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Raising Misinformation Awareness via Rule-Based and Mindfulness Training

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ABSTRACT [1]

Disinformation campaigns can have real and lasting effects, such as driving political elections, causing vaccine hesitancy, and creating intergroup conflicts. This paper reviews existing literature on disinformation and misinformation, and describes a study conducted by the authors in which the likelihood of sharing misinformation was measured among participants who received training based on rules or mindfulness, or who received no training at all. Participants who received misinformation training were less likely to share (i.e., pass along) the misinformation compared to participants who did not receive misinformation training. Thus, susceptibility to misinformation can be combated through educational strategies.

Keywords: Manipulation, epistemology, misinformation, psychology, trust, psychology, polarization, trolling, national security, policy, social cybersecurity, disinformation, mindfulness, training, media literacy.

1. INTRODUCTION

Information warfare leaves society vulnerable to whomever wishes to manipulate it. One significant tool used in information warfare is *misinformation* [4]: a broad, catch-all term that covers trolling, spam, urban legends, rumors, false news, and disinformation [26]. Indeed, the US military views misinformation as a threat to national security [4]. Compared to the intentional spreading of information known to be false (i.e., disinformation), misinformation is the spread of false information when the sharer may or may not be aware of the falsehoods in the story [26]. The focus of this paper is to explore and test techniques that may be helpful against all types of misinformation including purposeful disinformation.

Misinformation is a growing threat in our increasingly interconnected society because campaigns can reach their target audience more readily through online social media (e.g., Facebook). The problem is so widespread that it threatens democracy itself, as evidenced by the attacks conducted by Russian troll farms related to the 2016 and 2020 elections [18]. The Russian government has further shown its skills in misinformation via disinformation campaigns related to the war in Ukraine [7]. A society remains vulnerable to exploitation unless mitigation strategies are developed and used to increase awareness of misinformation among its members.

In this research study, we explored two ways of mitigating the harms of misinformation through training programs: one based on rules, and one based on rules with the addition mindfulness education. These programs aimed to raise awareness of misinformation and how to handle it. We then examined the effectiveness of these programs in identifying misinformation and making decisions about sharing misinformation in social media.

2. RELATED WORK

In "Misinformation in Social Media: Definition, Manipulation, and Detection", the authors distinguished between intentional and unintentional spreading of

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misinformation and recommended fact-checking websites to decrease the spread of misinformation [26].

"Social Cybersecurity: An Emerging National Security" is an article in which the authors defined social cybersecurity as an especially dangerous type of information warfare that can impact human behavior because people are easily accessible and hackable through the Internet. The researchers described techniques, such as misdirection and creating a false generalized sense of the "other," to influence people. They ultimately concluded that it is important to teach people about social threats to defend against them [4].

"New Zealand's 23-day Parliament Siege" described the increase in misinformation leading up to, and during, the 23-day siege on New Zealand's Parliament in 2022. The situation began as anti-vaccine protests but also involved a variety of other conspiracy theories, including those related to "Q." Politicians received death threats, and many people living in the surrounding area felt unsafe, with protestors blocking roads and setting fires. The siege showed the offline effects that online misinformation can cause [19].

In the "Effect of Disinformation Propagation on Opinion Dynamics: A Game Theoretic Approach", the authors created a game simulating social media behavior and studied the spread of misinformation. The authors noted that people with similar views may form echo chambers. Their study showed that participants who felt more uncertainty concerning their opinions at the start were less influenced by disinformation than people who had strong opinions and were in groups with like-minded individuals due to the confirmation bias of being around people who shared their beliefs. The authors found that allowing users to flag suspicious content to administrators did decrease the spread of disinformation [12].

The author of "Why Do People Spread False Information Online? The Effects of Message and Viewer Characteristics on Self-reported Likelihood of Sharing Social Media Disinformation" conducted four studies across social media platforms to ascertain what factors may influence the spread of misinformation. One of the strongest factors in spreading misinformation was consistency with one's current beliefs. Other strong factors included belief that the information was true, and having seen the information previously [5].

"Disinformation and Echo Chambers: How Disinformation Circulates on Social Media Through Identity-Driven Controversies" described disinformation as a two-step process of "seeding" false information into the public sphere, and then "echoing" by trying to get people to accept it so that people like "us" believe in it, and all non-believers are classified as "them." The authors made the argument that disinformation worked on two levels: sharing misleading information, and persuading people to accept false narratives as part of their identity. They suggested: 1. allowing users to flag disinformation, 2. correcting social media algorithms that promote popular items if they contain disinformation, 3. increasing fact checking, and 4. demonetizing aspects of social media that encourage proliferation of disinformation, as potential ways to mitigate against seeding [21].

"'Imitation (In)Security' And the Polysemy of Russian Disinformation: A Case Study in How IRA Trolls Targeted U.S. Military Veterans" analyzed the efforts of the Internet Research Agency (IRA), an entity backed by the Russian government, and how the group amplified divisive messages to troll and polarize Americans leading up to and after the 2016 election. The authors discussed a concept they coined of imitation (in)security where the influence of foreign actors was not achieved by spreading false information but rather through creating and imitating domestic resentments. The article pointed out how many of these social media posts were not of obvious foreign origin and, instead, the posts imitated the types of things Americans might say. The IRA strategy seemed to be to lure people into their groups with innocuous posts, and they would later deliver a "payload," trying to get people to take action such as voting a particular way or protesting. Approximately 150 million Americans were exposed to Russian disinformation on social media leading up to the 2016 election. The authors noted that, since 2016, some Americans have co-opted many of the IRA's techniques to spread disinformation about their political opponents [3].

"Assembling the Networks and Audiences of Disinformation: How Successful Russian IRA Twitter Accounts Built Their Followings, 2015–2017" analyzed how four of the most popular IRA accounts acquired so many followers. The authors found that these accounts became popular by producing content that was retweeted often, or by gaining popular, verified people as followers. The accounts created a "propaganda feedback loop" where they amplified the messages of whatever community the account was trying to imitate. There were accounts at both extremes of the political spectrum, with the ultimate goal being to create more discord and polarization. Ultimately, these accounts became more popular by tapping into pre-existing rifts within American society. [27].

"A Proposed Method for Predicting User Disinformation Forwarding Behavior" analyzed the factors that impact whether or not people will share disinformation on social media. Key factors included appeals to emotion, and how similar the disinformation was to the user's existing beliefs. Once one person accepted the misleading post, it was spread among the people who trusted that person and kept going down the chain of trust. The authors also discovered that increased distrust of traditional news media was associated with higher trust of disinformation sources. The authors created an algorithm they believe

could be used to target people who are more susceptible to disinformation and persuade them to not spread it [11].

"When Truthiness Trumps Truth: Epistemic Beliefs Predict the Accurate Discernment of Fake News" examined the ways people justify how they know the things they believe they know. They found that post-truth beliefs, such as a low need for evidence, strong beliefs in intuition and seeing truth as a subjective choice, led to a heightened susceptibility to disinformation. The authors also found that people with high scores in psychopathy, narcissism, and Machiavellianism were more likely to possess post-truth beliefs. The authors recommended that people receive training, preferably starting at a young age, in requiring more evidence to support their beliefs, rather than just relying on intuition or seeing truth as something to be decided by the authority figures they trust [20].

In "Vulnerability in Social Epistemic Networks", the authors argued for the importance of taking into account multiple sources to determine if a fact is true, while also ensuring that the sources are truly diverse and independent from one another. They discussed a methodology to measure the extent to which a user is in an echo chamber or information silo online [24].

"State Disinformation: Emotions at the Service of a Cause" examined state-sponsored disinformation. The authors discussed the rise of alternatives to traditional journalism which offer information packaged in a more riveting way without being subject to the same legal standards as journalism. Information that had the most emotional appeal tended to be more popular than something well-researched but presented in a drier fashion. Further, there are no real legal consequences in most cases of spreading disinformation; but new laws could inhibit free speech, unless carefully crafted [16].

The authors of "Introduction: Epistemic Contestations in the Hybrid Media Environment" discussed how traditional media and social media have blurred into one another at times, changing traditional journalism. Many people attack traditional media and other institutions as being elitist. Such a view is unfortunate since institutions like universities and traditional media have been sources of knowledge and must uphold rigorous standards of integrity. When people no longer trust in knowledge-based institutions, they are more vulnerable to believing in conspiracy theories. Within some conspiracy theory communities, people sought to undermine belief in traditional institutions by claiming that proposed beliefs other than those widely accepted in the community are mechanisms of "gaslighting" [25].

Zara Abrams examined the research surrounding the "Bad News" and "Go Viral" apps in the publication, "Controlling the Spread of Information", to see how effective these apps were at inoculating people against misinformation. These apps are located at https://www.goviralgame.com/en and https://www.getbadnews.com/#intro. Abrams argued that the "Six 'degrees of manipulation'- impersonation, conspiracy, emotion, polarization, discrediting, and trolling are used to spread misinformation and disinformation" [1].

In "Towards Psychological Herd Immunity: Cross-cultural evidence for Two Prebunking Interventions Against COVID-19 Misinformation", Basol et. al posited the theory of "preemptively debunking ('prebunking') misinformation as a promising step towards building attitudinal resistance against misinformation" [2]. The authors tested their theory using the Go Viral! app. They ultimately concluded that while using the Go Viral! app did increase awareness of misinformation for participants, the effects tended to dissipate after one week [2].

In the "European Commission's Report, A Multi-dimensional Approach to Disinformation", several recommendations were made to protect against disinformation. Among these were to demonetize the spreading of disinformation, encourage the usage of fact-checking sites to help differentiate truths from untruths, and increase media literacy among citizens. The commission asserted that disinformation was a threat to democracy itself by undermining faith in the election process and increasing polarization among citizens [10].

Author John Dyer examined efforts to teach news literacy in "Can News Literacy Be Taught?" He also researched the cognitive biases and confirmation biases that impede news literacy. The article described a study where participants underwent 12 weeks of mindfulness training and practiced meditation as a way to become more aware of one's cognitive biases. The study showed some promise but was not able to conclusively show that mindfulness could increase news literacy [9].

"Tackling Online Disinformation Through Media Literacy in Spain: The Project 'Que no te la Cuelen'' described a media literacy program that taught children between 14 and 16 years old what disinformation was and how to engage in fact checking. Students were given a checklist to help decide if information might be disinformation: "suspect, read/listen/watch carefully, check the source, look for other reliable sources, check the data/location, be self-conscious of your bias and decide whether to share the information or not" [6]. The program designers emphasized the importance of participant engagement through games and/or practical application of the theories taught [6].

"Fake News, Alternative Facts, and Disinformation: The Importance of Teaching Media Literacy to Law Students" argued for the importance of teaching media literacy in schools, including in law schools. Being able to separate truth from untruth was important for anyone to do but was especially vital in keeping the justice system well-

functioning. The article described the lucrative market for creating disinformation given that sensational headlines were something people were more likely to click on, and ad revenue was based on the number of clicks rather than the veracity of the information. The article warned of the dangers to society when people can no longer agree on what facts are, and it highlighted the importance of authority figures to not succumb to misinformation because of the heightened weight given to their opinions [8].

In "Training to Mitigate Phishing Attacks Using Mindfulness Techniques", Jenson et. al conducted research at a U.S. university which included students, faculty, and staff. The research consisted of sending a phishing email to see who was susceptible to it, conducting mindfulness training, and then later sending another phishing email to ascertain if anyone was less susceptible to the attack after undergoing the training. The research showed that mindfulness training was helpful for some demographics to get people to think about what was happening and not instantly fall for the appeals to emotion which phishing campaigns tend to employ [13].

Eva Skobalj described how the concepts of mindfulness and critical thinking overlap and can create a better awareness of oneself and the world in "Mindfulness and Critical Thinking: Why Should Mindfulness Be the Foundation of the Educational Process?". The article described the rich history of self-questioning throughout history starting with the ancient Greeks onward. The article argued that mindfulness was useful in critical reflection [23].

3. PROBLEM STATEMENT

The problem of misinformation is a multi-faceted and complex one. While lies are certainly nothing new, misinformation is a uniquely modern problem due to the unprecedented access (via the Internet and especially social media) people have to data and messages from other people. Technology has outpaced people's ability to successfully sort through fact and fiction and all the gray areas in between. Beyond that, some misinformation (like pointed political campaigns) exists with the goal of advancing particular agendas and sowing discord among adversaries.

In many ways, the rapid spread of misinformation is symptomatic of the increasing amount of distrust that people have in one another and in traditional repositories of knowledge and facts [25]. Analyzing the rise of misinformation involves asking fundamental questions about trust and motives in how people acquire knowledge. Asking such epistemological questions about knowledge and beliefs also touches upon questions of identity and how it is formed.

Since there are so many areas implicated by misinformation, there is no one solution to the problem. Media literacy and fact checking can help against the "seeding" stage of misinformation, but once people have accepted the misinformation as part of their understanding of the world (essentially, their identity), misinformation is far more difficult to eradicate [21]. The present study sought to address the initial spread of misinformation before people have accepted it as part of who they are.

Two critical research questions were asked and addressed by the present study:

1. What factors, such as familiarity and trust in a source, may make one more likely to share misinformation?
2. How effective is education/training for raising awareness and decisions about misinformation?

To generate data for answering these questions, demographic information was collected from participants, and they were assigned to one of three levels of misinformation training. Thereafter, self-reported awareness and probability of sharing misinformation were measured for all participants.

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4. MISINFORMATION AWARENESS TRAININGS

Participants

Participants were recruited through requests for participation sent through university listservs and through recruitment by various professors. The 39 participants were assigned to one of three training groups (Rule-Based Training, Combined Training, or No Training) aimed to teach them about misinformation and strategies for lessening its impact. To increase the probability that all training participants paid attention during the training, the participants were informed they would be required to complete a short survey regarding the training content. There was not a minimum passing score for the survey. Finally, participants were measured on a number of demographic markers, such as age and social media presence, and tested with articles containing information of varied credibility about their wariness or belief in the contents, and whether or not they would share the articles. All participants were given $10 gift cards and were offered extra credit in a college course for their participation.

The training types and measures are described in more details in the subsections that follow.

Training Types

1. Rule-Based Training consisted of a 7-minute PowerPoint presentation that explained the manipulation techniques employed by those who curate misinformation, and ways to avoid being manipulated. This training listed a series of considerations for readers to consider when reading

articles with a more critical eye. This training examined each of the psychological factors that leave people susceptible to misinformation and sought to increase reader awareness by having people ask questions to determine if an article was trying to influence them in this manner. We designed this training based on the research conducted by Zara Abrams, and described to participants how to identify the manipulation techniques of "impersonation, conspiracy, emotion, polarization, discrediting, and trolling" [1].

2. Combined Training included the same elements of the Rule-Based Training (described above) with additional elements aimed at improving mindfulness. This training consisted of a 17-minute PowerPoint presentation of all the rule-based slides plus additional mindfulness slides. The Combined Training also had a guided reading (of a misinformation article fact-checked by Snopes.com) to demonstrate mindfulness techniques in an information-literacy context. The specific aspects/techniques of the mindfulness training were modeled after Jenson, et. al [13]. When mindful, readers should be more self-aware of their emotional reactions to information and, further, more able to stop the emotional response that the information evokes. In short, mindfulness helps readers to consume information from a more detached (i.e., objective) perspective**.**
3. Participants assigned to No Training were not provided any training prior to subsequent testing for misinformation awareness and sharing.

Measure of Training Effectiveness

One week after the training was completed, participants were sent information for completing the second half of the study. The week-long delay was meant to determine if lessons learned during the training were durable rather than dissipating relatively quickly, as was the case in some prior research [2].

The critical test/measure used in this study involved two articles and corresponding sets of questions about them that all participants, regardless of training, were required to read and answer. Participants were allowed two weeks to complete this task.

Both articles were fact-checked via Snopes.com.

1. One article was from CNBC and was verified as containing accurate information [14]. The article was entitled, "Amazon's Alexa assistant told a child to do a potentially lethal challenge" [22]. This article served as the control article to ascertain if students can recognize articles that contain verified information.
2. The second article was verified by Snopes.com as containing false information and was from the National File [15]. The article was entitled, "Australian Government To Seize 24,000 Children, Vaccinate Them Without Parents Present in Massive Stadium" [17]. This article was purposefully chosen as being a source outside the United States with which participants would be less likely to have heard of or to have formed an opinion concerning. This article will be referred to throughout the paper as the misinformation or disinformation article.

After reading the articles, participants provided demographic information and answered survey questions related to the articles.

5. RESULTS OF THE STUDY

To answer the research questions, we analyzed participants along demographic dimensions, their awareness of (mis)information, and their likelihood of sharing (mis)information, especially as related to the type of training they received: Rule-Based Training, Combined Training, or No Training.

Demographics

1. In the Rule-Based Training Group (n=11), five participants were between the ages of 18-24, one was between the ages of 25-34, three were between the ages of 35-44, and two were between the ages of 45-54. Three students identified as male, and eight identified as female. There was one information technology major, two cybersecurity management majors, one education/computer science-cybersecurity major, one psychology major, three computer science majors, one business administration major, one sociology major, and one communications major. Five participants were undergraduate students, and six were in graduate studies.
2. In the Combined Training Group (n=14), eight students were between the ages of 18-24, three were between ages of 25-34, two were between ages of 35-44, and one was between ages of 65-74. Seven participants identified as male, six as female, and one student identified as non-binary/third gender. Seven were undergraduate students, and seven were graduate students. One student was an accounting major, one was a mathematics major, one was an information technology major, four were cybersecurity management majors, one was a criminal justice major, one was a business major, one was a communications/film production major, and four were computer science majors.
3. In the No Training Group (n=14), eleven respondents were between the ages of 18-24, two were between the ages of 25-34, and one participant was between the ages of 35-44. One respondent was male, twelve were female, and one identified as non-binary/third gender. Ten students were psychology

majors, one was a nursing major, one was an applied computer science major, and one was a cybersecurity management major. Twelve participants were in undergraduate programs, and two were in graduate programs.

Factors that Contribute to Sharing Misinformation

We investigated the factors that may make one more likely to share misinformation (research question #1). Table 1 summarizes the statistics of our participants from all three training groups who would or would not share a misinformation article for a variety of reasons. People who responded that they definitely or probably would share the article containing the misinformation were more likely to be familiar with the publication, trusted the publication more, reacted with stronger emotions to the article, believed the statements in the article, were more likely to believe in conspiracy theories, were less likely to engage in fact-checking in general, and were less likely to obtain their news from the mainstream news or sources other than social media.

Table 1: Comparison Between Participants Who Would Share Misinformation Article and Those Who Would Not

	Would Share Misinformation Article (12 participants)	Would Not Share Misinformation Article (21 participants)
Familiarity with Publication	50% (6/12)	14% (3/21)
Definitely Do Not or Probably Do Not Trust the Publication	17% (2/12)	76% (16/21)
Indifferent Emotional Reaction to Article	17% (2/12)	48% (10/21)
Definitely or Probably Believe in Statements in Article	83% (10/12)	10% (2/21)
Definitely or Probably Believe in Conspiracy Theories	25% (3/12)	5% (1/21)
Definitely or Probably Engage in Fact-checking in General	33% (4/12)	81% (17/21)
Mainstream News as a Top News Source	33% (4/12)	57% (12/21)

Training Effectiveness

We investigated the effectiveness of the training using a control group that did not receive any training. Table 2 summarized the actions of the three different groups regarding misinformation articles.

Table 2: Comparison of the Awareness of Misinformation in the Three Groups

	No training (14 participants)	Rule Based training (11 participants)	Combined training (14 participants)
Would share the article containing misinformation	43% (6/14)	18% (2/11)	29% (4/14)
Would share article containing accurate information	64% (9/14)	55% (6/11)	50% (7/14)
Fact-checked at least one article	43% (6/14)	55% (6/11)	50% (7/14)
Identified Misinformation Article's Attempt to Persuade	35% (5/14)	64% (7/11)	79% (11/14)
Recognized Inflammatory Statements in Misinformation Article	50% (7/14)	55% (6/11)	79% (11/14)

A smaller percentage of sample participants self-reported the tendency towards sharing the article containing misinformation if they received training than if the participants received no training. However, this reduction was not significant when tested using a Kruskal-Wallis test. Answers to the question "Is the article something you are likely to share with others?" were coded from 1 (Definitely Not) to 5 (Definitely Yes) and median scores

for each training group were compared, yielding $H(2) = 1.31$, $p = 0.52$.

The percentage of participants who fact-checked at least one article was similar across all three training types, varying from 43% to 55%. A lack of relation between training type and use of fact-checking when reading the test articles is supported by a Chi-Square analysis indicating the two variables are independent of one another, $X^2(2, 3) = 0.35$, $p = .84$.

Training type was related to the participants' identification of persuasion as a purpose of the misinformation article, $X^2(2, 3) = 5.45$, $p = .066$, with a greater percentage of participants who received training on misinformation reporting that the article was intending to persuade them.

Sample participants also varied in their claim that some of the statements in the misinformation article were inflammatory; however, once again, this difference was not significant according to a Kruskal-Wallis test, $H(2) = 4.12$, $p = 0.13$.

6. CONCLUSION AND FUTURE WORK

Misinformation is a growing problem, potentially threatening democracy and other important institutions (e.g., healthcare), and steps should be taken to mitigate it [10]. More research should be conducted to ascertain the efficacy of the various training programs that governments and other entities have proposed as potential solutions.

Two training programs were the subject of this research study; both showed promise and should be studied and expanded upon as more results become available regarding the effectiveness of various elements of other media literacy programs. The fact that this training included a fact-checking component seemed to have been particularly helpful, as was the training segment which asked students to identify emotional manipulation in articles. The current failure to find significant outcomes in the present study could be due to a small sample size (which yielded a power of only 0.17) since the percentage differences in the sample were suggestive and might have yielded generalizable outcomes with more data. One additional limitation might be the transparency of items in the surveys, which were obviously about information literacy. Using measures that are more ambiguous or unknown to participants (e.g., whether they actually share a clickbait on their social media feed) would be more valid and potentially reveal more effects.

As many of the articles in the literature review pointed out, media literacy alone will not solve the problem of misinformation. Efforts are needed to demonetize the spreading of misinformation and to address the underlying polarization within society that misinformation facilitates and exploits. Increased trust in news sources with journalistic integrity is critical. The problem of misinformation is a difficult one, but it is not insurmountable.

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