

**The Role of Repetition in the Correction of Misinformation:
Repeated Corrections Effectively Reduce Belief in Misinformation**

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Abstract

Corrections to misinformation are an essential tool in the fight against misinformation. The current experiments aimed to test whether repetition may enhance the efficacy of corrections. While models emphasizing memory for the correction suggest repetition may benefit corrections, other models posit limits on the frequency with which misinformation can be corrected effectively. In two experiments ($N_{\text{Total}} = 192$; U.S. undergraduate sample), we tested the effects of repeated corrections on belief in misinformation by comparing the effects of retracting false information plus presenting true information to only retracting false information (Experiment 1) and presenting only conflicting true information (Experiment 2). Across both experiments, results showed that repetition of corrections reduced belief in misinformation. While repeated retractions accompanied by conflicting true information had the largest correction effects, retractions-alone and truth-alone also led to significant reductions in belief in misinformation. Overall, these results demonstrate the benefits of repetition in the correction of misinformation.

Keywords: Misinformation, Debunking, Repetition, Continued Influence Effect, Illusory Truth

General Audience Summary

Misinformation poses serious threats to a well-functioning society. While preventing the spread of misinformation would be ideal, once misinformation is believed, corrections are among the most commonly used tools to reduce the negative effects of misinformation. Although corrections have been shown to be somewhat effective in reducing belief in misinformation, their effects often do not last over extended periods of time and misinformation can continue to influence people's judgments even after a successful correction. Evidently, there is a need to improve the efficacy of corrections to misinformation. The aim of the current research is to examine one potential method for strengthening the effects of corrections—repetition. While some theories suggest that repetition may be beneficial in enhancing the effectiveness of corrections by strengthening one's memory for the correction, other theories have claimed that each representation of misinformation in memory can be corrected only once, suggesting a serious upper limit on the potential role of repetition in enhancing the efficacy of corrections. In two experiments, we tested the effects of repeated corrections on reducing belief in misinformation by either retracting the misinformation, providing the corresponding true information, or by both retracting and providing the corresponding true information. Across both experiments, we found that the greater number of times a piece of misinformation is corrected, the less likely it is that the misinformation will be believed to be true. While repeating the combination of retracting and providing the corresponding true information was the most effective method for reducing belief in the misinformation, retraction-alone and providing the corresponding true information-alone also led to reductions in belief in the misinformation. These results demonstrate the benefits of using repetition when correcting misinformation.

Interventions aimed at correcting misinformation would benefit from using repetition to more effectively reduce the negative effects of misinformation.

The Role of Repetition in the Correction of Misinformation:

Repeated Corrections Effectively Reduce Belief in Misinformation

While preventing the spread of misinformation before it reaches people would be ideal, once misinformation is believed, corrections are one of the few options available. Encouragingly, meta-analyses have generally found moderate to large effect sizes for the effects of corrections in debunking misinformation (Chan et al., 2017; Chan & Albarracín, 2023; Walter et al., 2020, 2021; Walter & Murphy, 2018). However, the effects of these corrections drastically wane over time (i.e., *belief regression*; Swire-Thompson et al., 2023) and often the misinformation can have continued influences on one's judgments even after a successful correction (i.e., *continued influence* effect; Walter & Tukachinsky, 2020). Evidently, the effectiveness of corrections needs to be boosted to adequately eliminate belief in misinformation. The overarching aim of the current work was to test the efficacy of using repetition to boost the impact of correcting misinformation.

Repetition and Corrections to Misinformation

While the effects of repetition have been extensively studied in the context of the repetition of misinformation, far less work has examined repetition's role in debunking misinformation. However, repetition may be a strong candidate for boosting the efficacy of corrections.

First, repetition may serve to increase a person's familiarity with the correction. This is critical as familiarity has been extensively shown to be a key factor affecting people's beliefs. Demonstrating this, the *truth-by-repetition* (or *illusory-truth*) effect finds that repeated statements are more likely to be judged as true in comparison to statements that are not repeated (Dechêne et al., 2010; Hasher et al., 1977; Fazio et al., 2022). Specifically, repetition is thought to

influence people's truth judgments by increasing familiarity with the statement, which in most contexts is associated with truth (Corneille et al., 2020). Repetition of corrections may function similarly, increasing familiarity with the correction, thereby leading people to be more likely to believe in the correction and to discount the misinformation. Some, however, have raised concerns about repeating the original misinformation in corrections, claiming that the inclusion of the misinformation can increase its familiarity and therefore ironically increase belief in the misinformation. This has been commonly referred to as the *familiarity backfire* effect. However, a substantial body of work has largely debunked this idea, finding that *familiarity backfire* effects are very rare (Ecker et al., 2017; Nyhan, 2021; Swire-Thompson et al., 2020).

Second, repetition may be a likely candidate for boosting the effectiveness of corrections, given its well-established relation to improving the retention of memories (Hintzman, 1976), which recent work has shown to play a key role in the efficacy of corrections (Kemp et al., 2024). For example, Swire-Thompson et al. (2023) found that failure to remember a correction accounted for 66% of the variance in the tendency for corrections to lose their efficacy over time. Further demonstrating the role of memory in correction efficacy, reminders of the original misinformation have been shown to improve correction efficacy specifically via improvements in recollection of the correction (Kemp et al., 2022).

Third, repetition may foster the integration of the misinformation into memory. Integrative encoding of a correction with a piece of misinformation has been shown to increase the probability of recollecting the correction when the respective piece of misinformation is encountered, leading to more effective corrections. For example, corrections which include reminders of the original misinformation have been shown to increase the saliency of the conflict in information that is being presented in the correction and enable better integration with the

original misinformation in memory (Wahlheim et al., 2020). To the extent that repetition enables more chances for the conflict in information to be detected and the correction to be integrated, then repetition should also serve to benefit the efficacy of corrections.

Prior Work on the Effects of Repeated Corrections

While there may be good reason to believe that repetition might enhance the effectiveness of corrections, few studies have explicitly tested the effects of repetition on debunking efficacy. Moreover, previous work in which the number of corrections is experimentally manipulated has found mixed results.

First, Ecker et al. (Experiment 1; 2011) tested the role of repetitions of corrections, finding that three repetitions of a correction were more effective at reducing inferences to misinformation compared to one (or zero) repetition(s) of the corrections. However, this was only the case when the original piece of misinformation had also been repeated three times. When the original misinformation was presented only once, three presentations of the correction were no more effective than one presentation. To explain this finding, Ecker et al. (2011) proposed what we refer to as the *one-negation-per-memory-token* model. According to this model, a correction becomes “attached” as a negation tag to a memory token of a piece of misinformation. Three additional critical assumptions of the model are that (a) if a correction is presented, it is encoded or attached, (b) the attached negation tag reduces, but does not eliminate, the influence of the misinformation, and (c) only one negation tag can be attached to each token of misinformation (Ecker et al., 2011, p. 576). One implication of the model is that, if there are a greater number of corrections than there are memory tokens of the original misinformation, these additional corrections will provide no added benefit. The model along with the results of Ecker et al.’s Experiment 1 suggest a serious upper limit to the effectiveness of corrections. If each

memory token of misinformation can only be corrected once, and if one correction per memory token is insufficient to eliminate belief in the misinformation as the model also assumes, then corrections may never be able to adequately address the problem of misinformation.

However, other studies have failed to find such a *one-negation-per-memory-token* effect. For example, in an experiment by Sanderson et al. (2023), three repetitions of a retraction were more effective than one repetition of a retraction even though the original misinformation had only been encountered once. While these results appear to contradict the findings of Ecker et al. (2011), they may still be compatible with their *one-negation-tag-per-memory-token* model because participants in Sanderson et al.'s (2023) experiment were exposed to corrections while also performing an additional driving task. This driving task may have imposed an additional cognitive load which may have interfered with encoding and rendered inapplicable Ecker et al.'s assumption that the presentation of a correction necessarily results in its being encoded. If the probability of encoding the correction is less than one, the effectiveness of corrections might increase with repetition because each presentation of a correction could be construed as another opportunity for it to be attached to a token of misinformation.

Finally, at least one study has failed to find any beneficial effect of repeated corrections (Carey et al., 2022). Specifically, participants were presented with corrections at either zero, one, or two time points spaced out roughly by a month. While the corrections had an immediate effect of reducing belief in the misinformation, this effect completely decayed after a month. Crucially for our purposes, a second correction provided no additional bump in effectiveness in comparison to a single correction.

The Current Work

The primary aim of the current set of experiments is to test the effectiveness of repeated corrections to misinformation. Specifically, we hypothesize that repetition will increase the effectiveness of the correction. Furthermore, we aim to address the conflicting results over the possible limits of corrections as implied by the *one-negation-per-memory-token* model proposed by Ecker et al. (2011). To do so, we manipulated the number of corrections such that one piece of misinformation was corrected zero-, one-, or five-times, under conditions involving no potentially interfering processing demands. If the *one-negation-per-memory-token* model is correct, we should expect that five corrections would be no more effective than one correction. Alternatively, if this model is incorrect, we should expect five corrections to have a greater effect than only one.

Additionally, we manipulated the type of correction that was given, such that some participants received only a retraction of the original misinformation (Retraction-Only; Experiment 1), only the corresponding true information (Truth-Only; Experiment 2), or both the retraction of the original misinformation and the corresponding true information (Retraction-Plus-Truth; Experiments 1 & 2). According to the integration account of misinformation correction, the Retraction-Plus-Truth condition should be more effective than the other two conditions. By juxtaposing a presentation of the correct information with a re-presentation of the misinformation as part of the retraction, the Retraction-Plus-Truth condition would enhance people's ability to integrate the correct information with the original piece of misinformation. Secondly, our experiments also allowed us to assess the possibility of a *familiarity backfire* effect even though we did not expect to find such an effect based on previous findings. Evidence

for a *familiarity backfire* effect would be revealed if relative belief in the original misinformation is increased to the extent that it is repeated as part of the correction process.

Experiment 1

Method

Raw data and analysis scripts for both experiments are available at <https://osf.io/nqc5u>. Neither experiment was preregistered. Both experiments were approved by the Institutional Review Board of Villanova University. We report all measures, conditions, data exclusions, and how we determined our sample size in both experiments.

Participants and Design

Experiment 1 utilized a 2 (Correction Type: Retraction-Only vs. Retraction-Plus-Truth) $\times$ 2 (Statement Veracity: true vs. false) $\times$ 4 (Repetitions: 0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) design with the first factor varying between-participants and the final two factors varying within-participants.

Participants were recruited from Villanova University's undergraduate participant pool and were compensated with course credit. Informed consent was obtained prior to the collection of any data. A total of 96 students were recruited, evenly split between the Retraction-Only ($n = 48$) and Retraction-Plus-Truth conditions ($n = 48$). All participants were included in analyses.

We decided that our sample size would be sufficient to detect the desired effects based on sensitivity analyses conducted using G*Power 3.1.9.6 (Faul et al., 2007). To determine the minimal detectable effect for the key three-way interaction involving Correction Type, Statement Veracity, and Repetition, we took two complementary approaches. First, we focused on the critical Statement Veracity $\times$ Repetition two-way interaction within each correction-type group. We concluded that a group size of 48 participants would be sufficient to detect the desired two-

way interactions, as this would provide 80% power, assuming a correlation of $r = .30$ and non-sphericity correction of $\epsilon = .80$, to detect a small to medium effect of $\eta_p^2 = .030$. In an effort to approximate a three-way interaction by using the full sample and including all of the experimental conditions, we considered a two-way interaction between Correction Type and a composite variable composed of all Statement Veracity $\times$ Repetition combinations. We concluded that a full sample of 96 participants would be sufficient to detect the desired interaction, as it would provide 80% power, assuming a correlation of $r = .30$ and non-sphericity correction of $\epsilon = .80$, to detect an effect of $\eta_p^2 = .015$. Finally, to provide a test which more accurately captures the power for the key three-way interaction, we ran post-hoc simulation-based power analyses using the *Superpower* package in R (Lakens & Caldwell, 2021). These analyses confirmed that we achieved sufficient power (Study 1: 100% power; Study 2: 89.1% power) to detect the three-way interaction between Correction Type, Statement Veracity, and Repetition.

Materials

Following previous work on the truth-by-repetition effect, we relied on trivia statements. We aimed to select a set of statements about which participants likely would have little knowledge and for which there was a true and false version of each statement. Therefore, we relied on a subset of statements previously used by Fazio et al. (2015), which had the desired characteristics. We added two comparable statements for a total of 90. The full list of statements we used can be found in the supplemental materials where it can be seen that every statement had both a true (e.g., *Camus is the last name of the French author who wrote "The Stranger"*) and a false version (e.g., *Moliere is the last name of the French author who wrote "The Stranger"*). Fazio et al. developed their trivia statements from Nelson and Naren's (1980) norms

which charted people's success in generating the correct answers to 300 general knowledge questions. Although the norms were old and possibly of questionable current relevance, Fazio et al.'s data confirmed that the norms were still predictive of contemporary participants' knowledge of the related trivia statements.

Statements were divided into 10 groups of nine, corresponding to the eight conditions resulting from the crossing of Statement Veracity (true vs. false) and Repetitions (0 repetitions, 1 repetition, 5 repetitions, and test-phase only), as well as two groups of filler items which were included to prevent the same statement from being presented back-to-back during the correction phase. Filler statements were not included in analyses. Statement groups were counterbalanced across conditions.

Procedure

The experiment consisted of three phases: the Learning Phase, the Correction Phase, and the Test Phase. Participants were informed they would be presented with a series of statements, some of which would be true and some of which would be false. During the Learning Phase, the statements, half of which were true and half of which were false, were presented for 8 s each. To encourage participants to process each statement, they were asked to answer the question *Do people learn this in high school?* on a 4-point scale (1 = *Very Unlikely*, 4 = *Very Likely*). The order of the statements was randomized.

The Correction Phase then proceeded immediately after the Learning Phase. During this phase, true statements were repeated, and false statements, depending on the Correction-Type condition, were retracted (Retraction-Only condition) or were retracted in conjunction with presentation of the corresponding true information (Retraction-plus-Truth condition). In both conditions, this occurred zero-, one-, or five-times for different subsets of items. See Figure 1 for

a depiction of the correction of false information. In the Retraction-Only condition, false statements were retracted as follows: first, the word *CORRECTION* appeared on screen for 2 s and remained for the duration of the retraction, then participants were told *The following statement from Phase 1 was WRONG!* followed by the false statement for 8 s. In the Retraction-plus-Truth condition, participants saw the same retraction as described above, followed by the sentence *The correct statement is:* and the true statement presented for an additional 8 s. To encourage processing of each statement during this phase, participants were asked to rate *How interesting is this?* on a 4-point scale (1 = *Very Uninteresting*, 4 = *Very Interesting*).

A retention period of 10 min followed the Correction Phase during which participants played an unrelated video game (Snood). Finally, during the Test Phase, participants were shown each statement and asked to rate *Your confidence this is true?* for each statement on a 6-point scale (1 = *Very unlikely to be true*; 6 = *Very likely to be true*). To serve as a baseline for the judged veracity of each statement, statements serving in the Test-Phase Only condition were presented for the first time during the Test Phase.

Results

Mean truth judgments within each condition are shown in Figure 2. These data were submitted to an overall 2 (Correction Type: Retraction-Only vs. Retraction-Plus-Truth) $\times$ 2 (Statement Veracity: true vs. false) $\times$ 4 (Repetitions: 0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) mixed ANOVA. For ease of interpretability, we present here only the ANOVA results pertaining to our key hypotheses (see Supplement for all main effects and interactions).

As expected, there was a significant three-way interaction, $F(3, 282) = 33.70, p < .001, \eta_p^2 = .26$. To probe the three-way interaction, we conducted separate 2 (Statement Veracity: true

vs. false) $\times$ 4 (Repetitions: 0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) repeated-measures ANOVAs, for the Retraction-Only and Retraction-Plus-Truth conditions, respectively. Results confirmed that there was a significant interaction effect between veracity and the number of times the information was repeated in both the Retraction-Only group, $F(3, 141) = 38.71, p < .001, \eta_p^2 = .45$, and the Retraction-Plus-Truth group, $F(3, 141) = 210.97, p < .001, \eta_p^2 = .82$.

Replicating the standard truth-by-repetition effect, a linear contrast on the number of times a true statement was repeated found that truth ratings showed a monotonic increase as the number of repetitions increased, in both the Retraction-Only condition, $F(1, 47) = 58.17, p < .001, \eta_p^2 = .55$, and the Retraction-Plus-Truth condition, $F(1, 47) = 305.54, p < .001, \eta_p^2 = .87$.

Our primary concern was the effect of repeated corrections on the truth ratings of misinformation. A series of planned comparisons using the Sidak method to correct for multiple comparisons supported all major hypotheses (Statistics are reported in Table 1). Truth ratings for misinformation that was presented once but not corrected (R-Only: $M = 3.89, SE = 0.12$; R+T: $M = 3.98, SE = 0.11$) were significantly higher than the Test-Only baseline, reflected by ratings for the same items when they were not presented at all prior to the test (R-Only: $M = 3.33, SE = 0.11$; R+T: $M = 3.13, SE = 0.10$). Compared to misinformation that was presented but never corrected, truth ratings were lower when misinformation had been corrected once, regardless of whether the correction involved Retraction-Only ($M = 3.51, SE = 0.16$) or Retraction-Plus-Truth ($M = 2.47, SE = 0.11$). Supporting the effectiveness of repeating both types of correction, misinformation that was corrected five times (R-Only: $M = 3.06, SE = 0.21$; R+T: $M = 1.84, SE = 0.11$) was rated significantly less true than corresponding misinformation that was corrected only once in the same manner. In the Retraction-Plus-Truth condition, both one and five

corrections reduced the truth ratings of misinformation significantly below the Test-Only baseline. However, although corrections in the Retraction-Only condition effectively countered the prior presentation of misinformation, neither one nor five retractions yielded truth ratings that differed from the Test-Only baseline.

Further planned comparisons indicated that truth ratings did not significantly differ by Correction Type when misinformation occurred only in the test, $t(94) = 1.36, p = .176, d = 0.28$, or when the misinformation was presented once but not corrected prior to the test, $t(94) = -0.57, p = .570, d = -0.12$. However, as expected, truth ratings were significantly lower in the Retraction-Plus-Truth condition compared to the Retraction-Only condition when the misinformation was corrected once, $t(94) = 5.24, p < .001, d = 1.07$, and when it was corrected five times, $t(94) = 5.07, p < .001, d = 1.03$.

Discussion

Experiment 1 revealed several notable findings. First, supporting the role of repetition in boosting the efficacy of corrections, we found that, regardless of the type of correction, five corrections were more effective than only one correction in counteracting the influence of one prior presentation of misinformation. Second, although both retractions alone and retractions combined with the presentation of conflicting true information reduced belief in prior misinformation, the latter form of correction was more potent. Third, only when retractions were combined with contradictory true information was belief reliably driven below the baseline level of statements never previously encountered (Test-Phase Only condition).

While the results of Experiment 1 supported several key hypotheses, a question remains regarding why Retractions-Plus-Truth were more effective than Retractions-Only. Specifically, it is unclear whether the effect is driven solely by the presentation of contradictory true

information, or whether the combination of retraction and true information is critical. To address this question, Experiment 2 aimed to replicate the role of repetition in misinformation correction as well as to compare the effects of the Retraction-Plus-Truth condition with one in which corrections took the form of presenting contradictory true information without explicitly retracting the misinformation (Truth-Only).

Experiment 2

Method

Participants and Design

Experiment 2 utilized a 2 (Correction Type: Truth-Only vs. Retraction-Plus-Truth) $\times$ 2 (Statement Veracity: true vs. false) $\times$ 4 (Repetitions: 0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) design with the first factor varying between-participants and the final two factors varying within-participants.

Participants were recruited from Villanova University's undergraduate subject pool and were compensated with course credit. Informed consent was obtained prior to the collection of any data. A total of 96 participants were recruited, evenly split between the Truth-Only ($n = 48$) and Retraction-Plus-Truth conditions ($n = 48$). All participants were included in the analyses.

Procedure

Experiment 2 followed the same procedure as in Experiment 1 with one exception. During the Correction Phase in the Truth-Only condition, the originally-presented false statement was not re-presented. Rather, participants saw the word *CORRECTION* for 2 s, followed by the corresponding true statement for 8 s (see Figure 1).

Results

Mean truth judgments within each condition are shown in Figure 3. These data were submitted to a 2 (Correction Type: Truth-Only vs. Retraction-Plus-Truth) $\times$ 2 (Statement Veracity: true vs. false) $\times$ 4 (Repetitions: 0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) mixed ANOVA. Again, for ease of interpretability, we present here only the ANOVA results pertaining to our key hypotheses (see Supplement for all main effects and interactions).

As expected, there was a significant three-way interaction, $F(3, 282) = 4.38, p = .005, \eta_p^2 = .044$. To probe the three-way interaction, we conducted separate two-way repeated-measures ANOVAs involving Statement Veracity (true vs. false) and Repetitions (0 repetitions vs. 1 repetition vs. 5 repetitions vs. test-phase only) for the Truth-Only and the Retraction-Plus-Truth conditions, respectively. Results confirmed that there was a significant interaction effect between veracity and the number of times the information was repeated in both the Truth-Only condition, $F(3, 141) = 86.11, p < .001, \eta_p^2 = .65$, and the Retraction-Plus-Truth condition, $F(3, 141) = 138.40, p < .001, \eta_p^2 = .75$.

As in Experiment 1, we replicated the standard *truth-by-repetition* effect with true statements. When these items were repeated, truth ratings showed a monotonic increase as a function of the number of repetitions, in both the Truth-Only, $F(1, 47) = 162.86, p < .001, \eta_p^2 = .78$, and the Retraction-Plus-Truth conditions, $F(1, 47) = 208.13, p < .001, \eta_p^2 = .82$.

Again, however, our primary concern was the effect of repeated corrections on the truth ratings of misinformation. A series of planned comparisons supported all hypotheses (see Table 2). As in Experiment 1, truth ratings for misinformation that was presented once but not corrected (T-Only: $M = 3.84, SE = .08$; R+T: $M = 4.00, SE = 0.08$) were significantly higher than for the Test-Only baseline (T-Only: $M = 3.11, SE = 0.10$; R+T: $M = 3.30, SE = 0.08$). Also,

compared to misinformation that was presented but never corrected, truth ratings were lower when misinformation had been corrected once in both the Truth-Only ($M = 3.21$, $SE = 0.12$) and the Retraction-Plus-Truth ($M = 2.69$, $SE = 0.12$) conditions. Both types of correction provided additional support for the effectiveness of repeating corrections. Compared to truth ratings after a single correction, five corrections yielded significantly lower ratings in both the Truth-Only condition ($M = 2.69$, $SE = 0.14$) and the Retraction-Plus-Truth condition ($M = 2.12$, $SE = 0.12$). However, in the Retraction-Plus-Truth condition, both one and five corrections lowered truth ratings significantly below the baseline level (i.e., no prior exposures), whereas, in the Truth-Only condition, neither one nor five corrections lowered truth ratings significantly below the baseline level.

Further planned comparisons indicated that truth ratings did not significantly differ by Correction Type in the baseline condition, $t(94) = 1.51$, $p = .134$, $d = 0.31$, or when the misinformation was presented once but not corrected, $t(94) = 1.48$, $p = .143$, $d = 0.30$. However, truth ratings were significantly lower in the Retraction-Plus-Truth condition compared to the Truth-Only condition, regardless of whether the misinformation was corrected once, $t(94) = -3.03$, $p = .003$, $d = -0.62$, or five times, $t(94) = -3.02$, $p = .003$, $d = -0.62$. These findings indicate that combining a retraction with a presentation of the actually true information is more effective in countering the influence of prior misinformation than presenting the true statement alone.

Discussion

The present experiment replicated the major findings of Experiment 1 regarding the effect of repeated corrections on misinformation belief. In addition, the results showed that the superior effectiveness of the Retraction-Plus-Truth condition over the Retraction-Only condition in Experiment 1 was not due solely to the potency of presenting conflicting true information. The

combination of retraction and exposure to the truth was more effective in countering belief in misinformation than exposure to conflicting truth alone.

General Discussion

The results of two studies support the use of repetition as an effective tool for enhancing the efficacy of corrections to misinformation. We found that repeated corrections of previously presented misinformation significantly reduced belief in erroneous information compared to a single correction, regardless of the correction type. However, we also found that the type of correction impacted the efficacy of correction. Specifically, corrections were more effective when they both retracted the false information *and* presented the true information (i.e., Retraction-Plus-Truth) as compared to when a correction only retracted the false information (i.e., Retraction-Only) or presented only the true information (i.e., Truth-Only). Repeated corrections not only countered belief in misinformation, but, in most cases, they rendered misinformation less believable than it was prior to its original presentation.

A central finding of the current experiments is that corrections repeated five times are more effective than corrections encountered only once. This finding fails to support the *one-negation-per-memory-token* model as proposed by Ecker et al. (2011). When misinformation is presented only once as in our experiments, the one-tag model erroneously predicts that one correction would have a maximum effect and that the additional repetitions would be inconsequential. This prediction follows from the assumptions that a negation tag is encoded whenever a correction is presented and that each misinformation token or representation in memory can be offset only by a single negation tag. Our results suggest that presentation of a negation tag is not always sufficient to guarantee its adequate encoding or that the strength, and thus effectiveness, of a negation tag increases with repeated experience. More generally, our

results indicate that the number of misinformation tokens in memory does not necessarily limit the effectiveness of repeated corrections. Rather, given that repetition likely enhances the chances of retrieving a correction, our results align with theories emphasizing memory for the correction as key to its effectiveness (e.g., Swire-Thompson et al., 2023).

While retractions-alone proved to be effective at debunking misinformation in Experiment 1, especially when repeated, belief in misinformation was only reduced below baseline levels when the misinformation was retracted and the corresponding true information was provided. This effect only became more pronounced as the number of repetitions increased. Furthermore, this superiority of the Retractions-Plus-Truth condition could not be explained solely by the presence of true information as the Retractions-Plus-Truth condition also greatly outperformed the Truth-Only condition in Experiment 2. Thus, while retractions alone (Exp. 1) and truth alone (Exp. 2) are both viable options for reducing belief in misinformation, our results indicate that the most effective method for correcting misinformation is to repeatedly combine explicit retraction of the misinformation with a presentation of the counteracting true information.

The superior effectiveness of the Retraction-Plus-Truth condition is consistent with previous work demonstrating that the correction of misinformation benefits to the extent that relevant true information can be integrated with previous misinformation in memory (Kemp et al., 2024; Wahlheim et al., 2020). The retraction should increase the likelihood that misinformation is active in working memory when conflicting true information is presented, creating conditions that would encourage integration and successful updating of memory. Importantly, our results also indicate that repetition increases the effectiveness of corrections that foster such an integrative process.

Despite having repeated the original piece of misinformation up to five times in some cases, we found no evidence of a *familiarity backfire* effect. The high number of repetitions in these experiments likely represented ideal conditions under which the *familiarity backfire* effect should arise. Yet, we found no evidence of it occurring, even in the Retraction-Only condition in which the misinformation was repeatedly presented, unaccompanied by any other information aside from the instructions that the statement being presented was wrong. Likewise, it may be instructive to consider that the corrections in the Truth-Only and Retraction-Plus-Truth conditions of Experiment 2 both involved the presentation of conflicting true information, while only the latter condition also re-presented the misinformation. If re-presenting misinformation as part of a correction enhances the influence of misinformation as the backfire effect suggests, one might have expected the Retraction-Plus-Truth condition of Experiment 2 to be less effective than the Truth-Only condition in countering misinformation. However, as noted previously, we obtained just the opposite outcome.

While the *continued influence effect of misinformation* has demonstrated that eradicating the influence of misinformation is exceptionally difficult (see Kan et al., 2021, for a review), it is notable that we found many cases in which belief in misinformation was not only eliminated, but driven below the level that existed without any prior exposure. The potency of the corrections in the current experiments may, in part, be attributed to methodological differences, including the choice of dependent variables. While we relied on truth judgments in the current experiments, previous studies have typically employed an index capturing the frequency of inferences from memory that revealed reliance on misinformation (e.g., Chan et al., 2017; Ecker et al., 2011; Johnson & Seifert, 1994; Sanderson et al., 2023). For inference scores, the baseline representing no influence of previously presented misinformation is at or near zero. Consequently, there may

be a floor effect, making it difficult or impossible for individual scores to be at or below the baseline. Such a floor effect also may have contributed to Ecker et al.'s finding that three corrections did not lead to lower reliance on misinformation than one correction when the misinformation had only been presented once. If inference scores are low after one presentation of misinformation has been corrected once, the aforementioned floor effect may make it exceptionally difficult for additional corrections to reduce inferences further. By relying on truth judgments of plausible, but unknown, statements, we avoided the possibility of floor effects because the baseline indicating no effect of prior presentation of misinformation falls in the middle of the range of possible scores.

Applications

Previous work on debunking misinformation has suggested that the efficacy of repeated corrections may be severely limited (e.g., Ecker et al., 2011). Encouragingly, our results suggest otherwise, finding that repeating corrections can be very effective in reducing belief in misinformation. Not only can it counter the effect of prior exposures to misinformation, but it can drive belief in misinformation below its pre-exposure levels. Furthermore, the effects of repetition were not trivial with effect sizes ranging from Cohen's d 's of 0.54 to 0.82 of beneficial effects above and beyond the effects of one correction.

However, it is worth noting that while the use of trivia statements in the current experiments allowed for greater experimental control, it remains unclear how well these findings may generalize to other kinds of misinformation that may be prevalent in many real-world scenarios. Whereas the trivia statements were specifically selected because they were unlikely to be known by participants, it seems likely that people often have at least some prior knowledge or prior attitudes regarding the information at hand. Given the large role attitudinal congruence

plays in shaping truth judgments (Gawronski et al., 2026), it may be particularly important for future research to determine whether, and to what extent, the attitudinal congruence of the information being corrected limits the generalizability of the effects reported here.

Another important remaining question is whether the benefits seen in the current experiments would persist over time (e.g., Carey et al., 2022). If the diminishing effect of corrections with the passage of time is primarily attributable to failure to remember the corrections (e.g., Swire-Thompson et al., 2023), repeating corrections should help by strengthening memory for the corrections. Nevertheless, further research is needed to determine whether and to what extent repeated corrections may help to mitigate the waning effects of corrections over time.

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Figure 1

Correction Phase for False Information for Retraction-Only, Retraction-Plus-Truth, and Truth-Only Conditions.

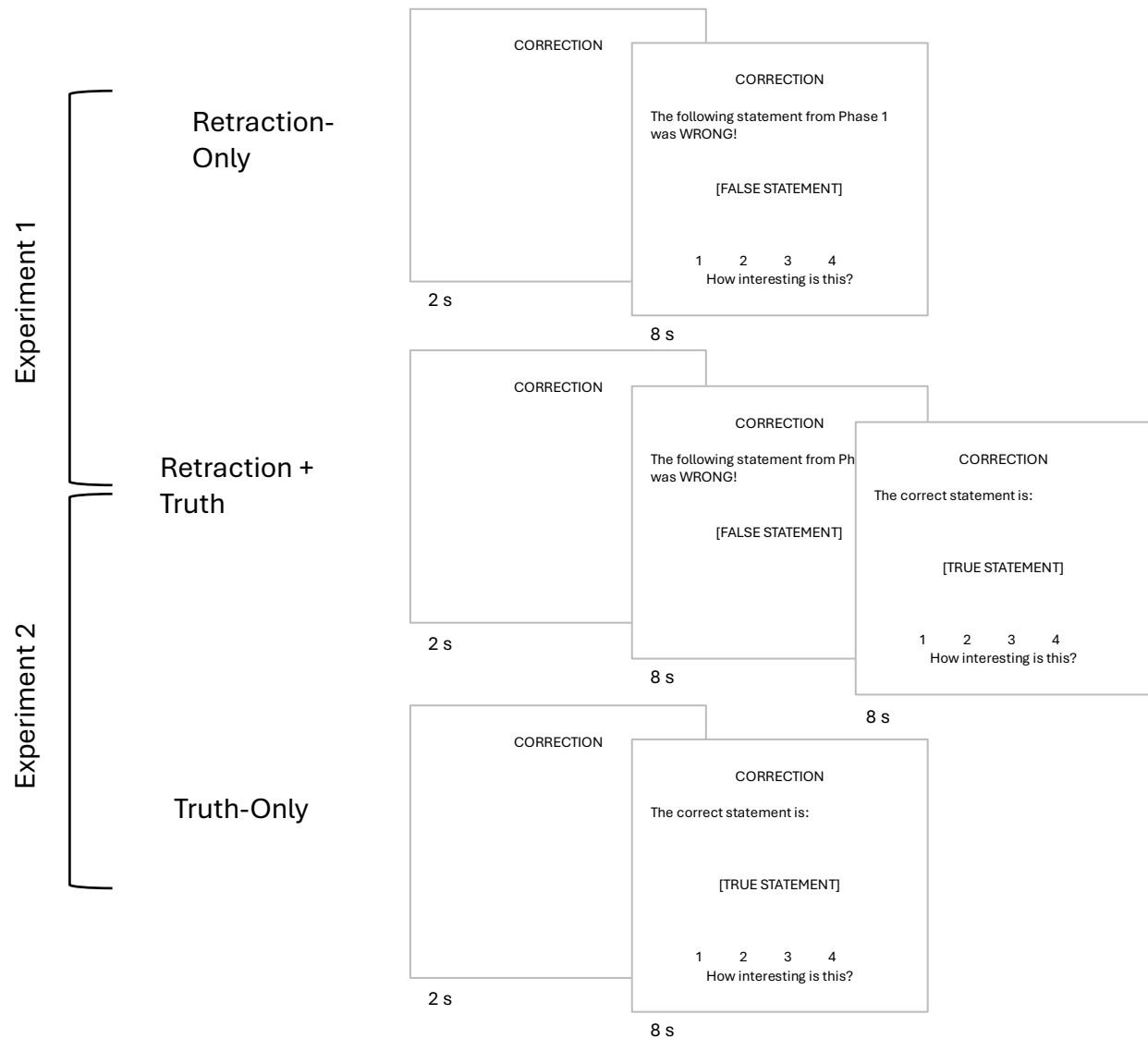
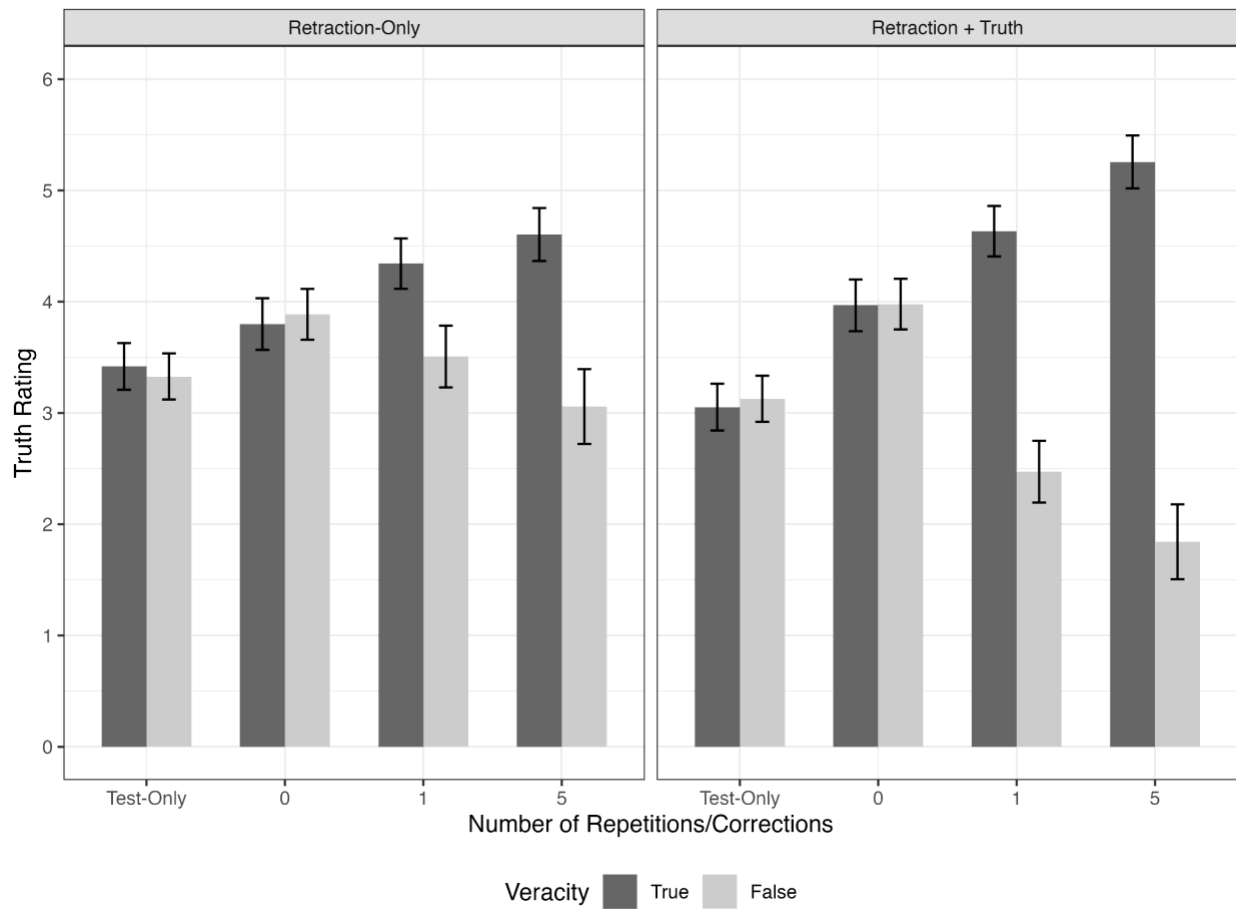


Figure 2

Mean Truth Ratings by Number of Repetitions in Retraction-only and Retraction-Plus-Truth Conditions, Experiment 1.



Note: Error bars represent model-based 95% confidence intervals.

Table 1

Comparisons of the Number of Corrections of False Information in the Retraction-Only and Retraction-Plus-Truth Conditions of Experiment 1.

Comparison	Retraction-Only			Retraction + Truth		
	<i>t</i> (47)	<i>p</i>	Cohen's <i>d</i>	<i>t</i> (47)	<i>p</i>	Cohen's <i>d</i>
Test-only vs. 0	-4.84	< .001	-0.70	-7.42	< .001	-1.07
1 vs. Test-only	1.02	.893	0.15	-4.52	< .001	-0.65
1 vs. 0	-3.01	.025	-0.43	-9.22	< .001	-1.33
5 vs. Test-only	-1.11	.852	-0.16	-9.32	< .001	-1.34
5 vs. 1	-3.73	.003	-0.54	-5.71	< .001	-0.82

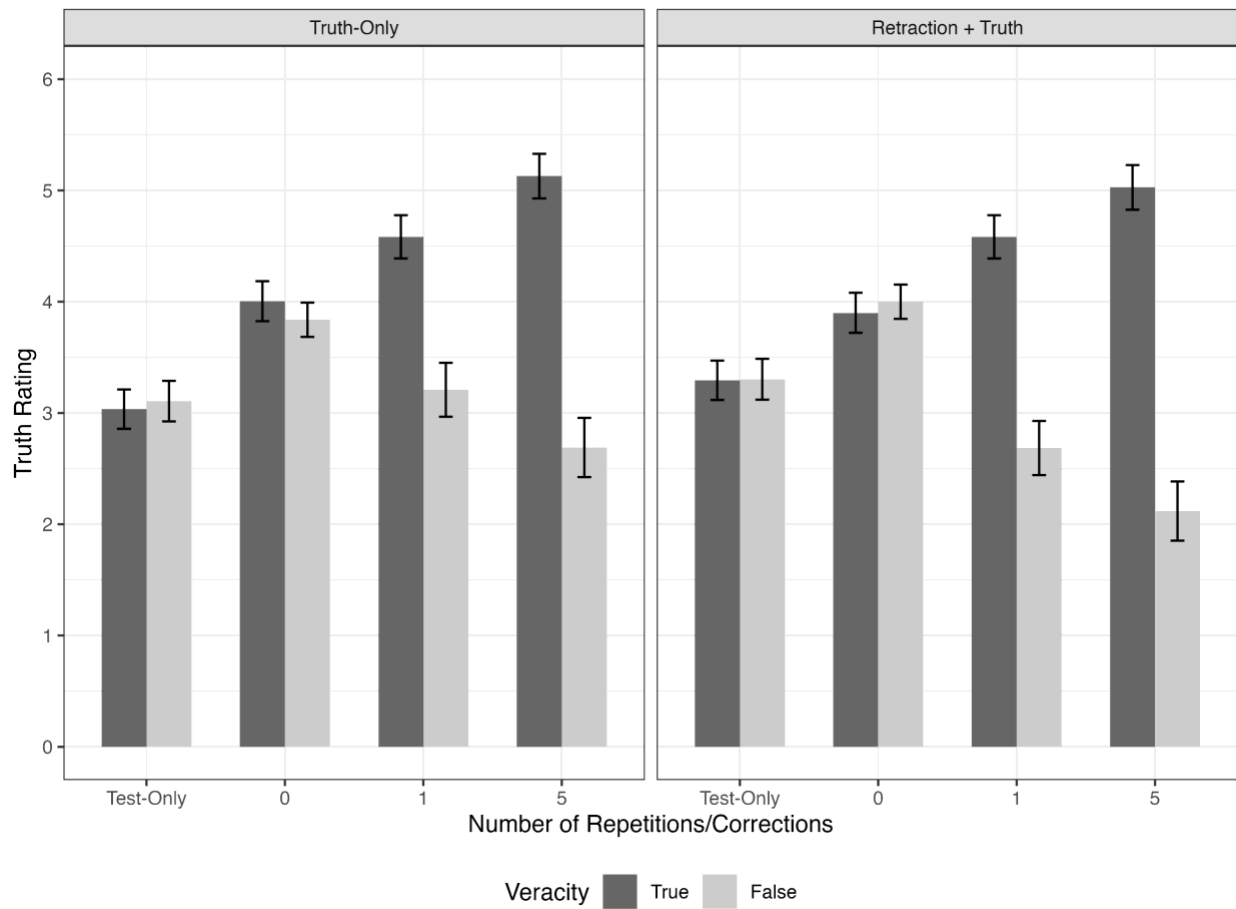
Note. *p*-values were adjusted for multiple comparisons using the Sidak method. Bold =

Significant at $p < .05$.

Figure 3

Mean Truth Ratings by Number of Repetitions in Truth-only and Retraction-Plus-Truth

Conditions, Experiment 2.



Note: Error bars represent model-based 95% confidence intervals.

Table 2

Comparisons of the Number of Corrections of False Information in the Truth-Only and Retraction-Plus-Truth Conditions of Experiment 2.

Comparison	Truth-Only			Retraction + Truth		
	<i>t</i> (47)	<i>p</i>	Cohen's <i>d</i>	<i>t</i> (47)	<i>p</i>	Cohen's <i>d</i>
Test-only vs. 0	-7.33	< .001	-1.06	-6.52	< .001	-0.94
1 vs. Test-only	0.68	.984	0.10	-4.06	.001	-0.59
1 vs. 0	-4.36	< .001	-0.63	-8.34	< .001	-1.20
5 vs. Test-only	-2.64	.066	-0.38	-9.48	< .001	-1.37
5 vs. 1	-4.45	< .001	-0.64	-4.15	< .001	-0.60

Note. *p*-values were adjusted for multiple comparisons using the Sidak method. Bold = Significant at $p < .05$.