Timing matters when correcting fake news

Nadia M. Brasherab, Gordon Pennycookb,c,d, Adam J. Berinskye, and David G. Randf,g

*Department of Psychology, Harvard University, Cambridge, MA 02138; bPaul J. Hill School of Business, University of Regina, Regina, SK S4S 0A2, Canada; cKenneth Levens Graduate School of Business, University of Regina, Regina, SK S4S 0A2, Canada; dDepartment of Psychology, University of Regina, Regina, SK S4S 0A2, Canada; eDepartment of Political Science, Massachusetts Institute of Technology, Cambridge, MA 02139; fDepartment of Brain and Cognitive Sciences, Massachusetts Institute of Technology, Cambridge, MA 02139; gDepartment of Technology, Cambridge, MA 02139

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Concern about fake news escalated during the run-up to the 2016 US presidential election, when an estimated 44% of Americans visited untrustworthy websites (1). Faced with mounting public pressure, social media companies enlisted professional fact-checkers to flag misleading content. However, misconceptions often persist after people receive corrective messages (continued influence effect; ref. 2). Detailed corrections increase the likelihood of knowledge revision (3), but social media platforms prioritize user experience and typically attach simple tags (e.g., “disputed”) to posts. Can we optimize the longer-term impact of these brief fact-checks by presenting them at the right time? There are arguments for placing fact-checks before, during, or after disputed information. Presenting fact-checks before headlines might confer psychological resistance. Inoculating people to account for misinformation and its correction are reactive (8). This mechanism explains why corrections rarely reinforce the original false belief (i.e., do not “backfire”) (9)—it is actually best to restate a myth when retracting it (10, 11). Thus, labeling a headline as “true” or “false” could increase salience and updating. Finally, providing fact-checks after people process news could act as feedback, boosting long-term retention of the tags. Corrective feedback facilitates learning (12), especially when errors are made with high confidence (13). Prediction error enhances learning of new facts that violate expectations (14). Surprise also occurs when low-confidence guesses turn out to be right, improving subsequent memory (15). Debunking after readers form initial judgments about headlines could boost learning, even if they did not make an error.

Despite the extensive previous work on corrections, no study has directly compared the efficacy of equivalent corrections delivered before, during, or after exposure. In two nearly identical experiments (total N = 2,683), we tested whether the timing of corrections to fake news impacts discernment 1 wk later. Participants were exposed to 18 true and 18 false news headlines taken from social media. In the treatment conditions, “true” and “false” tags appeared before, during, or after participants read each headline. Participants in a control condition received no information about veracity. One week later, participants in all conditions rated the same headlines’ accuracy. Providing fact-checks after headlines (debunking) improved subsequent truth discernment more than providing the same information during (labeling) or before (prebunking) exposure. This finding informs the cognitive science of belief revision and has practical implications for social media platform designers.

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The authors declare no competing interest.

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1To whom correspondence may be addressed. Email: nbrasher@fas.harvard.edu.

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2 than in Experiment 1, after is still more effective than during or before exposure when considering each experiment separately ($P < 0.001$, $P_{\text{stan}} < 0.01$ for all comparisons).

Interestingly, neither analytic thinking, as measured by the Cognitive Reflection Test, nor political knowledge moderated the treatment effects ($P_s > 0.421$), despite both measures being associated with better baseline discernment ($P < 0.001$, $P_{\text{stan}} < 0.001$ for both). Lastly, providing corrections after reading may have been less effective for headlines that aligned with participants’ partisanship than for headlines that did not, $F(1, 96857) = 5.06, P = 0.025, P_{\text{stan}} = 0.129$, while the effectiveness of during and before did not differ based on partisan alignment ($P_s > 0.30$). Nonetheless, after was more effective than before or during exposure even for politically aligned headlines ($P < 0.001$, $P_{\text{stan}} < 0.001$, for all comparisons).

For regression tables and separate analyses of each experiment, see Open Science Framework (OSF, https://osf.io/bcq6d/).

**Discussion**

We found consistent evidence that the timing of fact-checks matters: “True” and “false” tags that appeared immediately after headlines (debunking) reduced misclassification of headlines 1 wk later by 25.3%, compared to an 8.6% reduction when tags appeared during exposure (labeling), and a 6.6% increase (Experiment 1) or 5.7% reduction (Experiment 2) when tags appeared beforehand (prebunking).

These results provide insight into the continued influence effect. If misinformation persists because people refuse to “update” beliefs initially (16), prebunking should outperform debunking: readers know from the outset that news is false, so no updating is needed. We found the opposite pattern, which instead supports the concurrent storage hypothesis that people retain both misinformation and its correction (17), but over time,
the correction fades from memory (e.g., ref. 18). Thus, the key challenge is making corrections memorable. Debunking was more effective than labeling, emphasizing the power of feedback in boosting memory.

Our implementation models real-time correction by social media platforms. However, delivering debunks farther in time from exposure may be beneficial, as delayed feedback can be more effective than immediate feedback (19). Similarly, while our stimulus set was balanced, true headlines far outnumber false headlines on social media. Debunking may improve discernment even more when “false” tags are infrequent, as they would be more surprising and thus more memorable (15). On the other hand, mindlessly scrolling, rather than actively assessing accuracy at exposure, may lead to weaker initial impressions to provide feedback on, thereby reducing the advantage of debunking over labeling.

Ideally, people would not see misinformation in the first place, since even a single exposure to a fake headline makes it seem truer (20). Moreover, professional fact-checkers only flag a small fraction of false content, but tagging some stories as “truer” (20). Moreover, professional fact-checkers only flag a small fraction of false content, but tagging some stories as “true” (20). Furthermore, professional fact-checkers only flag a small fraction of false content, but tagging some stories as “true” (20). Moreover, professional fact-checkers only flag a small fraction of false content, but tagging some stories as “true” (20).

Materials and Methods
We selected 18 true headlines from mainstream news outlets and 18 false headlines that Snopes.com, a third-party fact-checking website, identified as fabricated (Fig. 1). The Committee on the Use of Human Subjects at the Massachusetts Institute of Technology deemed these experiments exempt. After informed consent, participants evaluated the accuracy of these 36 headlines on a scale from 1 (not at all accurate) to 4 (very accurate). In the treatment conditions, participants saw “true” and “false” tags immediately before, during, or immediately after reading. In the control condition, participants rated the headlines alone, with no tags. One week later, all participants judged the same 36 headlines for accuracy, this time with no veracity information. See SI Appendix for our full methods and preregistrations.

Data Availability. Our preregistrations, materials, and anonymized behavioral data are available on OSF (https://osf.io/nuh4q/). Regression tables and separate analyses of each experiment are also on OSF (https://osf.io/bcq6d/).

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