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## ORIGINAL ARTICLE

## In Related News, That Was Wrong: The Correction of Misinformation Through Related Stories Functionality in Social Media

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*Research on social media and research on correcting misinformation are both growing areas in communication, but for the most part they have not found common ground. This study seeks to bridge these two areas, considering the role that social media may play in correcting misinformation. To do so, we test a new function of Facebook, which provides related links when people click on a link within Facebook. We show users a post containing misinformation, and then manipulate the related stories to either confirm, correct, or both confirm and correct the misinformation. Findings suggest that when related stories correct a post that includes misinformation, misperceptions are significantly reduced.*

**Keywords:** Misinformation, Social Media, Health Communication, Facebook, Vaccines, GMOs, Algorithms.

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As social media use approaches ubiquity in American society, attention is rapidly shifting to the challenges inherent in social media use on a large scale. Of growing concern is the ability for false or misleading information to spread online (Vis, 2014). This concern has been echoed in disaster management, where social media may propagate unconfirmed or untrue information upon which people rely in a crisis situation (Keim & Noji, 2010); in illicit behaviors, where social media may reinforce positive feelings toward illegal drug use (Cavazos-Rehg, Krauss, Grucza, & Bierut, 2014); and in public health, where a wealth of bad information swarmed social media during the last Ebola outbreak (Sarmah, 2014). The dangers of misinformation are not limited to new and emerging issues. Social media may also provide an opportunity to reinforce existing misinformation on public debates that have widely agreed upon answers

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by the scientific community, which dissonance research has shown to be essential in maintaining misperceptions or beliefs outside of the mainstream (Festinger, Reicken, & Schachter, 1956; Tavris & Aronson, 2008).

However, given its daily presence in many users' lives, social media may also offer an opportunity to combat misinformation. As of 2014, 71% of online American adults have a Facebook account, and 70% of those visit the site daily (Pew, 2014), providing constant flows of information which may succeed in exposing people to more diverse political and social orientations than they might seek out themselves (Bakshy, Rosenn, Marlow, & Adamic, 2012; Stroud, 2010). In fact, social networking sites and their emphasis on social endorsements have been seen as a location to counter misinformation deliberately maintained for political reasons (Messing & Westwood, 2014), and there is some evidence that the broad information environment of the Internet may diminish the prevalence of conspiracy theories (Clarke, 2007). Instead of providing the social support to maintain misperceptions in the face of scientific evidence, social media may in some circumstances expose people to more accurate information.

This may be particularly true when exposure to accurate information is not dependent on the selection behaviors of the individual. Although people may not actively choose their Facebook friends (and thus what they see on Facebook) on the basis of shared political or social beliefs (Vraga, Thorson, Kligler-Vilenchik, & Gee, 2015), de facto selection biases may still mean that friends circles are relatively homogeneous (Aiello et al., 2012). However, what we see on social media is not just a function of the friends we select or what those friends post, but also of complex algorithms that govern content exposure (Gillespie, 2014; Pariser, 2011). These algorithms are often opaque in how they select information, encompassing predictions of relevance based on past behaviors, content type, interactions, and, of course, commercial goals (Gillespie, 2014; Messing & Westwood, 2014; Pariser, 2011). Although some have argued such algorithms are likely to create a "filter bubble," promoting more exposure to like-minded content (Pariser, 2011), we suggest they may also offer an alternative way for people to be exposed to novel information, which may contradict misperceptions held by users or by their friends. It is therefore an empirical question—one that we consider in this study—whether social media use contributes to reinforcement or correction of misinformation.

For these reasons, this study focuses on the intersection of misinformation and social media. To study the way in which social media may affect establishment and correction of misperceptions, we developed an experimental design that takes advantage of a new function within Facebook. Many posts within Facebook consist of users sharing a link from a source outside of Facebook, and in 2014, Facebook began offering "related stories" that display underneath a link when a user clicks on it, generated by an algorithm that attempts to match stories in terms of topic (Kranish, 2014). Our study tests the extent to which this functionality may play a role in reinforcing or combating misperceptions, depending on the information provided by these related stories. Because Facebook is the most used social media platform in the United States

and in the world (Pew, 2014), it is the most appropriate case to study, and it provides an important test for the role that social media platforms—and specifically algorithms employed within those platforms—can play in combating misinformation online.

### **Misinformation and motivated reasoning**

Misinformation, or factual misperception, refers to the presence of or belief in objectively incorrect information. Nyhan and Reifler define misperceptions as “cases in which people’s beliefs about factual matters are not supported by clear evidence and expert opinion” (Nyhan & Reifler, 2010, p. 305). Along these lines, in this study, we intentionally focus on issues on which there is scientific consensus, allowing us to work within a truth versus misperception dichotomy: that there is no link between vaccines and autism (Institute of Medicine, 2004), and that there is no link between consumption of genetically modified organisms (GMOs) and health (Pew, 2015; Snell et al., 2012).

Research on misinformation has resulted in several clear takeaways. First, misinformation in the American system abounds. Citizens are misinformed about foreign policy (Gershkoff & Kushner, 2005), domestic policy (Jerit & Barabas, 2012), scientific policies (Leiserowitz, Maibach, Roser-Renouf, & Hmielowski, 2011), and especially about President Obama (Nyhan & Reifler, 2010). Although partisanship and motivated reasoning are often responsible for these misperceptions (Jerit & Barabas, 2012; Taber & Lodge, 2006), both Republicans and Democrats suffer from factual misperceptions when they benefit their party (Kraft, Lodge, & Taber, 2015; Uscinski & Parent, 2014), and partisan-related media choice may exacerbate misinformation (Kull, Ramsay, & Lewis, 2003).

The prevalence and persistence of misinformation is often linked to motivated reasoning, which enables individuals to protect pre-existing attitudes. As a result, people find information that agrees with prior-held beliefs to be more credible and reliable than disconfirming information (Jerit & Barabas, 2012; Taber & Lodge, 2006)—a finding that extends to online environments, which often results in dismissal of incongruent ideas (Vraga, 2011). Because motivated reasoning plays such a key role in how people process information, it also has major implications for acceptance and rejection of information designed to correct a misperception, which people are likely to discredit if it disagrees with their views. Therefore, when people are exposed to recommended news stories that either debunk or confirm a misperception, we expect evaluations of those stories to depend on initial perceptions of the issue (Lord, Ross, & Lepper, 1979; Taber & Lodge, 2006). We predict that among those with no initial misperceptions for a controversial issue (e.g., with opinions in line with scientific evidence), evaluation of the recommended stories will be highest among those who see news stories debunking the misperception (H1a). Alternatively, among those with initial misperceptions, evaluation of the recommended stories will be highest among those exposed to confirming information (H1b).

### **Misinformation in online environments**

Motivated reasoning makes misinformation a particular concern in the digital media environment. The lack of gatekeepers online leads to an environment in which credible evidence-based information exists alongside personal opinion and poor quality data (Ennals, Byler, Agosta, & Rosario, 2010). New media allowances such as visual memes facilitate fast transmission of information (Nahon & Hemsley, 2013; Ratkiewicz et al., 2010), allowing “health messages as well as concerns and rumors regarding vaccinations ... to spread virally across the globe in a rapid, efficient and vivid manner” (Betsch & Sachse, 2012, p. 3723; see also Qazvinian, Rosengren, Radev, & Mei, 2011). Therefore, people have few cues other than pre-existing attitudes for judging quality information, making motivated reasoning more likely.

The fractured nature of the Internet also tends to send information seekers down dramatically different paths depending on mildly different search terms (Ruiz & Bell, 2014), where misinformation may persist for long periods without contradiction (Kata, 2010). Further, coverage of rumors, misinformation, and controversies in mainstream media can spur additional information seeking online—but such information seeking is not always motivated by a desire for accurate information and may instead lead to making decisions based on low-quality sources (Southwell, 2013; Weeks & Southwell, 2010).

The prevalence of misinformation has major implications no matter in what realm it occurs. Widespread misinformation changes collective preferences (Kuklinski, Quirk, Jerit, Schwieder, & Rich, 2000; Reedy, Wells, & Gastil, 2014), which in turn affects public outcomes such as elections and public policy (Fowler & Margolis, 2013) and individual decisions related to health care and other issues (Tafuri et al., 2013). As a recent treatise on the subject put it, those “who possess inaccurate information may form opinions that differ substantially from the opinions they would have formed were they correctly informed ... [and] prevent them from seeking new information” (Thorson, 2013, p. 4).

This importance is amplified by another well-studied attribute of misinformation—it is famously hard to correct. Misinformation tends to be sticky, persisting in memory, often in ways only partially related to the original misheld belief (Thorson, 2013). Even targeted interventions may fail to reduce misperceptions (Nyhan & Reifler, 2010), and sometimes even lead to a backfire effect, actually increasing misperceptions (Nyhan, Reifler, Richey, & Freed, 2014). However, several methods for correcting misinformation do exist, and they may be especially applicable to social media. Strong retractions of misinformation may be effective at reducing misperceptions (Ecker, Lewandowsky, Swire, & Chang, 2011), although they are contingent upon perceptions of the source of the corrective information and on political sophistication (Nyhan, Reifler, & Ubel, 2013). Although these mechanisms have not been tested within the realm of social media, there is no reason that recommended best practices of simple, brief, and strong retractions, an emphasis on facts, and an alternative account should not be similarly effective in social media (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012).

Further, motivated reasoning usually operates by discrediting a source of incongruent information (Lord et al., 1979; Taber & Lodge, 2006), which may be more difficult via social media. Endorsements via social media have been shown to encourage people to engage with information they would usually ignore, such as articles from ideologically incongruent sources (Messing & Westwood, 2014). Motivated reasoning may lead people to discredit individuals attempting to correct misperceptions as engaging in unbelievable partisan attacks (Lewandowsky et al., 2012). However, when an algorithm produces these corrections they may be more difficult to discount, as they are unlikely to be seen as overtly partisan.

Because we tailored our disconfirming information conditions to these recommendations, we expect to be able to move attitudes rooted in misinformation. For this reason, we predict that among those with initial misperceptions, attitude change will be greater among subjects exposed to disconfirming information than subjects exposed to other types of information (H2). The prediction is less clear for those with no initial misperceptions: whether exposure to disconfirming information reinforces previously held attitudes (along the lines of motivated reasoning), or whether it plants a seed of doubt (as occurred with attempts at correction in Nyhan et al., 2013). For this reason, we ask: Among those with no initial misperceptions, to what extent will attitudes change as a result of exposure to information debunking a misperception they do not already hold (RQ1)?

It is also unclear how the conditions in which subjects receive either confirming information or a mix of disconfirming and confirming information should operate. Not surprisingly, it is uncommon for studies to confirm misheld beliefs, rather than correcting them. Those with misperceptions might be expected to strengthen their opinions, by simple virtue of having more supporting information (Zaller, 1992), but without theory to guide us, we are hesitant to offer such a hypothesis. Similarly, we have little theory with respect to those who agree with the scientific consensus to start. When confronted with a misperception and confirmation of that misperception, their attitudes might be weakened from new information, but they might also respond by reinforcing their previous (correct) beliefs (Nyhan et al., 2013) or not respond at all. We therefore ask how attitudes are affected when confronted with confirmation of a misperception for those with misperceptions on the issue (RQ2a) and for those without misperceptions (RQ2b).

The mixed condition, in which both confirming and correcting information are included, is likewise relatively untried. Research on competitive framing suggests that effects should be minimal in this condition (Chong & Druckman, 2007, but see Nisbet, Hart, Myers, & Ellithorpe, 2013), but given that this is untested in the realm of misinformation and correction, we ask how attitudes are affected when confronted with both confirming and correcting information for those with (RQ3a) or without the misperception (RQ3b).

Finally, we think it worthwhile to consider how these mechanisms operate under different circumstances. We therefore consider two issues—the relationship between vaccination and autism, and the relationship between GMOs and illness. Attitudes

related to the link between vaccines and autism are likely to be well-established — this issue has persisted for more than 10 years (Goldacre, 2008), and has received enormous amounts of media attention (Dixon & Clarke, 2013). On the other hand, controversy over the safety of GMOs is relatively young, with major public interest emerging in 2012–2013 (Vermont v science, 2014). However, this public controversy is not reflected at the scientific level, where experts broadly agree that GMOs pose no health risks to the population (Snell et al., 2012). Because the public debate over the link between vaccines and autism is a more established issue than the GMO issue, people who are misinformed on the issue should have a more strongly held attitude and more motivation and ability to reason away disconfirming information. Therefore, we expect that it will be more difficult to change attitudes on this issue than for the issue of GMOs (H3).

## Method: Study 1

### Design

To test our hypotheses, we performed an experiment embedded in a web-based survey in the fall of 2014. We recruited participants from a large mid-Atlantic (U.S.) university, who received extra credit for their participation. Our sample included 524 participants, who had an average age of nearly 20 ( $M = 19.76$ ,  $SD = 3.22$ ) and were somewhat more females (68.0%) and liberal ( $M = 4.23$ ,  $SD = 1.40$ ) than the general population.

This study used a 4 (related story position: confirm misperception, debunk misperception, mixed to misperceptions, unrelated to misperception)  $\times$  2 (controversial issue: GMOs cause illness or vaccines cause autism) between-subjects experimental design. Participants completed a pretest questionnaire, which included questions about their attitudes toward each issue along with other issue attitudes to obscure our purpose. Participants were then told they would see several screens from one person's Facebook NewsFeed (the home page where they can see recent posts from friends). All participants viewed four separate Facebook screens, three pages of which are controls (see Appendix S1, Supporting Information, for samples of stimulus materials) containing a mix of news stories, pictures, and status posts. All poster information (e.g., name and picture) was blurred out to maintain privacy and enhance generalizability.

The second page of these stimuli pages contained the experimental manipulation, where participants were randomly assigned to one of eight conditions. In all conditions, the original post confirmed the misperception (issue manipulation: "GMOs make you sick" or "vaccines cause autism") and included a news story supporting that argument. This story is followed by two "related links" from Facebook — one from Snopes.com (a well-known website that researches rumors and urban legends) and a second from the American Medical Association (AMA). These related stories contained the second experimental manipulation: (a) both confirmed the misperception, (b) both refuted the misperception, (c) a mixed condition, where Snopes.com confirmed the misperception and the AMA refuted it, or (d) the unrelated condition,



where the related stories did not address the misperception. These related stories consisted of a headline and a brief preview of the article to which they were linking. Following misinformation correction best practices (Lewandowsky et al., 2012), and the general format employed by Facebook, we kept statements short and to the point.

After viewing the simulated Facebook NewsFeed, participants were assigned to a separate posttest that matched the issue they saw. Therefore, participants only evaluated the related news stories for the issue they saw, so no direct comparison is possible.

## Measures

### *Attitudes toward vaccination and autism*

A set of three items measured participants' perceptions of whether vaccines cause autism. Participants rated their agreement with three items on a 7-point scale (*strongly disagree* to *strongly agree*): "Some vaccines cause autism in healthy children," "Many children will suffer serious side effects from the MMR vaccine," and "If I have a child, I will vaccinate him or her" (reversed). These items were combined into an index (see Table 1 for descriptive statistics). This index was split to create autism position: People who averaged less than a "4" were coded as "disbelieve misperception" ( $N = 419$ , 80.0%), people who averaged higher than "4" were coded as "believe misperception" ( $N = 47$ , 11.1%), and people who averaged "4" were excluded from future analysis ( $N = 58$ , 9.0%). In addition, the same three items were asked in the posttest and combined into an index. A change score was computed by subtracting pretest autism attitude from posttest autism attitude, with a positive score indicating an increase in misperceptions and a negative score indicating decreased misperceptions.

### *Attitudes toward GMOs and illness*

Three items measured perceptions of the relationship between GMOs and illness: "Genetically modified foods are safe to eat" (reversed), "Genetically modified foods give you cancer," and "I try to avoid genetically modified foods" (7-point scale, *strongly disagree* to *strongly agree*). These items were combined into an index, which was split to create GMO position: People who averaged less than a "4" were coded as "disbelieve misperception" ( $N = 183$ , 34.9%), people who averaged higher than "4" were coded as "believe misperception" ( $N = 266$ , 50.8%), and people who averaged "4" were excluded from future analysis ( $N = 75$ , 14.3%). As with the vaccine attitudes, the same questions were combined into an index in the posttest and a change score was computed, with a higher score indicating increased misperceptions.

### *Evaluations of the recommended news stories*

Immediately following the simulated Facebook feed, participants rated their perceptions of the recommended news stories following the initial post they saw (on either vaccines and autism or GMOs and illness) on a series of seven indicators: novel (or new), useful, interesting, trustworthy, credible, and accurate (1 *"not at all"* to 7 *"extremely"*). These items were combined into an index.

For additional information about the manipulations, cell sizes, measures, and manipulation checks, please see Appendix S1.



**Table 1** Descriptive Statistics

	Study 1			Study 2		
	Correlation or Cronbach's Alpha	Mean	Standard Deviation	Correlation or Cronbach's Alpha	Mean	Standard Deviation
Autism attitude: pretest	$\alpha = .66$	2.97	1.05	—	—	—
Autism attitude: posttest	$\alpha = .69$	2.99	1.09	—	—	—
Autism attitude: change score	$r = .82^{***}$	.02	.64	—	—	—
GMO attitude: pretest	$\alpha = .77$	4.18	1.32	$\alpha = .84$	3.94	1.48
GMO attitude: posttest	$\alpha = .81$	4.11	1.31	$\alpha = .86$	3.81	1.53
GMO attitude: change score	$r = .87^{***}$	-.08	.66	$r = .90^{***}$	-.13	.66
Evaluations of recommended news stories (autism)	$\alpha = .93$	3.15	1.37	—	—	—
Evaluations of recommended news stories (GMOs)	$\alpha = .91$	3.15	1.27	$\alpha = .93$	3.82	1.39

GMO = genetically modified organism.

$^{***}p < .01$ .

## Results: Study 1

### Issue 1: The relationship between genetically modified foods and illness

To test our hypotheses, we ran a series of two-way analyses of covariance (ANCOVAs), which compare participants' pre-existing attitudes about the safety of GMOs with their experimental condition (i.e., which related stories they saw), while controlling for age, gender, need for cognition, political ideology, and Facebook use frequency. All analyses below are only for participants assigned to the GMO issue condition and who have a nonneutral GMO attitude ( $N = 187$ ).

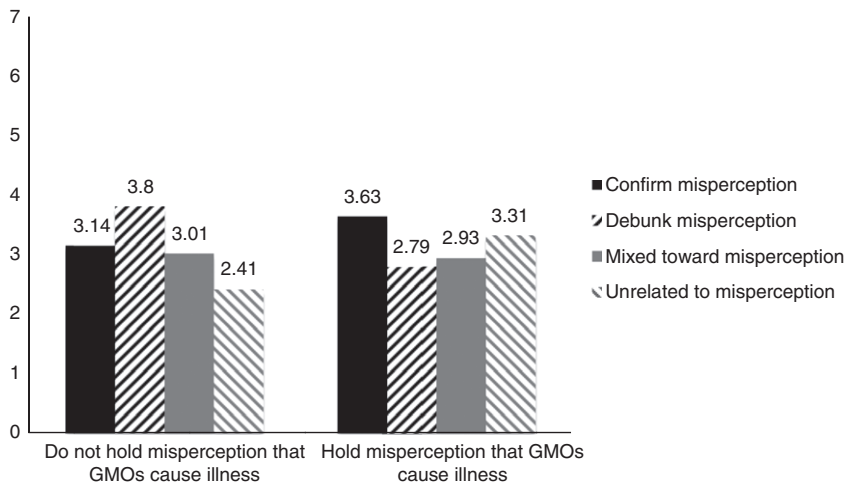
First, we test H1a and H1b, which examined evaluations of the related news stories that appeared after the manipulated story. As expected, there is a significant interaction with GMO position (see Table 2), with participants rating the related news stories highest when they match their predispositions. The pairwise comparisons demonstrate that for those who do not believe GMOs cause illness, the news stories that debunk the misperception were rated more highly (see Figure 1) than stories that confirmed the misperceptions ( $p < .10$ ), mixed stories ( $p < .05$ ), or unrelated stories ( $p < .01$ ), supporting H1a. The pattern is similar for those who believe GMOs cause illness: The news stories that confirm these misperceptions are rated significantly more highly than stories that debunk misperceptions ( $p < .05$ ) or are mixed ( $p < .05$ ), but the difference to unrelated stories is not significant ( $p = .33$ ), supporting H1b.

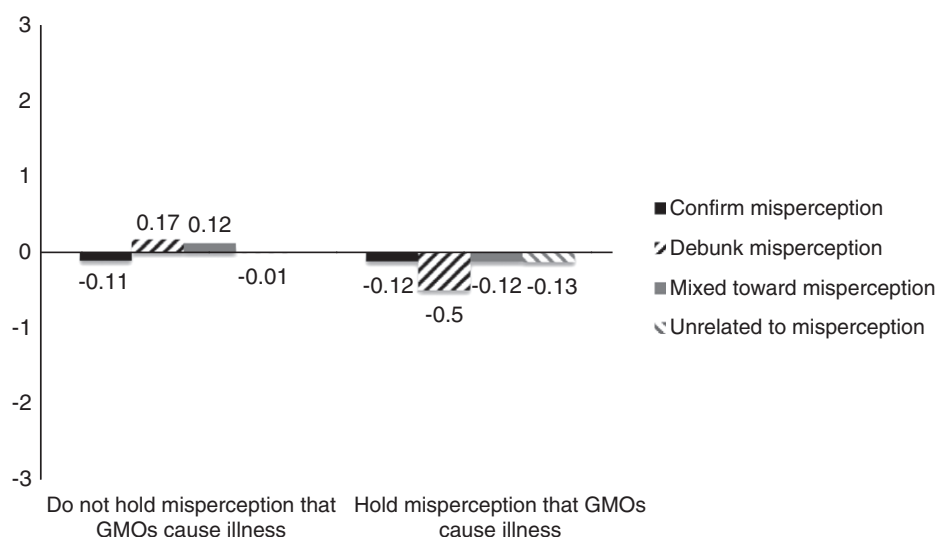
**Table 2** Summary of Interactive Effects of Related Stories and Previous Position on Outcomes

	<i>df</i>	<i>F</i>	<i>Partial</i> $\eta^2$	<i>p</i>
GMO issue—Student sample				
Evaluations of related news stories	3	4.98	.079	.002
Attitude change	3	2.33	.039	.076
Autism issue—Student sample				
Evaluations of related news stories	3	.94	.016	.422
Attitude change	3	.14	.002	.940
GMO issue—MTurk sample				
Evaluations of related news stories	3	6.66	.048	.000
Attitude change	3	3.19	.023	.024

GMO = genetically modified organism.

Next, we examine whether exposure to the post and related news stories influenced change in attitudes toward the relationship between GMOs and illness. In this case, we see a marginal interaction between GMO position and exposure to the manipulated news stories (see Table 2). As predicted by H2, among those who believe GMOs cause illness (i.e., hold the misperception), seeing the related news stories containing corrective information significantly reduced this misperception compared to all other conditions ( $p < .05$ , see Figure 2). However, there is no effect of seeing debunking stories on attitude change for people who do not hold the misperception (RQ1). In short, when the related stories correct the misperception that GMOs cause illness perpetuated in the original posted story, they successfully reduced this misperception among people who initially held this belief.

**Figure 1** Evaluations of related news stories for the genetically modified organism issue, student sample.



**Figure 2** Attitude change for the genetically modified organism issue, student sample.

These analyses also shed light on our second and third research questions. Among those with no misperceptions that GMOs cause illness, related stories that confirm misperceptions or are mixed on the topic have no impact on attitudes (RQ2b and RQ3b, see Figure 2). Similarly, among those who originally hold misperceptions, related stories that confirm misperceptions or are mixed produce no significant effects on attitudes (RQ2a and RQ3a). Therefore, among the student sample, only the stories that fully debunk misperceptions produce significant attitude change, reducing misperceptions among those who originally held them.

## Issue 2: The relationship between vaccines and autism

Next, we test the same hypotheses using the same tests, but for participants assigned to the issue of whether vaccines cause autism (analyses are limited to participants assigned to the autism issue condition who have a nonneutral autism attitude ( $N = 190$ )).

In this case, there is no significant interaction between pre-existing autism attitudes and the recommended news stories on evaluations of the related news stories (see Table 2; H1a and H1b are not supported). Further, there are no significant effects of the manipulation on change in autism attitude, as predicted by H2. Thus, in contrast to earlier findings, related stories on the autism issue did not affect participants' evaluations of these stories, nor did it lead to a change in attitudes.

These analyses support H3. It proved easier to affect participants' evaluations of the news stories, and to change their attitudes toward the misperception when discussing the relationship between genetically modified foods and illness, compared to the relationship between autism and vaccinations.

## Method: Study 2

### Design

For this reason, our second study replicated the design for Study 1, but focused on the GMO issue among a more diverse population: participants from Amazon's Mechanical Turk, a crowdsourcing service in which participants are paid to complete tasks. Previous research has suggested that Mechanical Turk samples are similar to other Internet samples and substantially more diverse than samples of American college students (Buhrmester, Kwang, & Gosling, 2011; Casler, Bickel, & Hackett, 2013). Therefore, although we cannot claim generalizability to the American population, we can examine whether the mechanisms uncovered in the student sample apply more broadly.

The second study was fielded in September 2014. Five hundred participants were paid \$0.75 for taking part in a 10-minute survey experiment, which replicated the above design. This sample is older ( $M = 34.65$ ,  $SD = 11.20$ ) and more evenly split in gender (56% females), but remains relatively liberal ( $M = 4.49$ ,  $SD = 1.64$ ) and educated, averaging above a technical/professional degree ( $M = 4.16$ ,  $SD = 1.30$ ).

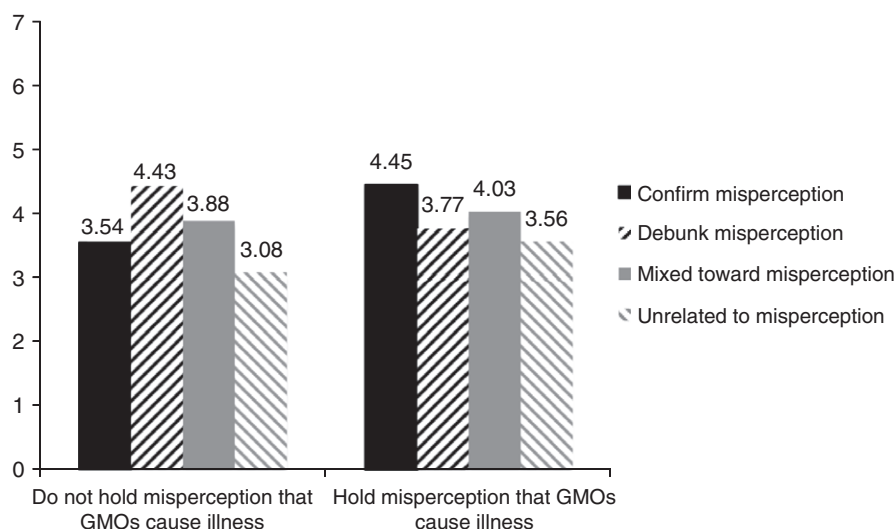
### Measures

All measures for GMO attitudes and evaluations of the related news stories are identical to Study 1 (see Table 1 for descriptive statistics).

## Results: Study 2

We again test our hypotheses using a series of two-way ANCOVAs, entering both experimental condition (e.g., which related news stories participants saw) and initial GMO position as factors, excluding participants who were neutral on the issue ( $N = 413$ ), while controlling for age, gender, need for cognition, political ideology, education, and Facebook use.

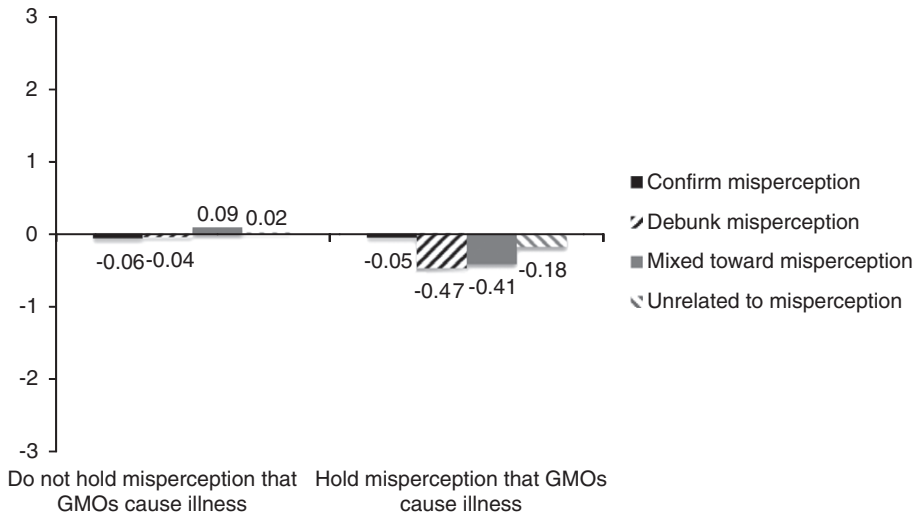
Testing H1a and H1b among this adult sample provide support for our hypotheses. With the adult sample, there is a significant main effect of recommended story position ( $F = 7.36$ ,  $p < .001$ , partial  $\eta^2 = .052$ ),<sup>1</sup> which is conditioned by a significant interaction with GMO position (see Table 2). As with Study 1 and as predicted by H1a, among those with no initial misperceptions (i.e., people who do not believe GMOs cause illness) the related stories that debunk the misperceptions are rated significantly more highly (see Figure 3) than those that confirm ( $p < .01$ ), that are mixed ( $p < .05$ ), or that are unrelated to the misperception ( $p < .001$ ). Likewise, as predicted by H1b and matching the pattern from Study 1, among those with the misperception that GMOs cause illness, the related stories that confirm the misperception are rated significantly more highly than those that debunk the misperception ( $p < .01$ ) or those that are unrelated ( $p < .001$ ), but the difference between the confirmatory and mixed conditions is not significant ( $p = .11$ ). Therefore, we find support for the patterns uncovered in Study 1 and predicted by H1a and H1b: People evaluate related news stories more highly when they match their initial position toward the issue.



**Figure 3** Evaluations of related news stories for the genetically modified organism issue, MTurk sample.

Next, we turn to our central hypothesis and research question of how the related stories impact attitude change on the issue of GMOs. In this case, there is no significant main effect of story position, but there is a significant interaction (see Table 2). As predicted by H2, among those who initially hold a misperception that GMOs cause illness, there is a significant decline in these misperceptions when seeing related stories debunking this misperception (see Figure 4) compared to the confirm misperceptions ( $p < .01$ ) or the unrelated stories conditions ( $p < .05$ ). In addition, to answer RQ3b, the mixed story condition among adults showed a significant decline in misperceptions compared to the confirm misperceptions condition ( $p < .01$ ) and a marginally significant decline compared to the unrelated condition ( $p < .10$ ). Meanwhile, in answer to RQ1, there is no effect of experimental condition among those who do not hold this misperception initially. Therefore, we find support for H2 among the adult sample: Seeing related news stories that debunk the misperception led to a significant change in GMO attitudes, lessening misperceptions among those who originally held this belief.

Turning to our second and third research questions, we again see there is no impact of seeing related stories that confirm misperceptions, among either the group that initially held a misperception that GMOs cause illness or a group that is more accurately informed (RQ2a and RQ2b). However, turning to the mixed condition, there is some evidence that it successfully debunks the misperception among those who initially held it, compared to the confirmatory or unrelated conditions (RQ3b), although it again has no effect among those who did not hold the misperception. Therefore, among the adult sample, the mixed condition did appear to also produce some correction in misperceptions among those who were initially incorrect.



**Figure 4** Attitude change for the genetically modified organism issue, MTurk sample.

### Testing for differences between issues

H3 predicted that because the link between vaccines and autism is a more established issue, movement on attitudes toward this issue should be less than for the issue of GMOs. Additional analyses allowed us to test this assumption by comparing the relative strength of attitudes toward the two issues. First, in the student sample, a paired samples  $t$ -test ( $t = 2.51, p < .05$ ) reveals that autism attitude strength is stronger ( $M = 1.16, SD = .90$ ) than GMO attitude strength ( $M = 1.05, SD = .82$ ), confirming our assumption that attitudes on the autism issue were more firmly held. In addition, we compared attitude strength for those who held versus did not hold a misperception on the GMO issue for both samples. Here, the evidence is mixed: Among the student sample, there is no meaningful difference in attitude strength between those who held the misperception that GMOs cause illness ( $M = 1.21, SD = .73$ ) and those who did not ( $M = 1.23, SD = .79, p = .76$ ). Conversely, among the Mechanical Turk sample, this difference is significant, with people who did not hold a misperception reporting stronger attitudes on the issue ( $M = 1.43, SD = .88, p < .05$ ) than those who did ( $M = 1.25, SD = .76$ ). Although these results are not perfectly consistent, they do suggest—in line with previous research—that the attitudes that were less strongly held were more impacted by our manipulations, leading to the correction of misinformation after seeing debunking information.

### Discussion and Conclusions

The findings of this study might give hope to those attempting to correct misinformation in online contexts. Our experimental evidence suggests that attitude change related to GMOs can be achieved with regard to misperceptions by virtue of exposure

to corrective information within social media. It is key that this change is obtained absent any heuristic cues from members of one's social network (as in Messing & Westwood, 2014), but instead achieved through the articles suggested by Facebook's algorithm. This is an important finding, given how difficult it is to correct misperceptions (Nyhan et al., 2014; Thorson, 2013). Moreover, given the consistency across multiple samples, we are confident this effect is real.

This suggests a positive implication of social media curation. Algorithms curating content on social media are often lambasted for preventing people from seeing diverse information, and for reinforcing existing beliefs (Pariser, 2011). However, we have revealed a positive effect of content curation—although obviously this effect is only positive when the related stories serve to correct the misinformation. Although in our experiment, the main story contained misinformation and related stories (sometimes) included corrective information, the opposite may be true for actual user experiences. Particularly since Facebook recently stated their intention to combat hoaxes using their platform (Owens & Weinsberg, 2015), future research should endeavor to study the frequency with which Facebook and other sources actually offer corrective information.

Although algorithmic correction may offer an opportunity to combat motivated reasoning tendencies, this does not mean motivated reasoning is entirely absent—and we would be surprised if it were. Instead, we also find evidence of motivated reasoning in evaluations of the related stories for the GMO issue. Users who are exposed to stories that reflect their opinions on an issue rate those stories more favorably. This continues a long literature indicating that people react differently to information affirming their opinions than to information with which they disagree (Jerit & Barabas, 2012; Taber & Lodge, 2006; Vraga, 2011), and this motivated reasoning occurs equally for those who hold versus do not hold a misperception on the relationship between GMOs and illness.

Yet it is interesting that, although people lower evaluations of related news stories when they contradict pre-existing attitudes, this does not prevent those stories from changing attitudes among those who believed the misperception. One of the mechanisms by which motivated reasoning is theorized to work is via discrediting the incongruent information (Redlawsk, Civettini, & Emmerson, 2010; Taber & Lodge, 2006). In this study, although participants successfully denigrated the value of the related stories when they disagreed with their beliefs, those holding misperceptions on the GMO issue still adjusted their attitudes after reading debunking news stories. It may be that although the stories were seen as less credible, they maintained sufficient credibility to impact attitudes. A second possibility may be that participants reached their affective "tipping point" of incongruence, where motivated reasoning still operates in evaluating stories but does not prevent updating of attitudes (Redlawsk et al., 2010).

Such a tipping point should be variable, dependent on individual and issue characteristics such as issue relevance and attitude certainty. This may explain the differences between the issues examined: While attitude change occurred for the issue of GMOs and illness, we were unsuccessful in changing attitudes among those who



viewed stories on the issue of autism and vaccination. We deliberately selected issues that varied in their relative novelty: Public concerns about the health consequences of GMOs are relatively new, so public opinion may not be as established on the topic, whereas the issue of whether vaccines cause autism has been in the public eye much longer, allowing people to build up their motivation and ability to resist incongruent information (Cooper & Fazio, 1984; Festinger et al., 1956). The policy prescription suggested by these findings is that public health experts should not wait before correcting public misinformation. The sooner a misheld opinion can be corrected, before an attitude becomes ingrained and strengthened among the public, the more likely correction is to be successful.

It is also worth noting that no attitude change occurred among those who did not hold a misperception that GMOs cause illness, even when the original post was confirmed by two additional stories. It may be that people who hold accurate information on contested scientific issues are more knowledgeable, and thus able to ignore or refute incorrect information promoting a misperception (Zaller, 1992). However, this does not explain why misperceptions were not strengthened by exposure to confirmatory information among those who hold those misperceptions initially. Future research should focus on what circumstances prevent adopting and strengthening of misheld attitudes, in addition to studies like ours that focus on correcting misheld attitudes, as well as testing the mechanisms by which updating attitudes occurs.

We see several limitations to this study. First, although we test our expectations on two separate samples, and find consistent results across both, neither sample is an ideal test case for this research.<sup>2</sup> In addition, it is difficult to speculate on the external validity of our study, given that Facebook does not release any data regarding its related stories algorithm. For this reason, we do not know how often the conditions we created are mimicked in real life. Obviously, the more often they actually occur (and in particular, the more often the corrective information condition occurs), the more meaningful this research becomes. However, there are indications that Facebook plans to actively monitor and flag potentially misleading stories, after a case in which false “related stories” about Michelle Obama’s relationship with the President surfaced in 2014 (Kranish, 2014; Owens & Weinsberg, 2015).

We are also conducting this study at a single point in time. For this reason, we have no way of knowing how long the corrections we observe persist. Future research should consider this question to ascertain the magnitude of this study’s importance. It might also consider the effects of corrections that occur via Facebook’s built-in functions (as we studied) versus those that originate with other users (both friends and strangers). Responses with a social element may be more powerful than those originating from Facebook, but may be more likely to be considered biased. Different types of corrective messages should also be considered, including those that are matched to individual characteristics to maximize persuasion (Briñol & Petty, 2006).

Despite these limitations, there are major implications of this study. Most importantly, we have revealed a meaningful way that social media can act to correct misinformation. Given the difficulty of correcting misinformation (Nyhan et al., 2014;

Thorson, 2013), this is noteworthy. A relatively small intervention produced meaningful effects in terms of moving misperceptions.

The fact that this was achieved via social media is equally important. Social media have been maligned for propagating the spread of misinformation (Vis, 2014; Vishwanath, 2014), but we demonstrate a means by which they can correct misperceptions. The ubiquity of social media amplifies the importance of this finding; as 71% of online American adults use Facebook, the opportunities available for misperception correction are enormous. And evidence suggests that this effect exists broadly, given the consistency of effects we find using multiple samples.

This study also speaks directly to the literature on corrective information. We have outlined new means by which misperceptions can be corrected, and looked specifically at the realm of social media, an overlooked area in previous research (for exceptions see Qazvinian et al., 2011; Ratkiewicz et al., 2010). In addition, we think the Facebook function highlighted in this research represents a new way of thinking about accidental exposure to information via social media (Bode, 2012, 2015; Kim, Chen, & Gil de Zuniga, 2013). Outside the experimental study, of course, this functionality depends on the inputs to the Facebook algorithm, which are different for different people. Future research might consider the real world use of these functions to further our understanding of this new feature, particularly as a mechanism of accidental exposure.

Overall, this study furthers our understanding of the role that social media may play in propagating or correcting misinformation. Everyday Facebook use has the potential to quickly and simply correct misinformation without having to depend upon users selecting into particular information streams. This represents an important advance in understanding how misinformation spreads or stops in the modern media environment, and offers positive policy recommendations for moving forward.

## Notes

- 1 Please see Appendix S1 for the results of this main effect.
- 2 For further discussion of this issue, see the supporting information Appendix S1.

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## Supporting Information

Additional supporting information may be found in the online version of this article:  
**Appendix S1.** Methodological Appendix.