Testing The Effect of Information on Discerning the Veracity of News in Real-Time

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Abstract

In an effort to limit the spread of and belief in fake news, civil society organizations, social media companies, and governments have invested in interventions that provide news consumers with more information about the news they are viewing. Despite broad adoption of these digital media literacy interventions, relatively little is known about the marginal benefit of providing individuals with more information about news articles in real-time. Does it improve their ability to correctly discern the veracity of news? Does it reduce their belief in misinformation? To answer these questions, we used a series of pre-registered experiments in two separate studies to test the marginal effect of three types of information about a news article that have been the subject of broad scientific and popular interest: information in the text of the article, source information, and searching for additional information. This produced three important findings. First, we find that access to the full article, rather than just the headline and lede, improves the ability of an individual to correctly discern the veracity of news. Second, source information increases belief that news articles from mainstream sources are true, but decreases belief that news articles from low-quality sources are true. This, for the most part, holds when both full articles and headlines/ledes are being evaluated. Finally, searching for additional information (in our case, online research through a search engine) increases the belief that both true and false/misleading news articles are in fact true. Worryingly, the effect on false/misleading news is of a similar magnitude to the effect for true news. Our findings not only contribute to the scientific study of the discernment of news veracity, but also provide policy-relevant implications for those building interventions to lower belief in misinformation and increase belief in true information.

1 Introduction

While there is general agreement that misinformation is a problem, there is relatively little consensus on how to address it. This problem has become especially acute during the COVID-19 pandemic[1] and has led scholars, civil society groups, and social media companies to develop novel intervention and mitigation strategies. Among those, perhaps the most common are digital media literacy interventions that seek to provide consumers with more context – or information – about an article. For example, the NewsGuard web extension (released in 2018) focuses user's attention on the reliability of the source of information they are viewing.[2] In a similar vein, media literacy guides, such as one released by Facebook in 2017, advocate for individuals to look throughout a news article for specific textual features, such as words written in ALL CAPS, or to search for additional information when evaluating the veracity of news.[3] Yet despite the intuitive appeal of this general approach, we know very little about the marginal benefit of additional information on the ability of individuals to correctly discern the veracity of news. The lack of empirical evidence risks introducing interventions that lack efficacy or, even worse, introduce unintended consequences. Here, we aim to measure the marginal effect of providing more information about an article on the discernment of online news veracity in real-time. To this end, we ran two pre-registered studies in which we tested the effect of three distinct ways of providing news consumers with more or less information while they are trying to assess the veracity of news.[4]

More specifically, we measure the marginal effect of three types of information about an article on respondents' abilities to identify the veracity of news that has been published in the past 24-48 hours: whether the reader is exposed to the entire article or just a headline; whether the reader is exposed to just the content of an article or the content plus the source of the article; and whether the reader is encouraged to search online for additional information beyond the article itself. Taken together, one could imagine these interventions running the gamut from the most minimalist exposure to a news article – just the headline of the article with no source information – to a maximalist form of exposure, where the reader is exposed to the headline, text, source, and then also encouraged to consume additional related information beyond the article itself.

While previous research has assessed the effect of headlines versus full articles and sources versus no

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[1]Waves of misinformation about COVID-19 have increased distrust of public health officials, weakened responses to the pandemic, and increased skepticism of the COVID-19 vaccine (Loomba et al. 2021).

[2]Once installed, the NewsGuard web extension informs users if a site they are viewing is reliable by providing them with a reliability rating of that site. More information can be found here: https://www.newsguardtech.com.

[3]In 2017, Facebook listed a link to ten tips for spotting fake news and one tip asked the readers to "look at other reports. If no other news source is reporting the same story, it may indicate that the story is false."; see also: https://www.wnyc.org/story/breaking-news-consumer-handbook-fake-news-edition/.

[4]The pre-registration of Study 1 can be found here: https:–Link witheld to protect anonymity of study authors–. The pre-registration of Study 2 can be found here: https:–Link witheld to protect anonymity of study authors–. We have provided a blinded copy of both pre-registrations as supplemental documents for reviewers.

sources on news consumers' ability to discern the veracity of article, no one, to our knowledge, has measured the impact of such information on readers' ability to correctly identify the veracity of news immediately after publication – the time period when news articles are most likely to be consumed on social media (Vosoughi, Roy, and Aral 2018). Indeed, previous work testing the effect of source information and headlines versus full articles often asks respondents to evaluate specific articles selected by the researchers months after publication (Sundar and Nass 2001; Dias, Pennycook, and Rand 2020), which could conceivably impact how respondents evaluate information with different source information.[5] Moreover, previous studies measuring the effect of textual and source information use different experimental designs and recruitment strategies when testing the effect of this information, making proper comparison of effects across studies impossible.[6]

Here, we present results from a study that overcomes these limitations by testing the marginal effect of all three types of information in an unified real-time research design from the same study that employs a transparent, pre-registered, replicable, and algorithmically determined article selection process alongside a consistent recruitment strategy (see the experimental design section for details). By collecting popular false and true news articles directly after publication, our study is able to precisely measure the effect of additional information on discerning the veracity of news during the period in which people are most likely to consume it. And by holding constant respondent recruitment and article selection, we are able to limit any biases created by different sampling strategies. Taken together, these innovations allow us to measure the marginal effect of information about news articles, as well as compare marginal effects across different types of information.

Our pre-registered analyses produce three important findings. First, we find that access to the full article, rather than just the headline and lede, improves the ability of an individual to correctly discern the veracity of news. Second, we find that source information increases people's belief that news articles from mainstream sources are true, but decreases their belief that news articles from low-quality sources are true. Finally, being encouraged to search for additional online information increases belief in both true and false/misleading news articles, which, worryingly, is of roughly the same magnitude.

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[5]For example, as time passes post-publication, more respondents are exposed to the central claim of this article and could become more likely to rate it as true (Pennycook, Cannon, and Rand 2018). Asking respondents to evaluate fake news articles well after publication will likely overestimate the level of belief in fake news and overestimate belief in fake news among those who are most likely to be exposed to this news. Testing the effect of searching for additional information in the first 48 hours after publication is particularly important given that news consumers may be particularly vulnerable to believing false/misleading news stories when searching for information in this time period, as no fact-checks are likely available given the high cost and slow speed of producing fact-checker labels. Thus, searching for information may increase belief in these news stories before reliable fact-checks become available.

[6]As an example, some studies ask subjects to evaluate headlines/ledes (Dias, Pennycook, and Rand 2020), while others ask them to evaluate full articles (Sundar and Nass 2001). This literature leaves us with little ability to compare across variables of interest that are theorized and operationalized in disparate ways.

2 Theory and Hypotheses

In this manuscript we test the effect of three types of information that could impact one's ability to correctly identify the veracity of news in the 48 hours directly after publication: (H1) information in the text (vs just information contained in the headline and lede); (H2) source information; and (H3) searching online for additional related information beyond the article in of itself.

2.1 Information in the text

Information in the text – that is, having access to the text of an article as opposed to simply the headline and lede[7] – may affect one's ability to identify the veracity of an online news article through a number of specific cues. Indicators such as a "clickbaity" headline,[8] the relationship between headline and text, logical fallacies, and the emotional tone can affect how a news consumer discerns the veracity of a news article (Chen, Conroy, and Rubin 2015; Zhang et al. 2018). This would lead us to believe that being given the full text of an article versus just a news headline would improve respondents discernment of news veracity.[9] We therefore pre-registered the following two hypotheses:

H1.1 Respondents who are only given the headline and lede in standardized text of an article to evaluate are less likely to match the assessment of fact-checkers than those who are given the whole article in standardized text to evaluate.

H1.2 Respondents who are only given the headline and lede of an article to evaluate (with source information) are less likely to match the assessment of fact-checkers than those who are given the whole article to evaluate (with source information).

2.2 Source information

Source information may affect one's belief that an online news article is true through two specific cues: reputation of the publisher/domain and the quality of the web design. Traditional media provides cues through authenticity and reputation (Flanagin and Metzger 2000; Althaus and Tewksbury 2000) as well as

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[7]Another way to think of this distinction is as the difference between simply seeing an article in a social media feed, which typically contains only the headline, lede, and a graphic, as opposed to clicking on that link to read the actual article.

[8]Although recent work has found that some individuals actually trust and prefer "clickbait" media more than traditional media Luca et al. 2021

[9]Although a competing hypothesis could suppose that textual cues do not help as much as we would expect. When confronted with an online news article, consumers are often overloaded with information and may not be able to store and properly use all the information they receive when evaluating a news article (Lang 2000).

the professionalism of the design of the website (Fogg et al. 2001; Flanagin and Metzger 2007).[10] Results from the literature are mixed as Sundar and Nass (2001) have found source information helps, while Dias, Pennycook, and Rand (2020) have recently shown that emphasizing source information doers not aid the discernment of the veracity of news. Further complicating matters, the provision of source information from a mainstream news source and a low-quality news source likely affects a respondent's belief that a news article is true differently. A mainstream news source is likely to have a reputation of producing true news stories and the budget for a high-quality, well-maintained website, whereas a low-quality news source likely has either an unknown or negative reputation to most news consumers and a suspect web design. Given the lack of pre-existing consensus, we pre-registered four different hypotheses about the effect of source information on belief that a news article is true:

H2.1 Respondents who evaluate the full standardized text from articles known for publishing fake news will be more likely to rate this story as true than respondents who evaluate the full article from their website (with the source information).

H2.2 Respondents who evaluate the full standardized text of a mainstream news article will be less likely to rate this story as true than respondents who evaluate the full article from their website (with the source information).

H2.3 Respondents who evaluate the headline and lede in standardized text from an article known for publishing fake news will be more likely to rate this story as true than respondents who evaluate the headline and lede from their website (with the source information).

H2.4 Respondents who evaluate the headline and lede in standardized text from a mainstream news article will be less likely to rate this story as true than respondents who evaluate the headline and lede from their website (with the source information).

2.3 Searching for Additional Information

Given that users have become increasingly reliant on search engines to fact-check news stories they see online (Dutton et al. 2017), understanding the effect of searching for information through search engines is

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[10]A high quality web-site can convey source credibility through the attractiveness of the website's appearance and a lack of commercial content.

paramount within the study of news consumption. Past research has shown seeking out information online may lead some to adopt inaccurate beliefs if the false information one encounters is congenial to one's ideological views (Peterson and Iyengar 2021), but we are unaware of any prior research estimating the effect of searching for information on one's evaluation of true and false news just after publication. We believe that it is likely that when searching for information about a true news story, one will come into contact with similar articles that may corroborate the claims in the initial article. Given that recent work has found that when searching for information about false stories, individuals can fall into "data voids" (Golebiewski and boyd 2019) where only information from non-credible sources appear, it is likely that this phenomenon could increase belief in false/misleading stories. Accordingly, we pre-registered and tested three hypotheses:

H3.1 Individuals who are asked to search for evidence to help them evaluate a fake news article are less likely to match the assessment of fact-checkers than those who are not asked to search for evidence to help them evaluate that same fake news article.

H3.2 Individuals who are asked to search for evidence to help them evaluate a fake news article that is rated misleading/false by professional fact checkers will be more likely to rate this story as true (i.e., incorrectly answer the assessment question) than respondents who are not asked to search for evidence to help them evaluate that same fake news article.

H3.3 Individuals who are asked to search for evidence to help them evaluate a true news article that is rated true by professional fact checkers will be more likely to rate this story as true (i.e., correctly answer the assessment question) than respondents who are not asked to search for evidence to help them evaluate that same true news article.

3 Sampling and Demographic Characteristics

With these hypotheses in mind, we next turn to describing our recruiting strategy, how we sample the true and false/misleading articles to be evaluated by our respondents, and the experimental design in the three sections below.

3.1 Recruiting Respondents

We recruited survey subjects using Qualtrics (an online survey firm). Qualtrics recruits individuals through various means, but each participant was paid for their participation in either airline miles or direct transfers of money upon completion of our 15-minute survey.[11] An opt-in internet survey administered by Qualtrics is ideal for this task given that existing research has found that almost all of the experimental results identified using a gold-standard probability sample are indistinguishable from effects identified using an opt-in Qualtrics panel (Mullinix et al. 2015).[12] Although some opt-in surveys suffer from a lack of effort among participants, we found that offering higher levels of incentives did not change the answers we received.[13]

In Study 1, we tested the effect of source information and the full text by sending out surveys and asking respondents to evaluate articles on ten separate days beginning on January 8, 2020 and ending on February 1, 2020. Over this period, we recruited 7,274 unique respondents who were assigned to the different treatment categories laid out below in Figure 1 in the Section 4 of this manuscript. Study 2 tested the effect of searching for additional information online and sent out surveys to evaluate articles on ten separate days beginning on November 21, 2019 and ending on January 7, 2020. Over this period, we recruited 3,006 survey respondents who were assigned to either a treatment or control condition as described below in 2.

The groups of survey respondents were balanced every day in each article group by ideology,[14] gender,[15] age,[16] and education.[17] The full demographic breakdown is presented in Tables 1 and 2 below. We also report difference means between the groups of respondents in Tables 3 and 4 and we find very little differences between each group of respondents evaluating articles with different levels of information. The only substantial and statistically significant difference is that respondents evaluating the articles with the most information (full text and the source) are between 3 and 4 years older on average than respondents evaluating the other types of articles. Given that 4 years is less than 0.25 standard deviations of age within the whole sample of respondents and we control for age in our models, we do not believe this affects the results presented in this paper.

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[11]Not all respondents are paid the same amount, as it is up to both the participant and the vendor (Qualtrics) to negotiate terms.

[12]An added advantage of using Qualtrics for our particular study is that online sampling predominately recruits those in whom we are actually most interested: in, frequent users of the internet who are most likely to consume online news. Thus even if our results are less likely to be generalizable to overall population, they are still likely to be generalizable to the population that consumes news online more than other recruiting techniques such as in-person surveys.

[13]In a parallel study that paid respondents additional payments for correct answers to our veracity question we did not find any difference in responses. Figures displaying these results are located in the Supplementary Materials in Section J.

[14]We use census proportions which approximate to:1/3 self-identify as liberal, 1/3 self-identify as moderate, 1/3 identify as conservative

[15]We use census proportions which approximate to: 1/2 self-identify as male; 1/2 as self-identify as female; a small percentage self-identify as another gender

[16]We use census proportions which approximate to: 1/3 between the age of 18-34; 1/3 between the age of 35-54; 1/3 55 years old and above

[17]1/2 have no high school/ high school degree/partial college; 1/2 have a college degree or more.

Table 1: Summary Statistics for Respondents in Study 1

Article Type	Number of Respondents	Average Age	Proportion with a College Degree or more	Proportion that Self-Identify as Female
Headline - No Source (*Article Format* 1)	1735	44.98	0.51	0.47
Full Article - No Source (*Article Format* 2)	1919	44.72	0.48	0.48
Headline - Source (*Article Format* 3)	1752	44.03	0.48	0.46
Full Article - Source (*Article Format* 4)	1868	48.07	0.48	0.49

Table 2: Summary Statistics for Respondents in Study 2

Article Type	Number of Respondents	Average Age	Proportion with a College Degree or more	Proportion that Self-Identify as Female
Control (not encouraged to search for information)	1521	46.52	0.51	0.49
Treatment (encouraged to search for information)	1485	45.64	0.48	0.46

Table 3: Average Difference Between Groups in Study 1

Groups	Age	Education Level	Gender (Prop. Female)
Article Format 1 and 2	0.27	-0.013	0.05
Article Format 1 and 3	0.9	0.014	0.05
Article Format 2 and 3	0.64	0.027	0
Article Format 2 and 4	3.43***	0.009	-0.04
Article Format 3 and 4	4.07***	0.036*	-0.04

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 4: Average Difference Between Groups in Study 2

Groups	Age	Education Level	Gender (Prop. Female)
Control and Treatment	0	0	0

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

3.2 Sampling Articles for Evaluation

Each respondent was asked to evaluate three distinct popular articles published within the previous 48 hours. Existing studies in this field have tested the effect of additional information, such as guidelines to identify misinformation (Guess et al. 2020), fact-checking labels (Ecker, Lewandowsky, and Tang 2010; Clayton et al. 2019; Pennycook, Bear, et al. 2020) and source information (Sundar and Nass 2001) by asking respondents to evaluate articles that were either (i) months- (or years)-old and already received

fact-checker evaluations (Pennycook, Bear, et al. 2020); or (ii) synthetic news articles composed by the researchers themselves (Clayton et al. 2019). Both of these methods risk article selection effects, which introduce limitations for properly quantifying the effect of these additional types of information on news encountered online. These limitations are potentially especially pronounced when conducting research on news focused on rapidly-changing events.

To address these concerns, we created a transparent, replicable, and pre-registered article selection process that sources popular false/misleading and true articles from across the ideological spectrum within 24-48 hours of their publication. More specifically, we sourced one article per day from each of the following five news streams: liberal mainstream news domains; conservative mainstream news domains; liberal low-quality news domains; conservative low-quality news domains; and low-quality news domains with no clear political orientation. To generate our streams of mainstream news, we collected the top 100 news sites by U.S. consumption between 2016 and 2019 identified by Microsoft Research's Project Ratio.[18] To classify these websites as liberal or conservative, we used scores of media partisanship from Eady et al. (2020) that assign ideological estimates to websites based on the URL sharing behavior of social media users: websites with a score of below zero were classified as liberal and those above zero were classified as conservative. The top ten websites in each group (liberal or conservative) by consumption were then chosen to create a liberal mainstream and conservative mainstream news feed.[19] For our low quality news sources, we relied on the list of low-quality news sources from Allcott, Gentzkow, and Yu (2019) that were still active at the start of our study in November 2019, which we then subsequently classified into three streams: liberal leaning sources, conservative leaning sources, and those with no clear partisan orientation.[20]

Each day of the study we took the most popular online articles from these five streams (using CrowdTangle for the mainstream sources and RSS feeds for the low-quality ones)[21] that had appeared in the previous 24 hours and sent them to our respondents recruited by Qualtrics. Articles chosen by this algorithm therefore represent the most popular mainstream and low quality news from across the ideological spectrum. This method removed researcher choice from the selection process, overcoming sampling issues that have limited the robustness of previous studies (Clemm von Hohenberg 2020). Collecting and distributing the most popular false/misleading news articles directly after publication is a key innovation that enables us to test the effect of additional types of information from the article on perceived veracity of news *at precisely the time* that readers were likely to encounter these articles on social media (Vosoughi, Roy, and Aral 2018).[22]

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[18]https://www.microsoft.com/en-us/research/project/project-ratio/

[19]The list of the sources in each mainstream stream is provided in Section F of the Supplementary Materials and Methods.

[20]the list of the sources in each low-quality stream is provided provided in Section F of the Supplementary Materials. Explanation for how the partisanship of these sources were determined is provided in Section A of the Supplementary Materials.

[21]We used RSS feeds instead of CrowdTangle, because most low-quality sources did not have their own Facebook page

[22]All of the articles used in each study are available in Section G of the Supplementary Materials.

Every respondent evaluated three articles randomly selected from the five articles being evaluated that day. Each article was assessed by roughly 90 respondents who were required to complete the survey within 24 hours of the moment we selected the articles, which resulted in respondents evaluating articles within 48 hours of the article's publication. No respondent was allowed to take the survey more than once. Respondents evaluated each article using a variety of criteria, the most germane of which was a categorical evaluation question: "What is your assessment of the central claim in the article?" to which respondents could choose from three responses: (1) True (2) Misleading/False (3) Could Not Determine. To assess the reliability and validity of this measure, we also asked our respondents to rate each article on a 7-point ordinal scale of perceived veracity. We predict the rating of an article on a 7-point scale using a dummy variable measuring whether that respondent rated that article as True (categorical response) using a simple linear regression and find that rating an article as true on average increases the veracity scale rating by 2.5 (nearly 1.5 standard deviations of the veracity scale).[23]

Whereas many studies use source quality as a proxy for article quality, not all articles from suspect news sites are actually false (Allcott, Gentzkow, and Yu 2019). Other studies have relied upon professional fact checking organizations such as Snopes or Politifact to identify false/misleading stories from these sources (Clayton et al. 2019, Pennycook, McPhetres, et al. 2020), but this limits past studies to old articles. To overcome this limitation, we instead hired six professional fact checkers from leading national media organizations to assess each article during the same period as respondents.[24] Most articles were evaluated by five fact-checkers, but a few were evaluated by four or six. We use the modal response of the professional fact checkers to determine whether we code an article as true, false/misleading, or 'could not determine.' We are then able to assess the ability of our respondents to identify the veracity of an article by comparing their response to the modal professional fact checker response. For articles used in both studies, we report a Fleiss' Kappa score of 0.400.[25] This level of agreement is slightly higher than other studies that have used professional fact-checkers to rate the veracity of articles using the same categorical scale we use (Allen et al. 2020).

4   Experimental Design

We ran two studies to test the marginal effect of more information on correctly discerning the veracity of news (comparing evaluations to the modal fact-checker evaluation) and belief that a news article is true. Study 1 asks four different groups of respondents to evaluate the same articles, but in four different formats

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[23]Results of this model can be found in the Supplementary Materials in Section K.

[24]These professional fact-checkers were recruited from a diverse group of reputable publications (no publications from news domains in our list of possible news domains to ensure no conflicts of interest) and paid $10.00 per article.

[25]There was unanimous fact checker agreement on over 45% of the articles used in both studies

that vary whether they receive source information and the full text. Study 2 asks two groups of respondents to evaluate the same articles, but the control group is asked to evaluate a full article on its website without being encouraged to search for information, while the treatment group is encouraged to search for information. Study 1 and 2 use the same research infrastructure/pipeline to select articles, to source responses from respondents, to source responses from professional fact-checkers, and measure our two dependent variables: (1) "correctly" discerning the veracity news and (2) belief that the news article is "true."

In Study 1, we tested the effect of source information and information in the text of the article by asking four groups of respondents to evaluate the same news articles in the same 24 hour period, but varied whether they receive source information and the full text of the article. Figure 1 outlines the different variations of text and source information provided to the four different groups of respondents. Each respondent is initially randomly placed in one treatment category and then evaluates three randomly selected articles in that format.

Figure 1

	Headline/Lede	**Full Text**
No Source	Headline/Lede No Source Information (N=1,735) *Article Format 1*	Full Text No Source Information (N=1,919) *Article Format 2*
Source	Headline/Lede Source Information (N=1,752) *Article Format 3*	Full Text Source Information (N=1,868) *Article Format 4*

By comparing evaluations of the same articles, but with different amounts of information available to the respondent, we can test all of our pre-registered hypotheses regarding the marginal effect of the full text and source information in different formats. Hypotheses 1.1 and 1.2 can be assessed by evaluating the effect of textual information on correctly discerning the veracity of the article, while Hypotheses 2.1-2.4 can be tested by examining the effect of source information on belief that news articles from different sources (mainstream and low-quality) are true:

- **Hypothesis 1.1:** To test the effect of information in the text when source information is not present (H1.1), we compare the number of "correct" evaluations of articles in *article format 1* to the number

of "correct" evaluations of articles in *article format 2*.

- **Hypothesis 1.2:** To test the effect of information in the text when source information is present (H1.2) we compare the number of "correct" evaluations of articles in *article format 3* to the number of "correct" evaluations of articles in *article format 4*.

- **Hypothesis 2.1 and 2.2:** To test the effect of source information when only the headline and lede is present, we compare the number "true" ratings of articles in *article format 1* to the number "true" ratings of articles in *article format 3*. We run one analysis for articles from low-quality source (H2.1) and another analysis for articles from a mainstream source (H2.2).

- **Hypothesis 2.3 and 2.4:** To test the effect of source information when only the full text is present we compare the number "true" ratings of articles in *article format 2* to the number "true" ratings of articles in *article format 4*. We run one analysis for articles from low-quality source (H2.3) and another analysis for articles from a mainstream source (H2.4).

In Study 2, we tested the effect of searching for additional information online by asking two groups of respondents to evaluate the same news articles in the same 24 hour period. Those in the control group evaluate an online news article with the full text and source information on the website (*Article Format* 4), but are not encouraged to search for information. Those in the treatment group evaluate the same articles in the same format and time-frame, but are encouraged to seek out additional information online to help them evaluate the veracity of the article. Study 2 is outlined in Figure 2.

Figure 2
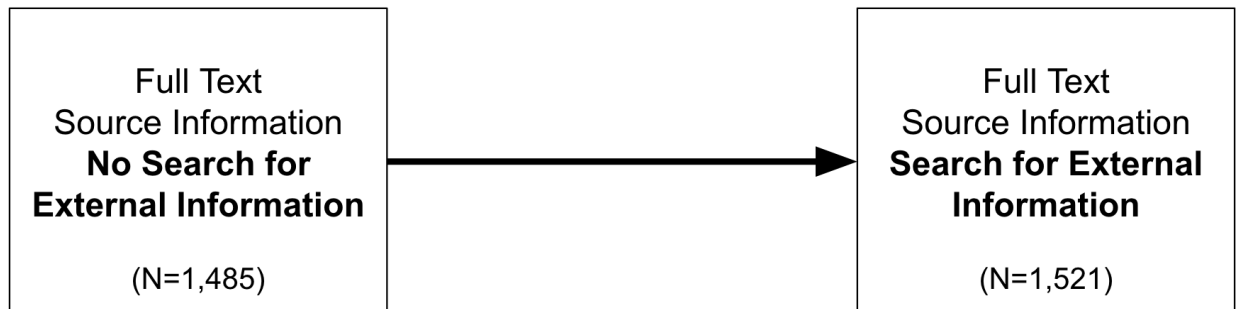
By comparing evaluations between groups encouraged to search for information and those not encouraged to search for information, we can test all of our pre-registered hypotheses regarding the effect of searching for additional information:

- **Hypothesis 3.1 and 3.2:** To test the effect of searching for additional information, we compare the number of "correct" evaluations of articles when encouraged to search for information to the number

of "correct" evaluations of articles when not encouraged to search for information. We run one analysis for articles rated true by professional fact-checkers (H3.1) and another analysis for articles rated as false/misleading by professional fact-checkers (H3.2).

- **Hypothesis 3.3:** To test the effect of searching for additional information, we compare the number of "true" ratings of false/misleading articles when encouraged to search for information to the number of "true" ratings of false/misleading articles when not encouraged to search for information.

5 Results

We now present the effect of providing respondents with different levels information about a news article on how individuals evaluate the veracity of news articles. To do so, we fit an OLS regression model with standard errors clustered at the respondent level to predict either correctly discerning the veracity of a news article (i.e., matching the evaluation of the professional fact-checker) or rating an article as true.[26] We control for a number of pre-registered variables: education level, age, gender (male dummy variable), income, and ideology,[27] but also report the results from models that do not condition on these covariates.[28] We also run all analyses using a logistic regression and report the similar results.[29] Figure 3 presents the marginal effect of a type of information in an article on correctly discerning the veracity of news[30] and Figure 4 presents the marginal effect of a type of information on rating an article as true.[31] We run all analyses in Figure 4 substituting a 7-point ordinal scale of veracity for the dichotomous measure and all of our findings hold.[32] In each figure in this section (3-6) the y-axis label denotes, in brackets in the first row, the hypothesis and the type of information that we are measuring an effect for. In the next line of the y-axis label (in braces), we list the type of news articles we are testing this effect on. In the final line of the y-axis label parentheses in the final line of each x-axis label we state the other type(s) of information that are constant across the control and treatment group.[33]

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[26]For our two dichotomous outcomes, (matching the evaluation of professional fact-checkers or rating an article as true with Yes=1 and No=0), OLS or logistic regressions produce similar results and are both appropriate, although OLS regression is the preferred specification because it provides unbiased, reliable estimates of a variable's average effect (Hellevik 2009; Mood 2010; Baetschmann, Staub, and Winkelmann 2015).

[27]Explanations for how these were calculated can be found in Section Q the Supplementary Materials.

[28]The results from these models can be found in Section I in the Supplementary Materials

[29]The results from these models can be found in Section K in the Supplementary Materials

[30]The results from the models that generate these coefficients are presented in Section H in the supplementary materials

[31]The regression tables that generate these coefficients are presented in Section H in the supplementary materials
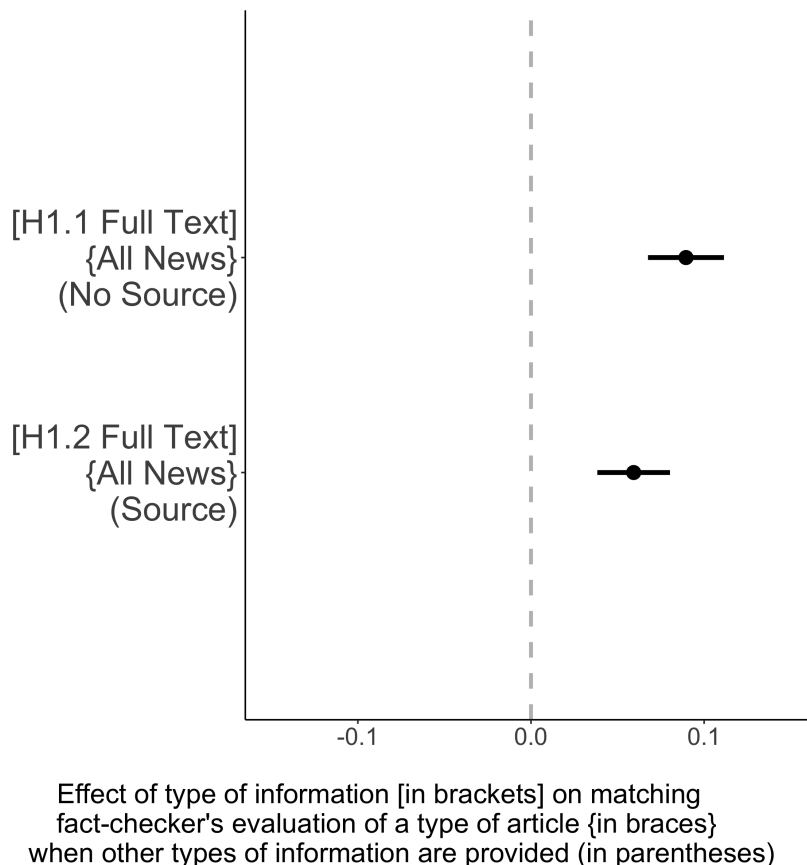
[32]The regression tables that generate these coefficients are presented in Section J in the Supplementary Materials

[33]We report adjusted p-values to account for multiple hypothesis testing in the Supplemental Appendix XXX using both the conservative Bonferroni approach and the less conservative false discovery rate method (Benjamini and Hochberg 1995). We find that none of our statistically significant results lose their significance when applying these multiple hypothesis testing corrections.

Marginal Effect of Information of Text

Using our results from Study 1, we begin by assessing the marginal effect of the full text of the article on discerning the veracity of online news articles. As Figure 3 shows, we find that providing the full text to respondents improves the discernment of news veracity. When the source is not provided to respondents (H1.1), providing respondents with the full text of the article increases the likelihood a respondent correctly discerns the veracity of an online news article by 0.0895 (a 17% increase given that the likelihood of correctly discerning the veracity of an article without source information and the full text is 0.506). When source information is available (H1.2), providing respondents with the full text of the article has a smaller effect and only increases the likelihood of correctly discerning the veracity of an article by 0.059 (an 11% increase given that the likelihood of correctly discerning the veracity of an article with source information, but without the full text, is 0.535). The effect is likely smaller when the source is provided because respondents are confronted with more information and may not be able to properly utilize the specific textual information they are receiving (Lang 2000).

Figure 3: Marginal effects of providing the full text: This figure presents the marginal effect of text information on the likelihood of correctly discerning the veracity of news when the source is not also provided (H1.1) and when the source is provided (H1.2).

Effect of type of information [in brackets] on matching
fact-checker's evaluation of a type of article {in braces}
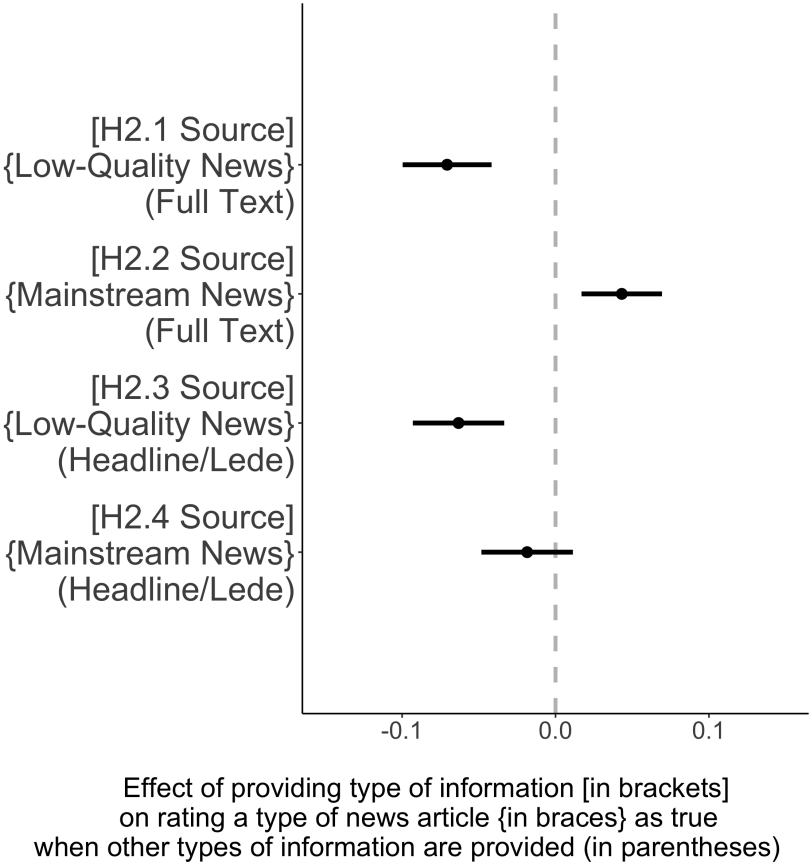when other types of information are provided (in parentheses)

Marginal Effect of Source Information

Similar to the marginal effect of the full text of the article, we also find that source information improves the discernment of news veracity. Rather than testing the effect of source information on the discernment of news veracity, we focus on the effect of source information on the belief that a news article from mainstream source or a low-quality source is true.[34] Figure 4 shows that, as expected, when the full text is available to respondents, providing source information for an article from a mainstream source (H2.1) *increases* the likelihood that one rates it as true by 0.043 (a 5.8% decrease in likelihood), but providing source information for an article from a low-quality source (H2.2) *decreases* the likelihood that one rates that article as true by 0.07 (a 13% decrease in likelihood). If we restrict respondents to evaluating solely the headline and lede rather than the full text, Figure 4 shows that we find that the effect of source information of an article from a mainstream source dissipates (H2.3), but source cues from articles from a low-quality sources remain strong. When only the headline and lede is available, the effect of providing source information for an article from a low-quality source (H2.4) decreases the likelihood of rating an article as true by 0.06 (a 13% decrease in likelihood). These results suggest that source effects are stronger when respondents visit the website and see the full text relative to when they only evaluate the headline and lede of an article.

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[34]We pre-registered these hypotheses using this outcome variable, because we did not believe that source will necessarily aid in correctly discerning the veracity of news. Rather, we believed that the credibility of the source will only affect whether individuals rate an article as true regardless of the content of the article.

Figure 4: Marginal effects of providing the source: This figure presents the marginal effect of source information on the likelihood of rating an article from low-quality news sources as true (H2.1 ; H2.3) and the likelihood of rating an article from mainstream news sources as true (H2.2 ; H2.4) when the full text is provided and when only the headline and lede is provided.

Effect of providing type of information [in brackets]
on rating a type of news article {in braces} as true
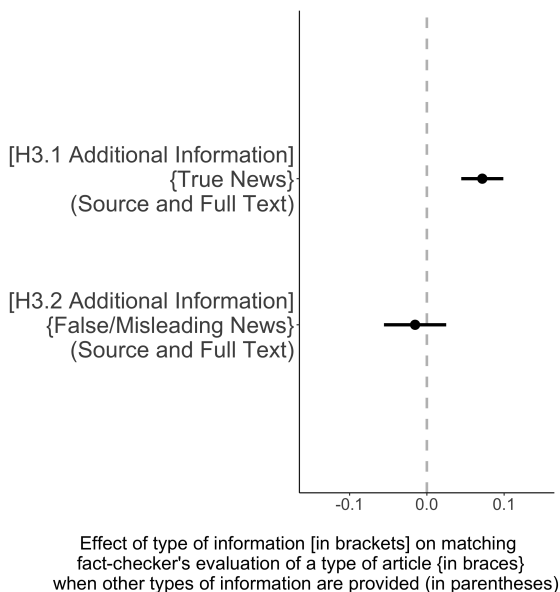when other types of information are provided (in parentheses)

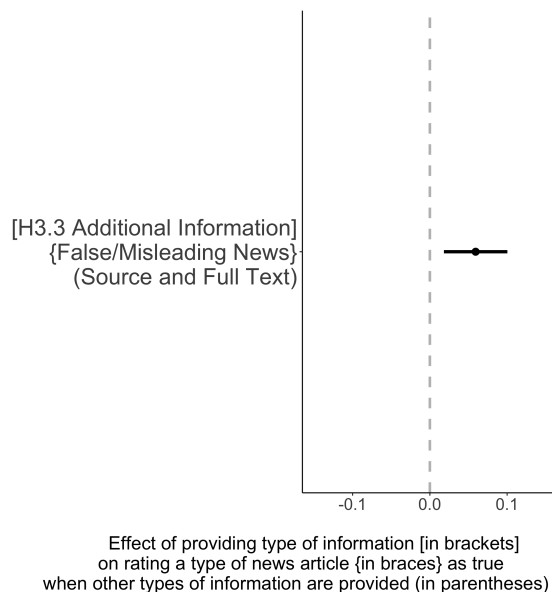## Marginal Effect of Searching for Additional Information

Contrary to the marginal effect of providing the full text of an article or its source, we find that seeking out additional information has a mixed effect on improving respondent's ability to discern the veracity of news. Figure 5a shows that encouraging respondents to search for information increases the likelihood of rating true articles as true by 0.071 (H3.1) (a 12.6% increase in likelihood), but has no effect on the likelihood of correctly identifying false/misleading news as false/misleading (H3.2). Although this would indicate an improvement relative to not encouraging respondents, Figure 5b shows that encouraging respondents to search for information increases the likelihood of rating false/misleading articles as true by 0.059 (nearly a 19.8% increase in likelihood). Worryingly, the effect of searching for additional information on false/misleading news articles appears almost identical to the effect of searching for additional information on true news articles.

Figure 5: Marginal effects of searching for additional information: Panel A presents the marginal effect of searching for additional information on the likelihood of correctly discerning the veracity of true news (H3.1) and false/misleading news (H3.2). Panel B presents the marginal effect of searching for additional information on the likelihood of rating a false/misleading article as true (H3.3)

(a) Effect of Additional Information on Correctly Identifying the Veracity of the News Articles

(b) Effect of Additional Information on Rating a News Articles as True

Effect of type of information [in brackets] on matching
fact-checker's evaluation of a type of article {in braces}
when other types of information are provided (in parentheses)

Effect of providing type of information [in brackets]
on rating a type of news article {in braces} as true
when other types of information are provided (in parentheses)

6   Discussion

We provide new findings about the marginal effect of information about an article on the discernment of news veracity in real-time. First, our results provide support for prior studies that access to the full text of an article (as opposed to just the headline and lede) and source information improves news veracity discernment of popular articles, providing important robustness to these results by testing them in real-time. Second, we find that encouraging individuals to search for information is not always beneficial. It increases the likelihood an individual rates a *true* article as *true*, but it also increases increases the likelihood an individual rates a *false/misleading* article as *true* by similar amounts.

By testing previous theories about the discernment of news veracity in real-time we can confirm previous work that access to the full text of an article improves the discernment of the veracity of news. This emphasizes the importance in how individuals come into contact with news stories online. Individuals may be more likely to believe misinformation if they are only exposed to the headline/lede of an article rather than the full text. For example, coming into contact with news stories as headlines/ledes with limited source information on social media could leave individuals less able to discern the veracity of news relative to having access to the full online article where the full text and source information is clear. In addition, these findings

can help us assess previous studies that strictly expose respondents the headlines/ledes of articles rather than the full article. For example, prior studies that only expose respondents to the headline and ledes of articles are likely underestimating the ability of news consumers to correctly discern the veracity of news relative to when individuals have access to the full article. Although it is likely that most individuals come into contact with news in headline form (Gabielkov et al. 2016), asking individuals to read the full story of articles they are exposed improves the discernment of news veracity and should be adopted by digital media literacy guides.

Our finding that searching for information increases belief in false/ misleading information is particularly concerning given that current digital media literacy guides recommend that individuals search for information when they come into contact with suspect news articles. It is likely that searching for information about a false/misleading news story nudges individuals towards believing it, as online search results may be returning similar articles that may corroborate the claims in the initial article. Low-quality sources often re-use false/misleading news stories, and fact-checks about fake news articles do not appear until well after publication. Therefore, directly after publication, search engine results for false/misleading news stories may be filled with other false/misleading stories that 'corroborate' non-credible claims. Assessing whether these speculations are correct would be an excellent subject for future research.

Most importantly, these results have implications for organizations seeking to increase belief in true news and lower belief in false/misleading news stories. It appears that providing source information and the full text can help individuals identify the veracity of news online. Digital media literacy guides might consider emphasizing reading the full text of an article and investigating the source of information to improve the discernment of news veracity. However, our results indicate that digital media literacy guides may be contributing to higher belief in false news by recommending that individuals search for additional information online. More generally, this study underscores the importance of evidence-based interventions that are thoroughly tested, rather than intuitively designed. As we show in this paper, even plausible interventions can have unintended consequences.

7 References

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