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Article in *Journal of Risk Research* · February 2018

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The fake news game: actively inoculating against the risk of misinformation

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ABSTRACT

The rapid spread of online misinformation poses an increasing risk to societies worldwide. To help counter this, we developed a 'fake news game' in which participants are actively tasked with creating a news article about a strongly politicized issue (the European refugee crisis) using misleading tactics, from the perspective of different types of fake news producers. To pilot test the efficacy of the game, we conducted a randomized field study ($N = 95$) in a public high school setting. Results provide some preliminary evidence that playing the fake news game reduced the perceived reliability and persuasiveness of fake news articles. Overall, these findings suggest that educational games may be a promising vehicle to inoculate the public against fake news.

ARTICLE HISTORY

Received 16 February 2018
Accepted 18 February 2018

KEYWORDS

Fake news; inoculation theory; misinformation; post-truth; influence

Introduction

In an age where almost half of all news consumers receive and share their news from online sources (Mitchell et al. 2016), false information can reach large audiences by spreading rapidly from one individual to another (van der Linden, Maibach et al. 2017). Following an age of 'post-trust' (Löfstedt 2005), some observers claim we have now entered an era of 'post-truth' (Higgins 2016). In fact, the Oxford dictionaries declared 'post-truth' word of the year in 2016, reflecting 'circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal beliefs' (Oxford Dictionaries 2016). Although not new (Cooke 2017), the spread of false information has become synonymous with the term 'fake news'. A Google Trends analysis reveals that this term began to gain relevance in U.S. Google searches around the time of the U.S. presidential election in 2016, and has remained popular since.¹ The risk that fake news poses to evidence-based decision-making is increasingly recognized by governments. For example, U.K. parliament recently launched an investigation into how 'fake news' is threatening modern democracy (Harriss and Raymer 2017) and the World Economic Forum (2013) ranked the spread of misinformation as one of the top risks facing the world today.

The study of the spread of false information, particularly through social media and online networks, has become an important area of research (Boididou et al. 2017; Luca Ciampaglia et al. 2017; Mustafaraj and Metaxas 2017; van der Linden, Maibach et al. 2017). In particular, scholars have theorized that fake news can exert a significant degree of influence on political campaigns and discussions (e.g. Jacobson, Myung, and Johnson 2016; Allcott and Gentzkow 2017; Groshek and Koc-Michalska 2017; Gu, Kropotov, and Yarochkin 2017). Yet, although extensive research exists on political misinformation (for a recent

review, see Flynn, Nyhan, and Reifler 2017), there is some debate about the extent to which fake news influences public opinion (Luca Ciampaglia et al. 2017; van der Linden 2017), including self-reinforcing social media ‘echo chambers’ and ‘filter bubbles’ (Bakshy, Messing, and Adamic 2015; Flaxman, Goel, and Rao 2016; Fletcher and Nielsen 2017; Guess et al., 2018).

Nonetheless, a majority (64%) of Americans report that fake news has left them feeling confused about basic facts (Barthel, Mitchell, and Holcomb 2016), and a study carried out by YouGov (2017) found that while many people believe they can tell the difference between true and fake news, only 4% of those surveyed could systematically differentiate the two. Similarly, a survey conducted by Ipsos MORI found that 75% of Americans who were familiar with a fake news headline thought the story was accurate (Silverman and Singer-Vine 2016). This is concerning because the functioning of democracy relies on an educated and well-informed populace (Kuklinski et al. 2000). Accordingly, the spread of misinformation has the potential to undermine both science and society (Lewandowsky, Ecker, and Cook 2017; van der Linden, Maibach et al. 2017). For example, the viral spread of misinformation on issues such as climate change and vaccines can undermine public risk judgments about not only the state of scientific agreement but also the perceived seriousness of these issues (Lewandowsky, Ecker, and Cook 2017; van der Linden, Leiserowitz et al. 2017).

Given these findings, a more recent line of inquiry looks at how the fake news dilemma may be solved (Bakir and McStay 2017; Lazer et al. 2017; van der Linden 2017). For example, recent risk management initiatives have involved the announcement of controversial ‘fake news’ laws (Bremner 2018). Other proposed solutions range from making digital media literacy a primary pillar of education (Select Committee on Communications 2017), to preventing false information from going viral in the first place or counteracting it in real time (Bode and Vraga 2015; Sethi 2017; Vosoughi, Mohsenvand, and Roy 2017). Lewandowsky, Ecker, and Cook (2017) call for technological solutions that incorporate psychological principles, which they refer to as ‘technocognition’. Similarly, in a recent edition of *Science*, van der Linden, Maibach et al. (2017) call for a *preemptive* solution grounded in ‘inoculation’ theory, which we explore further here.

Inoculation theory

The diffusion of fake news can be modeled much like the spread of a viral contagion (Budak, Agrawal, and El Abbadi 2011; Kucharski 2016). Inoculation theory offers an intuitive solution to this problem by offering the possibility of a ‘vaccine’ against fake news (van der Linden 2017).

Inoculation theory was originally pioneered by William McGuire (1964) in an attempt to induce attitudinal resistance against persuasion and propaganda, in a manner analogous to biological immunization. To illustrate: injections that contain a weakened dose of a virus can confer resistance against future infection by activating the production of antibodies. Inoculation theory postulates that the same can be achieved with ‘mental antibodies’ and information. In other words, by preemptively exposing people to a weakened version of a (counter)-argument, and by subsequently refuting that argument, attitudinal resistance can be conferred against future persuasion attempts (Papageorgis and McGuire 1961).

The inoculation process has an affective and cognitive component, often referred to as ‘threat’² and ‘refutational preemption’ (McGuire and Papageorgis 1962; McGuire 1964). The role of perceived ‘threat’ is largely motivational and refers to the recognition that one’s attitude on an issue is vulnerable to attack, whereas ‘refutational preemption’ is concerned with providing people with specific arguments to help resist persuasion attempts (McGuire and Papageorgis 1962; McGuire 1964; Compton 2013). Inoculation has a rich history in communication (see Compton 2013 for a review), and the approach has been applied in various contexts, most notably in the context of political campaigns (Pfau and Burgoon 1988; Pfau et al. 1990) and health risks (Pfau 1995; Niederdeppe, Gollust, and Barry 2014; Compton, Jackson, and Dimmock 2016). A meta-analysis found that inoculation is effective at conferring resistance (Banas and Rains 2010).

Importantly, however, inoculation research has traditionally centered around protecting the types of beliefs that everyone intuitively knows to be true (‘cultural truisms’), whereas very little is known

about how inoculation works with respect to more controversial issues (McGuire 1964; Wood 2007; van der Linden, Leiserowitz et al. 2017). Importantly, in two recent studies, van der Linden, Leiserowitz et al. (2017) and Cook, Lewandowsky, and Ecker (2017) found that inoculating people with facts against misinformation was effective in the context of a highly politicized issue (global warming), regardless of prior attitudes. Similarly, Banas and Miller (2013) were able to inoculate people with facts in the context of 'sticky' 9/11 conspiracy theories.

Although promising, most of these studies have been lab-based, and rely on *passive* rather than *active* refutation, meaning that participants are provided with both the counterarguments and refutations rather than having to actively generate pro- and counterarguments themselves (Banas and Rains 2010). McGuire hypothesized that active refutation would be more effective (McGuire and Papageorgis 1961) because 'internal' counter-arguing is a more involved cognitive process and some early research has supported this (e.g. Pfau et al. 1997). In addition, many studies use a so-called 'refutational-same' message, i.e. inoculating people against specific information to which they will be exposed later on, rather than a *refutational-different* format where the message refutes challenges that are not specifically featured in a subsequent attack. Although research to date has mostly found subtle differences between different inoculation procedures (Banas and Rains 2010), the hypothesis that inoculation could provide 'umbrella protection' against the risk of fake news is intriguing because such general immunity avoids the need for tailored content. Evidence for cross-attitudinal protection has also surfaced in other contexts (e.g. Parker, Rains, and Ivanov 2016) and van der Linden, Leiserowitz et al. (2017) found that while a general warning was less effective than a tailored message, it still conferred significant resistance against attempts to politicize science (see also Bolsen and Druckman 2015; Cook, Lewandowsky, and Ecker 2017). Accordingly, we draw on the inoculation metaphor and approach in the present study.

The present research

In particular, we build on prior work by extending 'active inoculation' in a novel and practical direction with clear educational value: 'the fake news game'. In collaboration with DROG,³ a Netherlands-based 'group of specialists who provide education about disinformation', we developed a multi-player game with the goal of actively creating a misleading (fake) news article about a given topic. The game requires that players engage in the creation of misleading information, and that they think about the various techniques and methods one might use to do this. We theorize that by placing news consumers in the shoes of (fake) news producers, they are not merely exposed to small portions of misinformation (as is the case with passive inoculation), but are instead prompted to think proactively about how people might be misled in order to achieve a goal (winning the game). We posit that this process of active inoculation will have a positive effect on students' ability to recognize and resist fake news and propaganda.

Specifically, we propose the following four hypotheses: active inoculation induced by playing the fake news game will reduce both the perceived reliability and persuasiveness of previously unseen fake news articles (H1/H2). In addition, we also posit a mediation hypothesis where playing the game reduces the persuasiveness of fake news through decreased reliability judgments (H3). Lastly, negative affective content has shown to be an important element of eliciting attitudinal threat and issue engagement (Pfau et al. 2009). Thus, consistent with inoculation theory, we therefore hypothesize that playing the game will elicit greater affective involvement as compared with a control group (H4).

Method

The fake news game

The basic structure of the fake news game is as follows: first, players are divided into groups of 2–4 people. These groups are then randomly assigned one of four key characters. The characters were developed to reflect common ways in which information is presented in a misleading manner (Marwick and Lewis 2017). The goal of each group is to produce a news article that reflects their character's unique goals and

motivations. This way, each group approaches the same issue from a different angle. In short, the four characters are: (1) the *denier*, who strives to make a topic look small and insignificant, (2) the *alarmist*, who wants to make the topic look as large and problematic as possible, (3) the *clickbait monger*, whose goal is to get as many clicks (and by extension ad revenue) as possible, and lastly (4) the *conspiracy theorist*, who distrusts any kind of official mainstream narrative and wants their audience to follow suit.

Each group is given a so-called 'source card' that explains the background of the article that the players will produce. Each group is also given a 'fact-sheet' in which the issue at hand is explained in detail. In our experiment, the overarching topic was immigration, and the specific salient risk issue a report by the Dutch Central Agency for the Reception of Asylum Seekers (COA)⁴ from 2016 (COA 2016), which stated that the number of incidents in and around Dutch asylum centers rose between 2015 and 2016. The fact sheet mentions the number of incidents in both years, plus additional information such as the number of filed police reports and cases that made it to court. Additionally, the fact sheet lists a number of possible reasons behind the rise in incidents. Based on the specific goals and motivations of their character, players are then instructed to use the information from the fact sheet to create a fake news article.

The article itself has a systematic structure. In order: (a) an image, (b) title, (c) header, (d) paragraph 1: numbers and facts, (e) paragraph 2: interpretation and presentation of numbers and facts, (f) paragraph 3: the cause of the problem, (g) paragraph 4: consequences of the problem, (h) paragraph 5: expert opinion, and (i) conclusion. For each part, groups are given a set of cards with four alternatives, each of which presents and interprets the fact sheet in a specific way consistent with one specific character. Players then pick one of these alternatives for each part of their article, based on their assessment of what their character would choose. Next, they put their choices together in the correct order to form the final article. The group with the most correct answers, i.e. the group that chose the most cards that correspond with their character, wins. Please see photos from the field (Figure 1) for a visual overview of the game.

Sample and participants

We tested the game at a secondary public high school in the central eastern part of the Netherlands. On the day of the experiment, a total of four classes of 'HAVO' and 'VWO' students⁵ ($N = 95$) between the ages of 16 and 19 took part in the game. Students from these classes were randomly assigned to an experimental ($n = 57$) or control ($n = 38$) group.⁶ The average age in the sample was 16.2 years ($M = 16$, $SD = 0.81$). In total, 59% of the students were male and 41% were female. The groups were somewhat



Figure 1. Fake news game.

unbalanced so that participants in the treatment group were more likely to be younger ($p < 0.01$) and female (74 vs. 53%, $p = 0.08$).

Experimental design and procedure

We administered a reading task as well as a survey to evaluate our hypotheses and the effectiveness of the fake news game. The reading task involved reading one of two (randomly assigned) fake news articles about an issue that related closely to the topic of the game. All facts and figures in these articles, except for proper names and names of institutions, were made up. The two articles were the same (insofar as this is possible) in their overarching topic, setup, structure, length, language use, and in terms of the techniques they used to mislead the audience (Hansen 2017; Marwick and Lewis 2017). Both articles related to polarized and contested risk issues about immigration and the refugee crisis in the Netherlands, and assigned blame to the same organization (the European Union). Additionally, a structured and fixed number of common and popular 'fake news' tactics were implemented. In both articles, *hyperbole* (stylized exaggeration, see McCarthy and Carter 2004) was used four times, the *common man* appeal (attempting to convince readers by appealing to perceived 'common sense'; see Hansen 2017) was used four times, *arguments from authority* (asserting an argument is true based on the credentials of the person making it, *ibid.*) was used twice, *conspiratorial reasoning* (theorizing that small groups are working in secret against the common good, see Hofstadter 1964; van der Linden 2015) twice, *demonization of the out-group* (Atkinson 2005) once, *whataboutism* (discrediting via hypocrisy accusations or the 'tu quoque'-fallacy, see Hansen 2017) once and the *ad hominem* attack (Walton 1998) also once.

The difference between the two articles lies in their framing (Entman 1993; D'Angelo and Kuypers 2009). Article 1 focused on the increasing number of people making their way to Europe from Libya. The framing of the immigration issue was such that the article displayed a negative attitude toward immigration: 'the European Union has failed to protect its borders from "hordes" of "immigrants". This has "created an unmanageable situation", which has caused Dutch citizens to "lose faith in Europe"'. Article 2 also framed the immigration issue in negative terms, but instead focused on the dire situation in European refugee camps: here, 'people live in "inhumane conditions", because of a failure on behalf of the EU to create safe living conditions for refugees, which has "eroded citizens" trust in Europe'. As such, the two articles represent two dominant but ideologically opposite frames about the European refugee crisis (Greussing and Boomgaarden 2017; Rodríguez Pérez 2017; Zeitel-Bank 2017). We introduced this variation to control for potential political biases. The full (translated) articles can be found in the supplement.

Before the start of the game, all participants filled out a short questionnaire to measure their general familiarity with the topic, political ideology, and demographic background information. After this, participants in the treatment condition ($n = 57$) were divided into groups, given materials, assigned a character, and, after a brief explanation by the research assistants, asked to start playing the game. In total, they played the game for approximately 30 min. Directly after this (without determining a winner or explaining what the game was about), participants were asked to read the fake news article and fill out a second questionnaire to measure their judgments about the article. Participants were given approximately 10 min to read the article and about 10 min for the questionnaire. The control group ($n = 38$) underwent the exact same procedure as the treatment group, but instead of playing the game watched an unrelated presentation that was part of the regular lesson plan for approximately 30 min.

Measures

We assessed participants' familiarity ($M = 4.15$, $SD = 1.37$) with the topic on a 7-point Likert scale by asking the extent to which they were familiar with the topic in general (1 = not familiar at all, 7 = very familiar). We also asked participants how *persuasive* ($M = 3.79$, $SD = 1.47$) they found the article (1 = not persuasive at all, 7 = very persuasive), how much they personally agreed with the article (1 = completely disagree, 7 = completely agree, $M = 4.0$, $SD = 1.38$) and how reliable ($M = 3.28$, $SD = 1.55$) they judged

the article to be (1 = not reliable at all, 7 = very reliable). In addition, we included several open-ended items to encourage participants to actively generate answers on their own (i.e. what is the writer trying to convince you of? Which arguments did you find persuasive or not persuasive? Which arguments did you find reliable?). Finally, we assessed participants' age ($M = 16$, $SD = 0.81$) and their political ideology on a 7-point scale (1 = extreme left-wing, 7 = extreme right-wing, $M = 4.06$, $SD = 1.43$).

Results

To confirm balance, there were no differences in prior familiarity with the general topic between groups ($M = 4.63$, $SE = 0.21$ vs. $M = 4.43$, $SE = 0.20$, $t(92) = 0.67$, $p = 0.50$). There was a significant difference in judgments about the reliability of the fake news article. The treatment group rated the (fake news) article's reliability significantly lower than the control group ($M = 3.06$, $SE = 0.20$ vs. $M = 3.60$, $SE = 0.27$, $t(90) = 1.69$, $p < 0.05$, one-tailed,⁷ Cohen's $d = 0.36$).

The effect on perceived persuasiveness of the fake news article (H2) was in the expected direction [lower for the treatment group] but not statistically significant ($M = 3.67$, $SE = 0.21$ vs. $M = 3.97$, $SE = 0.21$, $t(93) = 1.00$, $p = 0.16$, Cohen's $d = 0.21$). Equally, personal agreement with the fake news article was descriptively lower in the treatment group ($M = 3.91$, $SE = 0.18$ vs. $M = 4.14$, $SE = 0.23$, $t(91) = 0.77$, $p = 0.22$, Cohen's $d = 0.16$).

We conducted a mediation analysis to evaluate whether playing the fake news game influenced perceived persuasiveness of the fake news article through reliability judgments.⁸ We estimated the mediation (path) model in STATA (Figure 2). Age, gender, political ideology, and familiarity were included as covariates and standard errors were bias-corrected and bootstrapped 1,000 times. As expected, the higher the judged reliability, the more persuasive people find the fake news article ($\beta = 0.64$, $SE = 0.08$, $p < 0.001$). Allocation to the treatment group reduced reliability judgments of the fake news article ($\beta = -0.60$, $SE = 0.32$, $p = 0.028$) but not perceived persuasiveness directly ($\beta = 0.08$, $SE = 0.23$, $p = 0.37$). However, as hypothesized (H3), playing the fake news game did have a significant *indirect* effect on perceived persuasiveness through *reduced* reliability judgments ($\beta = -0.38$, $SE = 0.22$, $p = 0.034$).

Lastly, we conducted a sentiment analysis on the open-ended responses with the Linguistic Inquiry and Word Count dictionary (Pennebaker et al. 2015), to see if the active evaluation of (counter)-arguments elicited affective responses (H4). In general, the treatment groups' answers displayed greater affective content than the control group ($M = 13.01$, $SE = 2.13$ vs. $M = 8.09$, $SE = 1.43$, $t(83) = 1.82$, $p < 0.05$, Cohen's $d = 0.37$), specifically more negative affect ($M = 5.66$, $SE = 2.09$ vs. $M = 2.02$, $SE = 1.11$, $t(78) = 1.54$, $p = 0.06$, unequal, Cohen's $d = 0.31$).

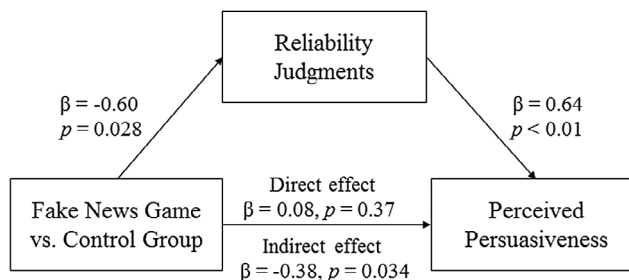


Figure 2. Mediation model.

Note: Coefficients are unstandardized. Covariates include gender, age, and ideology.

Discussion and conclusion

Our experimental pilot study found that the process of active inoculation induced by the fake news game reduced the perceived reliability and persuasiveness of fake news articles about the refugee crisis. At the same time, we stress the preliminary nature of these findings and recognize that the results from this study lack a certain degree of statistical precision and power. In fact, we encourage the reader to interpret these findings as novel but ‘exploratory’ (Matthews, Wasserstein, and Spiegelhalter 2017). Unfortunately, large sample sizes were not feasible during the pilot. Notwithstanding these limitations, it is encouraging that most results were in the hypothesized direction and the observed effect sizes are broadly in line with the inoculation literature (Banas and Rains 2010). In fact, in the context of attitudinal resistance research, ‘small effect sizes are both common and meaningful’ (Pfau et al. 2007, 212). This is especially true in the context of political elections (e.g. Brexit, 51.9% vs. 48.1%). Moreover, there is something to be said about the ‘noisy’ environment in which field studies are conducted and the novelty of this particular study. Indeed, to our knowledge, we are the first to engage in a novel partnership to help develop and evaluate an entertaining multi-player ‘fake news’ game that can directly be evaluated in schools, workplaces, and other educational settings to help counter and manage the societal risks posed by fake news. In this sense, the practical innovation and potential applications of this research are promising.

The finding that the active generation of counterarguments elicited greater affect in the treatment group is also consistent with the inoculation literature and typically indicates higher engagement, which is a key component of resistance (Pfau et al. 1997, 2001, 2009).⁹ In addition, from a theoretical perspective, it is important to highlight that despite its low sample size, this was a challenging test of inoculation. First and foremost, because traditional inoculation messages are often passively delivered in the *refutational-same* format, i.e. participants are inoculated against the same information to which they will later be exposed, whereas this study specifically tested a *refutational-different* format, where the article students are ‘trained’ on is related but *not* the same as the ‘validation’ article. The goal of the game was to train participants to recognize fake news tactics on a more general level by actively rehearsing different roles/sides of the argument, so that the inoculation is more likely to offer broad resistance. For example, Bolsen and Druckman (2015), Cook, Lewandowsky, and Ecker (2017), and van der Linden, Leiserowitz et al. (2017) all found that a general warning was effective in immunizing participants against politicizing messages.

Second, compared to passive reading, active inoculation requires more cognitive effort and engagement from people (Banas and Rains 2010). Lastly, because of the sample size and the fact that we randomly counterbalanced the political framing of the articles, we could not meaningfully explore the roles of political ideology or the assigned characters in this study. However, we recognize that inoculation can be effective across the political spectrum (e.g. see Cook, Lewandowsky, and Ecker 2017; van der Linden, Leiserowitz et al. 2017). Moreover, although deep-rooted ideologies change little over time (Sears and Funk 1999), one overlooked factor in the debate on motivated reasoning is that young students are still developing their beliefs about the world and have less crystallized attitudes and opinions (Sears 1986). Thus, in a sense, early media education may therefore be the ultimate inoculation to help empower people against the risk of disinformation. We invite scholars to explore the potential of this and other fake news games, with larger sample sizes, using repeated plays, and perhaps in a more interactive online environment.

Data accessibility

The raw (anonymized) data-set for this study has been deposited on Figshare and can be retrieved with the following link <https://dx.doi.org/10.6084/m9.figshare.5388085>. The online version of the game is available here: www.fakenewsgame.org.

Notes

1. <https://trends.google.nl/trends/explore?q=fake%20news>
2. Threat is not always manipulated, and there is some disagreement over its importance (see Banas and Rains 2010).
3. <https://aboutbadnews.com/>
4. <https://www.coa.nl/en/>
5. In the Dutch system, Hoger Algemeen Voortgezet Onderwijs (HAVO) and Voorbereidend Wetenschappelijk Onderwijs (VWO) are higher educational divisions that prepare high school students for university-level education.
6. There were two control and two treatment groups that were approximately the same size on paper, but on the day of the experiment there were more absentees in the control group, resulting in the observed imbalance.
7. All of our research hypotheses were directional (see p.7) and evaluated as such using one-tailed *p*-values (for guidelines, see Cho and Abe 2013 and Jones 1952).
8. The presence of a significant main effect is not a prerequisite for mediation to occur, especially when power to detect an effect is relatively low (Rucker et al. 2011).
9. We acknowledge that the negative framing of the articles in general may have contributed to eliciting negative affect but this in itself does not explain significant between-group differences in reported affect levels.

Acknowledgments

We would like to thank Ruurd Oosterwoud and Bob de Reus at DROG, as well as Dr. Wim Hilberdink, for coordinating the field experiments in the Netherlands. In addition, we thank the Cambridge Social Decision-Making Lab and the Dutch Journalism Fund (Stimuleringsfonds voor de Journalistiek, SvdJ), which has provided funding to DROG, for their generous support.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by Cambridge Social Decision-Making Lab and the Dutch Journalism Fund (Stimuleringsfonds voor de Journalistiek, SvdJ).

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