations used in the current experiment were not particularly well-suited to testing the cumulation hypothesis. For example, the co-witness feedback manipulation appears to have been relatively weak: Although co-witness feedback inflated eyewitnesses’ confidence, it did not affect eyewitnesses’ other retrospective self-reports as is typically observed in feedback studies (Steblay et al., 2014).

In Experiment 2, we aimed to conduct a more robust test of the cumulation hypothesis through two means. First, we removed the “good witness” feedback manipulation, which did not affect eyewitnesses’ self-reports but may have contributed additional variance to the data, thereby undermining statistical power to detect cumulative effects of co-witness and inference-based feedback. Second, we modified the confederate’s script to strengthen the co-witness feedback manipulation by making

it clear that the co-witness was confident in their identification decision. Research has shown that co-witness influence effects are strongest when the co-witness expresses high confidence (e.g., Charman et al., 2010; Ost, Ghonouie, Cook, & Vrij, 2008).

Experiment 2

Method

Design and participants. The study used a 2 (Co-witness feedback: Confirming feedback vs. No feedback) \times 2 (Inference-based feedback: Accurate inference vs. No inference) between-participants design. We carried out data collection over the course of three semesters and concluded with a sample of 195 participants. Participants were undergraduates at a small liberal arts college who participated in the experiment to satisfy a course requirement.

Materials and Measures

Experiment 2 used the same materials and measures as were used in Experiment 1 with the exception of methodological features pertaining to the experimenter “good witness” feedback, which was not manipulated in Experiment 2. As in Experiment 1, the confederate was trained that if the participant asked who they identified, the confederate should respond, “*I can’t remember the number, but my roommate did this study and s/he said that they switch the order of the pictures every time, so we might not have even had the same lineup.*” This occurred in two experimental sessions.

Procedure

A few changes were made to the procedure used in Experiment 1. Experiment 2 was conducted in a different laboratory than Experiment 1, and in the new laboratory, noise carried throughout the lab space easily. As a result, the procedure used in Experiment 1 in which the confederate administered the experimental manipulations in the main lab room had to be modified because it would not have been plausible that the experimenter was out of ear-shot of the students during the confederate-administered manipulations. Accordingly, we orchestrated a scenario in which the experimenter left the lab entirely and an ostensibly spontaneous interaction between the two students ensued. The details of this interaction are as follows.

The participant always completed the study in a cubicle that was open to the rest of the lab, whereas the confederate completed the study in a separate, closed lab cubicle. After delivering the lineup sheets to the students, the experimenter claimed that s/he needed to leave the lab to retrieve some materials for the next part of the session. Shortly after the experimenter left, the confederate exited their individual room (ostensibly after having made an identification from the lineup) and wandered around the lab as if in search of a bathroom. The confederate then walked past the participant’s open cubicle and asked, “Excuse me, do you know if there’s a bathroom in here?” Most participants responded that they did not, to which the confederate replied “I guess I’ll just wait until [the experimenter] gets back.” The confederate then gave the appearance of noticing the participant’s

lineup sheet and asked the participant if they saw the video “with the guy in the airport.” The confederate proceeded to deliver the two experimental manipulations, as described in Experiment 1.

Recall that in Experiment 1, the co-witness feedback consisted of the confederate remarking “Nice, me too.” in response to the participant’s statement about who they identified. To strengthen the co-witness feedback manipulation in Experiment 2, the confederate said “Nice, me too.” and then confidently added, “Yeah, it’s definitely him.” The inference-based feedback was the same as in Experiment 1. After completing the inference-based feedback manipulation, the confederate concluded the conversation with the participant by saying “Well, I guess I’ll just go back and wait for [the experimenter].” The confederate returned to their individual lab room, and when the experimenter returned to the lab, the confederate asked to use the bathroom and was directed by the experimenter to the bathroom down the hall in the lab. The experimenter then proceeded to invite the participant to return for a second session and instructed the participant to complete the final questions on the computer.

Results

Exclusions and manipulation checks. We excluded participants who did not make an identification from the lineup ($n = 7$), participants in the co-witness feedback condition who refused to tell the confederate who they picked ($n = 2$), and participants for whom the experimental manipulations were not properly administered because of session issues ($n = 2$). We also excluded participants who either correctly guessed the true purpose of the study during the suspicion probe (i.e., indicated they believed the study was testing the effect of comments from a confederate on their confidence; $n = 8$) or participants who indicated having knowledge of the effects of confirming feedback on eyewitness confidence ($n = 6$). Analyses were conducted on the final sample of 170 participants.

The majority of participants responded correctly to the manipulation check question regarding co-witness feedback (98.8%) and to the question regarding the reason for being invited back for a second session (93.3%). Due to a programming error, 5 participants did not respond to the manipulation-check questions. All participants were retained for the analyses.

Primary analyses.

Identification confidence. We examined the effect of the two feedback manipulations on eyewitness identification confidence using a univariate analysis of variance (ANOVA). Consistent with the results from Experiment 1, both co-witness feedback and inference-based feedback significantly inflated eyewitnesses’ identification confidence. Specifically, witnesses who received confirming feedback from the co-witness were more confident in their identifications ($M = 64.81$, $SD = 19.60$) than were witnesses who did not receive feedback from the co-witness ($M = 55.60$, $SD = 23.95$), $F(1, 166) = 6.19$, $p = .014$, $d = .38$, 95% CI [.08, .69]. Additionally, witnesses who were led to believe that only accurate eyewitnesses would be invited back for a second session were more confident in their identifications ($M = 66.94$, $SD = 18.77$) than were witnesses who were led to believe that all eyewitnesses—whether accurate

or inaccurate—would be invited back for a second session ($M = 52.82$, $SD = 23.69$), $F(1, 166) = 16.88$, $p < .001$, $d = .63$, 95% CI [.32, .94]. The Co-witness Feedback \times Inference-based Feedback interaction was not significant, $F = 0.09$, $p = .766$.

We conducted a more direct test of the cumulation hypothesis by examining whether two doses of feedback significantly inflated eyewitness confidence beyond the level of inflation produced by single dose of feedback. We performed two contrast analyses—one that compared the confidence levels of witnesses who received one dose of feedback to those of witnesses who received no feedback, and a second contrast that compared the confidence levels of witnesses who received two doses of feedback to those of witnesses who received only one dose of feedback (Figure 1). Consistent with past findings on the post-identification feedback effect, witnesses were more confident in their identification following a single dose of confirming feedback ($M = 60.90$, $SD = 21.87$) than when they received no feedback ($M = 48.98$, $SD = 24.17$), $t(166) = 3.04$, $p = .003$, $d = .55$, 95% CI [.19, .92]. In support of the cumulation hypothesis, witnesses who received two doses of feedback ($M = 70.47$, $SD = 15.11$) were significantly more confident in their identification than were witnesses who received only one dose of feedback, $t(166) = 2.44$, $p = .016$, $d = .46$, 95% CI [.09, .84].

Other self-reports. We conducted a multivariate analysis of variance (MANOVA) on the nine remaining eyewitness self-report measures. Means and standard deviations for these measures are shown in Table 2 of the Supplemental Materials. The main effects of co-witness feedback and inference-based feedback were not significant, nor was their interaction, $F_s \leq 1.82$, $p_s \geq .069$. However, univariate analyses using a Bonferroni correction for tests of nine dependent measures ($\alpha = .006$) yielded three significant main effects of the inference-based feedback. Specifically, participants who were led to believe that only accurate eyewitnesses would be invited back for a second session reported a greater willingness to testify, greater ease of identification, and a clearer image of the culprit in

their memory than did participants who were led to believe that all participants would be invited back for a second session, $F_s(1, 166) \geq 8.58$, $p_s \leq .004$, $d_s \geq .45$; all other $F_s \leq 7.18$, $p_s \geq .008$. None of the effects of co-witness feedback were significant at Bonferroni-corrected levels, $F_s \leq 5.08$, $p_s \geq .025$, and there were no significant interactions, $F_s \leq 2.17$, $p_s \geq .142$.

We conducted an additional, stringent test of cumulation for eyewitnesses' other self-reports by computing a composite measure of the self-reports and performing a one-way ANOVA with two contrast analyses—one that compared the averaged self-reports of witnesses who received one dose of feedback to those of witnesses who received no feedback, and a second contrast that compared the averaged self-reports of witnesses who received two doses of feedback to those of witnesses who received only one dose of feedback. A single dose of feedback led witnesses to report significantly higher standing on the self-reports ($M = 5.63$, $SD = 1.49$) relative to when no feedback was delivered ($M = 5.02$, $SD = 1.33$), $t(166) = 2.27$, $p = .024$, $d = .41$, 95% CI [.05, .77]. Witnesses who received two doses of feedback ($M = 6.13$, $SD = 1.48$) also tended to report higher standing on the self-reports than did witnesses who received only one dose of feedback, though this effect was not statistically significant, $t(166) = 1.91$, $p = .057$, $d = .36$, 95% CI [-0.01, .74].

Discussion

Not only did co-witness feedback and inference-based feedback independently affect eyewitnesses' retrospective confidence in Experiment 2, but eyewitnesses who received two doses of feedback were significantly more confident in their identifications than were eyewitnesses who received only one dose of feedback. A non-significant trend for cumulative feedback effects was also observed for witnesses' other self-reports, suggesting the potential for feedback to cumulatively inflate eyewitnesses' reports of other testimony-relevant judgments as well as eyewitness confidence.

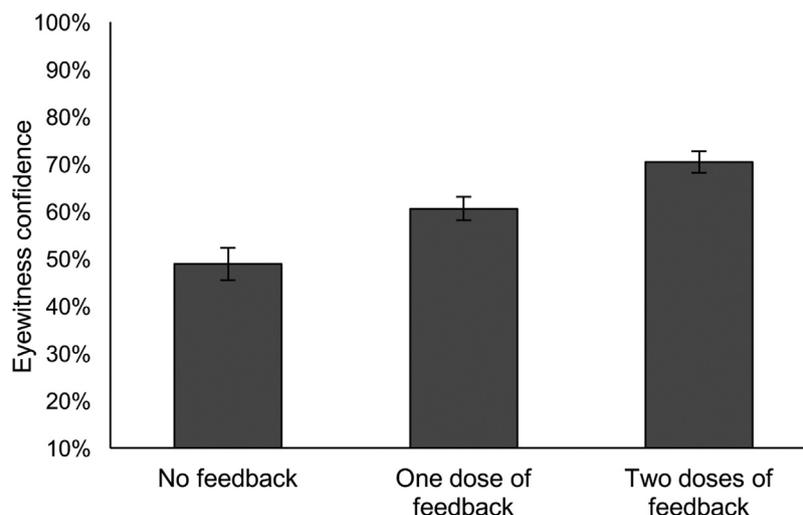


Figure 1. Eyewitness confidence in Experiment 2 for eyewitnesses who received no feedback, one dose of feedback, or two doses of feedback. Error bars denote standard error.

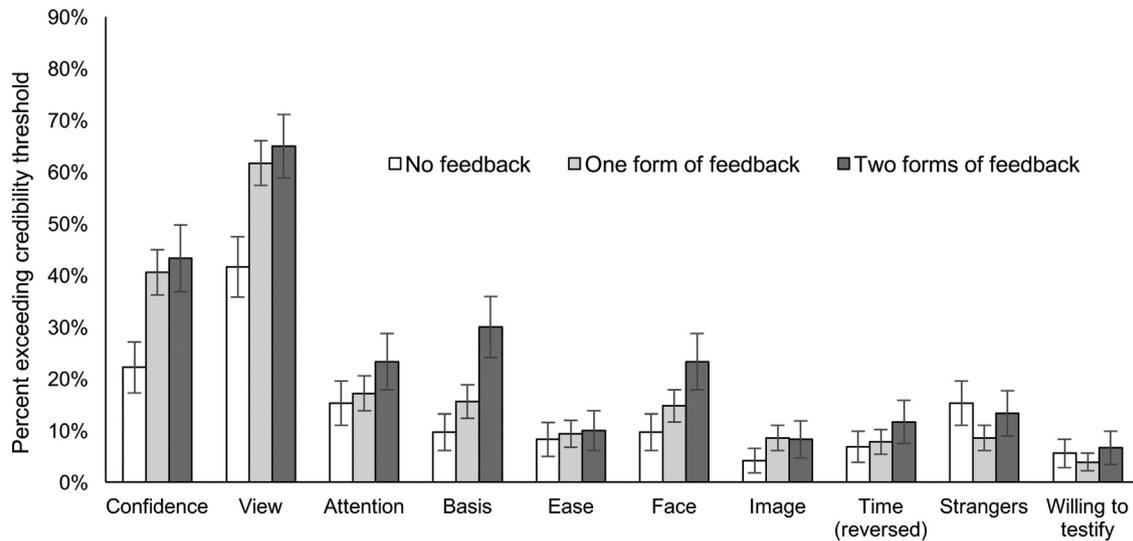


Figure 2. Percent of witnesses in Experiment 1 who met or exceeded the credibility threshold after receiving no feedback, one dose of feedback, or two doses of feedback. The confidence threshold represents eyewitnesses with confidence levels of 80% or higher; for all other measures, the credibility threshold represents eyewitnesses who responded with 8 or higher on a 0 to 10 scale. Error bars denote standard error.

General Discussion

The current research tested whether multiple doses of post-identification feedback have cumulative effects on eyewitnesses' confidence and other testimony-relevant self-reports. In Experiment 1, feedback from a co-witness and inference-based feedback independently inflated eyewitness confidence, but the most direct test of cumulation failed to show greater confidence inflation following two doses of feedback than following one dose of feedback. In Experiment 2, we found stronger evidence of cumulation, with two doses of feedback significantly inflating eyewitness confidence beyond the levels produced by a single dose of feedback. At a theoretical level, these findings are consistent with the notion that witnesses do not think about their confidence or recollections of the witnessed event until they are

first asked about them (Charman et al., 2010; Wells & Bradfield, 1998). Our results suggest that an initial dose of feedback does not prompt witnesses to think about these judgments, and witnesses therefore remain vulnerable to additional feedback effects following the initial dose.

An important consequence of post-identification feedback is that it can increase the likelihood that witnesses will pass a legal threshold of credibility (Stebly et al., 2014; Wells & Bradfield, 1998). The confidence of an eyewitness and other self-reports (i.e., view and attention) are criteria that the U.S. Supreme Court says should be considered by trial courts in deciding the admissibility of eyewitness identification evidence (*Manson v. Braithwaite*, 1977). By inflating eyewitnesses' retrospective self-reports, feedback increases the percentage of witnesses who are likely to be perceived as sufficiently credible to testify. To

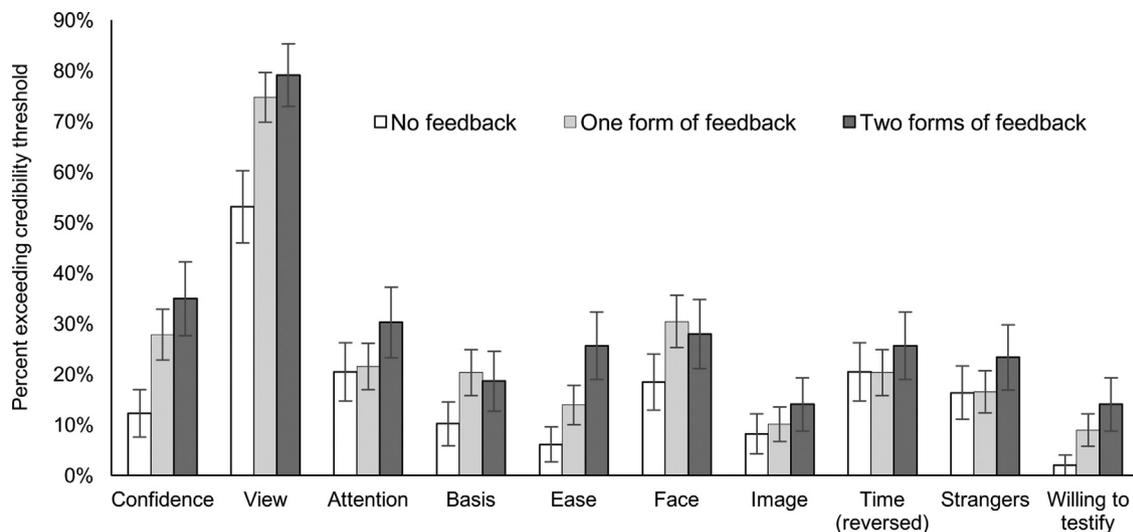


Figure 3. Percent of witnesses in Experiment 2 who met or exceeded the credibility threshold after receiving no feedback, one dose of feedback, or two doses of feedback. The confidence threshold represents eyewitnesses with confidence levels of 80% or higher; for all other measures, the credibility threshold represents eyewitnesses who responded with 8 or higher on a 0 to 10 scale. Error bars denote standard error.

examine the effects of multiple doses of feedback on eyewitness credibility, we calculated the percentage of eyewitnesses in the co-witness feedback and inference-based feedback conditions in both experiments who provided ratings at the high end of the confidence (80% and above) and other self-report (8 or above on the 0 to 10 scale) scales. We present these descriptive data in [Figures 2 and 3](#) as forensically-relevant measures of effect size for feedback cumulation. For many of the eyewitnesses' self-reports, there was a tendency for multiple doses of feedback to boost the percent of witnesses exceeding the credibility threshold beyond the levels produced by a single dose of feedback.

Given that this is the first research directed at testing the post-identification feedback cumulation hypothesis, it is useful to consider the possibility that there are conditions under which cumulation may be more or less likely to occur. For example, one might not expect cumulation to occur if two feedback episodes were informationally redundant, such as when both the lineup administrator and the prosecutor tell the eyewitness that they identified the suspect. On the other hand, exposing people to the same misinformation on repeated occasions increases their confidence in the misinformation, and answering the same question repeatedly can increase confidence in the memory (e.g., [Mitchell & Zaragoza, 1996](#); [Shaw, 1996](#)), so even redundant feedback might produce cumulative inflation effects. Cumulation effects might also depend on factors such as the perceived credibility of the source of the feedback (e.g., [Skagerberg & Wright, 2009](#)) and the potential motivations of the source of the feedback (e.g., [Neuschatz et al., 2007](#); [Quinlivan, Neuschatz, Douglass, Wells, & Wetmore, 2012](#)).

Unanticipated discrepancies in the strength of individual and cumulative feedback effects in the current research further suggest the presence of unidentified moderators. Specifically, we attempted to strengthen the co-witness feedback manipulation in Experiment 2 by having the confederate co-witness express confidence in their identification, but there was a negligible difference in the size of the co-witness feedback effects across experiments ($d = .33$ vs. $d = .38$). On the other hand, the inference-based feedback manipulation was consistent across experiments and yet produced a larger effect on eyewitness confidence in Experiment 2 ($d = .63$) than in Experiment 1 ($d = .30$). One possibility is that differences in characteristics of the study samples in our two experiments—one of which was conducted at a large public university and one of which was conducted at a small, private liberal arts college—might be at least partially responsible for these discrepancies. Although the current research provided an initial demonstration that cumulative feedback effects can occur, a more systematic investigation of when feedback effects are more or less likely to produce cumulation is in order.

A particularly noteworthy finding from the current research was that inference-based feedback, which has never before been studied, had powerful effects on eyewitnesses' retrospective judgments. Across both experiments, inference-based feedback significantly inflated eyewitnesses' recollections of how confident they were at the time of the identification and distorted eyewitnesses' other testimony-relevant judgments. These effects

are particularly impressive given that this feedback did not directly communicate information about the accuracy of the eyewitness's identification. This finding underscores the pervasiveness of feedback effects in real cases and shows that even in the absence of explicit forms of feedback, witnesses are likely to infer feedback based on how the case unfolds. An interesting question remains as to whether more explicit and potentially more powerful forms of feedback are likely to produce cumulation. What would happen, for example, if an eyewitness learned that the identified person confessed to the crime and then learned that the confession led police to new incriminating evidence? Is there an upper limit to the degree of cumulation that could occur for a given eyewitness? We can only speculate at this point, but we think that witnesses' internal cues regarding their own uncertainty at the time of an initial identification may place an upper bound on the amount of distortion that could arise from post-identification feedback. If a witness has no recollection of their uncertainty from the time of an identification, they may be subject to considerable distortion from subsequently-encountered feedback.

Conclusion

Documented cases of wrongful conviction reveal many instances of mistaken eyewitnesses testifying with extremely high levels of confidence. Dean Cage was convicted based on the testimony of an eyewitness who said she was "a hundred percent sure;" in Willie William's case, the witness was "one hundred and twenty" percent sure. Thomas Doswell was misidentified by an eyewitness who testified "This is the man or his twin brother" and rated her certainty as ten on a ten-point scale ([Garrett, 2011](#)). The current research suggests that the presence of multiple and repeated forms of confirming feedback over the course of a criminal investigation, prosecution, and trial may be at least partially responsible for these instances of mistaken eyewitnesses providing extremely high-confidence identification testimony.

These findings confirm the dangers of multiple forms of post-identification feedback and underscore the importance of collecting confidence statements from eyewitnesses immediately at the time of the identification, before eyewitnesses are exposed to confirming feedback or other contaminants. Not only does collecting a confidence statement help to protect eyewitnesses from the distorting influence of subsequently-encountered feedback (e.g., [Quinlivan et al., 2009](#); [Wells & Bradfield, 1998](#)), but perhaps more importantly, it serves as an objective record of the eyewitness's confidence at the time of identification, which can be used by fact-finders to make determinations about the eyewitness's accuracy.

Author contributions

L. Smalarz and G. L. Wells generated the research question and experimental designs. L. Smalarz collected and analyzed the data and drafted the manuscript. G. L. Wells provided critical manuscript revisions.

Conflict of Interest

The authors declare no conflict of interest.

Online Supplement

Supplementary material related to this article can be found, in the online version, at <https://doi.org/10.1016/j.jarmac.2020.06.003>.

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