Investigating Correction Effects of Different Modalities for Misinformation about COVID-19

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ABSTRACT

Misinformation presented in different modalities about the COVID-19 pandemic has been prevalent. One approach to reducing the negative effects of misinformation is through corrective information. However, it is possible that people develop counter-attitude towards the corrective information and reaffirm their belief in misinformation, called the boomerang effect. Fewer studies examined how different modes of corrective information about COVID-19 may address the boomerang effect. With a 3-by-3 between-subject experiment design (n = 210), we first presented one of the three modalities of misinformation (text, image, video) to the participants, followed by one of the three modalities of corrective information (text, image, video) to examine the effect of the corrective information. The results showed that there was no boomerang effect after correction in all modalities, indicating that all corrective information successfully reduced participants' perceived credibility and potential action for misinformation. In the post-hoc analysis, the correction in the video mode worked best on text misinformation. Our results also suggested that image misinformation worked least effectively in terms of conveying misinformation.

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1 INTRODUCTION

Misinformation in text, meme, or video mode revolving around COVID-19 has been prevalent since the onset of the pandemic. A report in the U.S. found that 78% adults were not sure about the credibility of misinformation related to COVID-19 [5]. Trusting misinformation about the pandemic can result in serious consequences that may impact people's health, making it crucial to investigate how to reduce the negative impacts brought by misinformation. One approach is to provide corrective information to debunk misinformation. However, research found that instead of believing the corrective information, people may in turn reaffirm their beliefs about the misinformation and develop resistance to the corrective information, or called the boomerang effect [7]. A study found that text correction was more effective in explicit misinformation than implicit misinformation [15], implying that persuasiveness of misinformation may not be the same. As different communication modes come in various levels of "richness" in terms of the cues available, what remains underexplored is whether the communication modes (i.e., text, image, or video) of the misinformation and those of the corrective information have any interaction effects. Our study has two purposes: 1) to find out whether different modes of corrective information lead to boomerang effect; and 2) to examine which correction mode works best on which mode of misinformation.

1.1 Misinformation and the boomerang effect

Misinformation can be broadly defined as fabricated content designed to mislead readers into a specific belief [25]. In contrast to "disinformation" designed to both mislead and harm, misinformation has no malicious intention [25]. In this study, we operationalize misinformation as information with false contents.

To address misinformation, one often used approach is to provide corrective information. However, research in many domains found that participants developed a boomerang effect where people generate a counter-attitude towards the corrective information and reinforce the original belief about the misinformation [7]. For example, in Werle and Cuny's [27] study, participants were exposed to an advertisement against obesity, which ironically increased the likelihood of participants choosing unhealthy sweets. Similarly, smokers are more likely to increase smoking behaviors after watching the antismoking campaigns [6]. In addition to the health domain, similar results were found in political science. Ecker and Ang [4] found that if people's political attitude is consistent with the corrective message, it is easier to correct the false message. So to speak, liberals had the tendency to accept the corrective information that supported a liberal viewpoint [13]. On the contrary, if people's political attitude is inconsistent with the message, it is difficult to correct them.

With the mediation of social media and messenger technologies, the misinformation of COVID-19 can be spread in different forms at a quick pace. The consequence can be serious when it comes to people's health and lives. It is worthy of scholarly attention to investigate how people may perceive misinformation and the effects of corrective information about COVID-19. As a result, we propose the following research question:

> *RQ1 : Is there a boomerang effect when correcting misinformation of COVID-19 ?*

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1.2 Media richness theory and modes of misinformation

Media richness theory (MRT) deals with how various types of media afford to deliver nonverbal cues so as to enable the audience to have a better understanding of messages [2]. According to the MRT, media that afford more cues (e.g., tones or gestures) and provide feedback can facilitate communication as a rich media, whereas media that afford fewer cues to clarify ambiguous information are leaner media. For example, compared with text, video is a rich medium because it provides audiovisual information. Rich media like videos are suggested to increase message credibility because they resemble real life and have vivid details [19]. Rich media may also increase people's behavioral intentions [18]. In the case of misinformation, people may perceive misinformation in video mode as more credible than that of text and of audio, eventually increasing their intention to share the misinformation with others [20]. Similarly, in Lee and Shin's [9] research, they found that deepfake videos were perceived with the highest credibility and engagement intentions than photoshopped images and rigged text.

Researchers have started to examine how modalities work for corrective information. Prior studies suggested that text-based corrections are effective in reducing misperceptions in text mode [1, 8, 16, 24, 29]. Vraga et al. [23] found that when participants were exposed to text correction information after watching video misinformation about sunscreen myths, the text corrections were less effective in reducing misperceptions in the video than showing no corrective information. Graham et al. [3] used image to correct misinformation about autism–vaccine in text mode. They found that images can balance the misinformation on their personal belief about the misinformation. However, the image condition was not significantly different from the text-only condition. Drawing on the MRT, it is possible that media richness matters: rich corrective information mode, such as video, may be more effective than text mode in correcting misinformation about COVID-19. As mixed results were found in the prior studies, we propose our second research question:

> *RQ2: What is the correction effect of the different modalities, including text, image, and video, in correcting misinformation about COVID-19 in text, image, and video?*

2 METHOD

2.1 Participants

An online survey administered with Qualtrics was implemented. We recruited 228 participants using social media like Facebook groups or online discussion forums. After data cleaning and screening based on the manipulation checks, we ended up with 210 participants for statistical analysis (age ranges between 19 and 72, M = 31.75, SD =10.2, 144 female; in terms of annual income, 8.6% of participants with more than USD$33460, 20% USD$20000-30000, 49% USD$6500-19000, and 32.4% less than USD$6500). All participants were compensated with a gift voucher of 100 NTD (roughly USD$3) for their time.

2.2 Study design and stimuli

A 3 (Misinformation Type: text, image, or video) by 3 (Correction type: text, image, or video) between-subject experiment was conducted online. All participants were randomly assigned to one of the nine conditions; each condition lasted for no more than 30 minutes.

The experiment materials were adapted using a fact-check post that we drew from the Taiwan FactCheck Center[1], which described a piece of misinformation claiming that eating bananas could prevent the infection of COVID-19 (see Table 1). We made sure that misinformation contents were equally presented in text, image, and video format. Then we created three correspondent corrective information in text, image, and video form.

We implemented two manipulation checks to ensure the validity of our experimental design. The first question asked our participants to identify the mode of material they had read/seen and another question probed which piece of information was correct. After removing participants who did not pass the manipulation checks, the participant numbers in each condition were: text-text (n = 23), text-image (n = 23), text-video (n = 25), image-text (n = 27), image-image (n = 24), text-video (n = 26), video-text (n = 23), video-image (n = 19), and video-video (n = 20).

2.3 Procedure

The participants first answered a pre-test survey that contained the baseline questions about their COVID-related knowledge, attitude, and preferred behaviors. Then the participants read or viewed the misinformation in the assigned modality and answered a questionnaire including their perceived credibility and potential action regarding the misinformation. Then, participants were asked to play an online gopher game for one minute, which was meant to distract their attention form the misinformation so as to allow the potential boomerang effect to arise [14]. Finally, participants read/viewed the corrective message in one of the three modalities and completed a post-test questionnaire about the perceived credibility and potential action regarding the corrective information.

2.4 Measures

Our pre-test and post-test survey covered the same measures: perceived information credibility and potential action regarding the information. Unless otherwise mentioned, all scales were measured with 5-point Likert scale (1 being extremely disagree; 5 being extremely agree). *Perceived credibility* was measured on a ten-item semantic differential scale [28]. A sample question asked participants to rate the information between objective to subjective (Pre-test: $M = 3.00$; $sd = .03$; $\alpha = .94$, Post-test: $M = 3.79$; $sd = 0.01$; $\alpha = .93$). *Potential action* was measured with a one-item question [12]: "I will adopt the content of this message" (Pre-text: $M = 3.00$; $sd = 1.15$ Post-test: $M = 4.00$; $sd = .69$). Then we used the post-test credibility score to subtract the pre-test credibility score for the *boomerang/correction effect*.

Control variables included 1) COVID Knowledge, measured on a 17-item scale ($M = 14.00$; $sd = .16$; $\alpha = .39$) [17], COVID Attitude, measured on a 6-item scale ($M = 4.20$; $sd = .14$; $\alpha = .31$) [17], COVID

[1]An organization that conducts factchecks on information relevant to public affairs in Taiwan.

Table 1: Examples of misinformation in text (left), image (middle), and video (right) in the experiment.

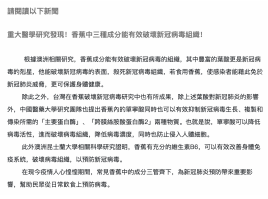
Format	Text	Image	Video
Sample			

Figure 1: Post-hoc comparison of pre-correction and post-correction of perceived credibility for the nine modality.

Behavior with a 12-item scale ($M = 3.80$; $sd = .46$; $\alpha = .75$) [17], and Media Trust with a 5-item scale ($M = 2.69$; $sd = .04$; $\alpha = .85$) [22]. We also included demographic variables like age and gender.

3 RESULTS

To answer RQ1, we analyzed the boomerang/correction effect of perceived credibility and potential action. A repeated-measure MANCOVA controlling our participants' baseline knowledge, attitude, behavior, and media trust was performed and suggested that all scores of perceived credibility and potential action in the correction conditions were significantly higher than those of the misinformation conditions $F(2,194) = 10.75$, $p < .001$, $\eta^2 = 0.1$ (see Figure 1, Figure 2). In other words, there was no boomerang effect in any correction mode for any misinformation mode; our participants perceived the corrective information to be more credible and were willing to act according to the corrective information (RQ1). What's interesting was the participants who viewed the image mode evidenced a lower influence of misinformation than did those in the text and video conditions. In other words, misinformation presented in the image mode most easily yielded participants' incredulity.

Then, to answer RQ2 about which correction mode worked best, a MANCOVA analysis revealed that there was a significant main effect for the correction (F (16, 388) = 1.74, $p = .038$, $\eta^2 = .067$). And the post-hoc analysis showed the text-video condition had significantly higher perceived credibility ($M = 0.91$, $sd = .24$, $p = .021$) than the video-text condition ($M = 0.36$, $sd = .24$). In terms of evoking participants' potential action, the text-video condition ($M = 1.31$, $sd = .34$) performed better than the video-text ($M = 0.4$, $sd = .34$, $p = .01$) and video-video condition ($M = 0.42$, $sd = .36$, $p = .01$). This suggested that using video to correct text misinformation worked better than using text to correct video misinformation in terms of perceived information credibility and potential action. In addition, the image mode performed better in perceived credibility and potential action than text and video modes in the correction condition.

4 DISCUSSION AND CONCLUSION

The current study examined whether there was a boomerang effect on participants' perceived credibility and potential action under different modalities of corrective information. Our results showed that the boomerang effect was not significant when correcting the COVID-related misinformation in all combinations of modalities (per RQ1). Our participants in general considered the corrective information to be more credible and were willing to take actions accordingly. One possible explanation is that facing this pandemic, our participants were more aware to accept the corrective information and their original attitude was consistent with the corrective information. Since the pandemic has lasted for around three years, people may be accustomed to receiving misinformation and corrective information related to COVID-19 on a regular basis. They were used to adjusting and adapting based on sound evidence and arguments [10]. Therefore, it is possible that the boomerang effect is difficult to be developed under this specific situation.

However, our results showed that the video correction mode was more effective for text misinformation on perceived credibility and potential action (RQ2), which echoing the media richness theory. One interesting finding is that image misinformation received the lowest score on credibility and potential action, compared with misinformation in text and video. It is possible that the image we provided was perceived as a meme by the participants [11]. A prior

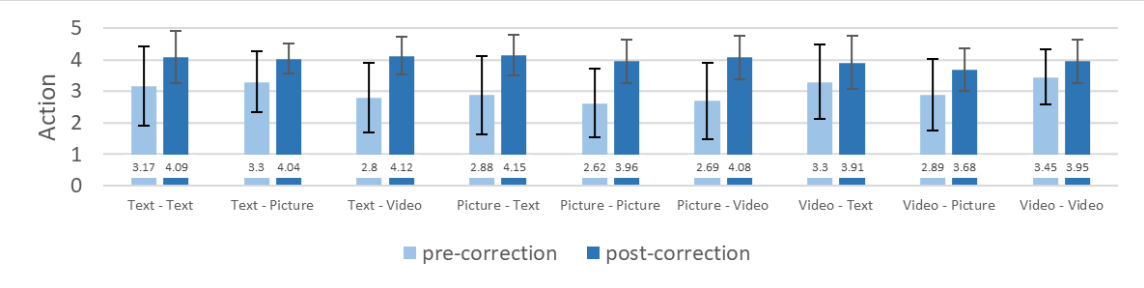


Figure 2: Post-hoc comparison of pre-correction and post-correction of potential action for the nine modality.

study found that meme can be exploited to spread misinformation [21] and not a credible information with nonexpert source [26]. We did not include any source information in the misinformation materials. Therefore, people may lower their trust when viewing an image mode. Future studies should investigate how source credibility interacts with communication mode in misinformation and corrective information.

The paper has some limitations. First, due to the constraints of online experiments, It is possible that boomerang effects may be more prominent if the experiment was conducted in lab. In addition, our misinformation materials were drawn from the FactCheck Center, which participants might exposed to the same material that limits the boomerang/correction effects. Future studies should look into other materials and different topics about the pandemic.

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