Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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What message features influence the intention to share misinformation about COVID-19 on social media? The role of efficacy and novelty

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ABSTRACT

Given the amount of misinformation being circulated on social media during the COVID-19 pandemic and its potential threat to public health, it is imperative to investigate ways to hinder its transmission. To this end, this study aimed to identify message features that may contribute to misinformation sharing on social media. Based on the theory of social sharing of emotion and the extant research on message credibility, this study examined if emotions and message credibility serve as mechanisms through which novelty and efficacy of misinformation influence sharing intention. An online experiment concerning COVID-19 misinformation was conducted by employing a 2 (novelty conditions: high vs. low) × 2 (efficacy conditions: high vs. low) between-subjects design using a national quota sample in South Korea ($N = 1{,}012$). The findings suggested that, contrary to the expectation, the overall effects of novelty on sharing intention were negative. The specific mechanisms played significant and unique roles in different directions: novelty increased sharing intention by evoking surprise, while also exerting a negative influence on sharing intention through an increase in negative emotions and a decrease in positive emotions and message credibility. Consistent with the expectation, efficacy exhibited positive total effects on sharing intention, which was explained by higher levels of (self- and response-) efficacy of protective action increasing positive emotions and message credibility but decreasing negative emotions. The implications and limitations of the study are discussed.

1. Introduction

The COVID-19 pandemic has presented an unprecedented global challenge. The World Health Organization declared it a "severe global threat," with more than 246 million confirmed infections and 5 million deaths as of November 2021 (World Health Organization, 2021). COVID-19 has significantly impacted public health, economics, politics, and the social sectors (Gollust et al., 2020; Van Bavel et al., 2020). In coping with the pandemic, extensive public health measures have increased the circulation and dissemination of timely and credible COVID-19 information (Wang et al., 2021). Nevertheless, research suggests that misinformation about COVID-19, which may compromise one's health, has also been rampant since the outbreak of the infection (Luo et al., 2021; Roozenbeek et al., 2020).

In the ongoing pandemic, the dual role of social media as an information channel is particularly apparent (Walter et al., 2020). With social distancing guidelines and other disruptions in our daily lives, social media has become an inevitable source of connection and information exchange. However, it has simultaneously posed a serious threat to public health by accelerating the spread of misinformation (Gabarron et al., 2021; Walter et al., 2020). Misinformation is defined as "incorrect or misleading statements presented as facts" (Green & Donahue, 2018, p. 109). It tends to flourish during uncertain circumstances because it fills the gaps in information that can help individuals manage uncertainty related to disasters and crisis events (Allport & Postman, 1946; Huang et al., 2015). Among the sources of misinformation, social media is often singled out as the main culprit because it offers easy access to information and facilitates active information sharing (Allcott et al., 2019; Chou et al., 2018, 2020).

The present study aimed to identify the factors influencing the likelihood of sharing misinformation on social media and to explain their underlying mechanisms in the context of COVID-19. Among the

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factors that affect misinformation reception and transmission, including source, message, channel, and receiver factors (Lee & Shin, 2021; Luo et al., 2021), this study focused on message features of misinformation. The goal of the study is two-fold. First, it examined whether novelty and efficacy of protective actions (Cappella et al., 2015) conveyed in misinformation influence the intention to share it on social media. These two message features are important to study as they likely suit the informational needs experienced during a pandemic posing high threat and uncertainty. Several widely shared misinformation that we observed on social media, particularly during the early stage of the pandemic, typically included ways to prevent infection (e.g., spraying alcohol or chlorine, rinsing with saline solution), which oftentimes were novel and eye-catching. Second, this study examined the mechanisms through which novelty and efficacy influence misinformation sharing intention on social media. Particularly, based on the theoretical framework of the social sharing of emotion (Rimé, 1995a, 1995b, 2009) and message credibility (Appelman & Sundar, 2016; Lee & Shin, 2021), the mediating roles of the two distinct mechanisms were investigated: emotional evocation and perceived message credibility. This research makes a valuable contribution to the study of misinformation on social media by identifying message features that facilitate social sharing (Zhu et al., 2020) and elucidating the underlying theoretical mechanisms, thereby enhancing our understanding of ways to hinder the spread of health misinformation.

2. Literature review

2.1. Effects of novelty on misinformation sharing

Novelty is one of the most widely recognized message features that facilitate the selection and sharing of online and social media content (Cappella et al., 2015). Novelty orients attention to a given message among overabundant information and rapidly spreading messages on social media. Novel content offers uncommon and unexpected information (Barto et al., 2013; Shoemaker, 1996), which leads individuals to deviate from their routine style of information processing and to attend to a potential threat depicted in the information (Cappella et al., 2015; Knobloch-Westerwick, 2015). Novel information with such attention-grabbing and informational utility possesses a greater potential for information sharing (Cappella et al., 2015; Photiou et al., 2021; Vosoughi et al., 2018). Indeed, after analyzing more than eight million Twitter posts in the first five months of the COVID-19 pandemic in 2020, Photiou et al. (2021) found that more novel contents concerning health, political, or personal information about the pandemic were retweeted substantially more.

The role of novelty in information sharing has been further emphasized in the context of false or misleading information. Vosoughi et al. (2018) noted that false information tends to be more novel than truthful information, which explains why the former tends to spread faster than the latter. During an unforeseen situation such as the COVID-19 pandemic, individuals are likely to experience high levels of uncertainty. The resulting efforts to reduce this uncertainty may render them more susceptible to believing novel information about COVID-19. Typically, individuals perceive novel information to be more valuable and useful than familiar information (Freedman, 1965; Frey & Rosch, 1984), not only to themselves but also to those in their social networks. Therefore, they may expect new and timely information to facilitate group- or society-level coping with the pandemic crisis. Accordingly, the following hypothesis was proposed:

H1. Misinformation with more novel information leads to greater sharing intention than that with less novel information.

2.1.1. Underlying mechanisms: emotions and credibility

Although substantial research has considered novelty as a key factor in motivating information sharing, less is known about the specific mechanisms underlying its influence. To explain how novel misinformation spreads more widely compared to its counterpart, this study investigated the role of two theoretical mechanisms: emotional evocation and perceived message credibility. To examine these mechanisms, we bring together the theory of social sharing of emotion (Rimé, 1995a, 1995b, 2009) and message credibility in persuasion (Appelman & Sundar, 2016; Lee & Shin, 2021).

First, the theory of social sharing of emotion offers explanations for the mediating role of emotion between novelty and misinformation sharing intention. Rimé (1995a, 1995b, 2009) coined the term social sharing of emotion and argued that emotion is an important factor motivating message sharing. Social sharing of emotion is described as an interpersonal process through which an individual experiencing an emotional event is compelled to share it with another individual (Rimé, 1995a, 1995b, 2009). A large body of literature on the theory of social sharing of emotion substantiated this theoretical argument (e.g., Christophe & Rimé, 1997). Notably, emotion has been found to induce information sharing regardless of the factuality of the information shared. The intensity of the emotion felt is positively correlated with the extent to which the emotional event is shared (Christophe & Rimé, 1997) and emotional arousal increases individuals' willingness to accept the information as well (Berger, 2011). Studies have found that recipients take their emotional responses as more important criterion in message processing than the information's truth value (Lewandowsky et al., 2012; Myers & Pineda, 2009; Peters et al., 2009).

The strong association between novelty and emotions has also been demonstrated in many studies. Previous findings show that emotions are likely to be evoked when unexpected (i.e., novel) events take place (Carver & Scheier, 1990; Oatley & Johnson-laird, 1987) or a planned behavior is interrupted (Miller et al., 1960; Simon, 1967). Since exposure to novel (mis)information can be considered an unexpected event, in which unusual and new information is encountered, such situation is expected to evoke emotions. This theoretical argument that novel stimuli lead to emotional arousal has been central to early research on responses to stimuli in psychology, including Berlyne's (1960) theory of arousal. The strong connection between novelty and emotions is also explained by neuroscientific evidence that novelty has been observed to increase activity in the amygdala, the central element in the neural workspace that computes affective value (Weierich et al., 2010).

Taken together, the theory of social sharing of emotion and its empirical evidence suggest that social sharing of emotion plays an important role in explaining how misinformation, particularly novels ones, may spread. Here, the valence of emotions warrants consideration. Recent studies on sharing behaviors on social media show that while positive emotions may promote social sharing, negative emotions may inhibit it. This is explained by the motivation to engage in online impression management (Manago et al., 2008). Individuals strive to manage their online impression by sharing posts that portray positivity rather than negativity (Wojnicki & Godes, 2008). Consistent with this argument, Berger and Milkman (2012) proposed and found that positive news content, which likely induces positive emotions, is more viral than negative news content. Similarly, So et al. (2016) found that tweets about obesity that evoked negative emotions (e.g., anger) were less likely to be retweeted than those evoking positive emotions (e.g., amusement). On a distinctive note, novelty is also deeply related to the emotion of surprise, as the latter results from encountering unexpected information (Barto et al., 2013). Novelty evokes surprise, which then stimulates individuals' interest, thus promoting the sharing of information (Berger & Milkman, 2012). For instance, tweets containing medical data, interesting facts, and statistical information that seem to evoke surprise are likely to be retweeted often (So et al., 2016). Since surprise may carry positive or negative valence as it can be induced by an event or stimulus with either valence (Lazarus, 1991), we will examine its mediating role separately from that of positive and negative emotions. Drawing from past research and the foregoing discussion, we hypothesized:

H2. Misinformation with more novel information leads to greater levels of positive emotions, which in turn increase sharing intention.

H3. Misinformation with more novel information leads to lower levels of negative emotions, which in turn increase sharing intention.

H4. Misinformation with more novel information leads to greater levels of surprise, which in turn increase sharing intention.

The second mechanism underlying the effects of novelty on misinformation sharing is perceived message credibility. During message processing in persuasion and communication, perceived message credibility is one of the prerequisites for cognitive, emotional, and behavioral changes (Lee & Shin, 2021). It has indeed been one of the central considerations in a large body of research on persuasion and message processing and, therefore, has been studied extensively (e.g., Hovland et al., 1953). This is because "whether an individual processes a piece of information depends, in part, on whether that information is perceived as credible and trustworthy" (Tandoc et al., 2018, p. 2747).

Appelman and Sundar (2016) define message credibility as "an individual's judgment of the veracity of the content of communication" (p. 63), noting that message credibility is a related but different concept from source credibility or medium credibility. While the three types of credibility – message, source, and medium credibility – are equally important to persuasion in general, the role of message credibility is particularly more important in online and social media context since overabundant social media messages typically lack explicit cues about a source or a medium, which renders the concept of source and medium credibility less relevant than message credibility (Appelman & Sundar, 2016; Sundar & Nass, 2001).

Much of the previous research on misinformation has focused on identifying factors that make misinformation seem more believable (Lee & Shin, 2021; Schaewitz et al., 2020; Schwarz & Jalbert, 2021) and linking these factors to the effect of credibility on sharing (Nedelcu & Balaban, 2021; Stefanone et al., 2019). For example, conducting an experiment involving six conditions that present different types of news articles (fact/misinformation by three political frames), Stefanone et al. (2019) found that perceived credibility of the information increased sharing behavior, regardless of the condition. Based on past research and related reasoning, we expect perceived message credibility to mediate the effect of novelty on sharing intention. Accordingly, the following hypothesis was proposed:

H5. Misinformation with more novel information leads to greater levels of message credibility, which in turn increase sharing intention.

2.2. Effects of efficacy on misinformation sharing

Health information typically includes content related to a given threat and protective actions that individuals can take to reduce the threat. The latter is referred to as efficacy information, which either pertains to the ease of performing the protective action (i.e., self-efficacy) or the effectiveness of the action in reducing the given threat (i.e., response-efficacy) (Rogers & Prentice-Dunn, 1997). Efficacy information is emphasized in theories of health message design including the extended parallel processing model (Witte, 1992), which suggest that people attend to messages if strong threat information is presented, but it is critical that efficacy information accompanies threat information to guide people to take actions to manage the threat. The efficacy component of health risk messages has thus been analyzed in varying types of messages, including public service announcements (Niederdeppe et al., 2018), news (Goodall et al., 2012), and social media messages (Shi et al., 2019).

Efficacy information is perceived as possessing high utility, which is crucial in predicting behavioral outcomes (Cappella et al., 2015). Past research has shown that information that is perceived as more utilitarian by offering efficacious advice is more likely to attract attention (e.g., Knobloch-Westerwick & Kleinman, 2012) and be shared (e.g., Thorson, 2008; Zhu et al., 2020). For example, Zhu et al. (2020) found that tweets that included efficacy information increased the size and the speed of the diffusion in an analysis of original posts on the Twitter account of the U. S. Centers for Disease Control and Prevention for twelve months and the diffusion of each post for six days.

The high utility of efficacy information can be apparent especially in situations involving high threat and uncertainty, such as the COVID-19 pandemic. This is because, according to the cognitive appraisal theory of emotions (Lazarus, 1991), individuals are highly motivated to seek protective actions that are effective in coping with the uncertainty of a potential threat (e.g., diseases; So, 2013). Indeed, in the first few months of the COVID-19 outbreak, widely retweeted and shared messages on Twitter mostly concerned information on prevention and protection against COVID-19, such as how to engage in effective social distancing and build support for social distancing, which is essentially efficacy-related information (Thelwall & Thelwall, 2020). Guided by past research on the informational utility of efficacy and applying it to the context of misinformation sharing, we hypothesized:

H6. Misinformation with higher efficacy information leads to greater sharing intention than that with lower efficacy information.

2.2.1. Underlying mechanisms: emotions and credibility

Similar to the hypotheses pertaining to misinformation with novelty, the role of efficacy was examined with reference to two theoretical mechanisms: emotional evocation and perceived message credibility. First, it was posited that information on highly effective (i.e., high response-efficacy) and relatively easy (i.e., high self-efficacy) protective actions against COVID-19 would function as core relational themes (Lazarus, 1991) that evoke positive emotions such as relief, hope, and interest. Recent research on emotional flow in persuasive health messages (Nabi, 2015) suggests that receiving efficacy information may replace fear with more positive emotions, such as relief or hope. As for negative emotions, coping research also suggests that individuals' coping response is activated by aversive emotional arousal that involves negative emotions, such as fear, anxiety, and anger (Lazarus & Folkman, 1984). When facing a potential threat, a search for protection from the threat is an immediate response that helps individuals cope with the situation. More specifically, efficacy information can facilitate a coping response, the purpose of which is to ameliorate negative emotional experiences, such as fear. Therefore, two hypotheses were proposed concerning the mediational mechanisms, respectively for the increase in positive emotions (H7) and decrease in negative emotions (H8) as underlying mechanisms:

H7. Misinformation with higher efficacy information leads to greater levels of positive emotions, which in turn increase sharing intention.

H8. Misinformation with higher efficacy information leads to lower levels of negative emotions, which in turn increase sharing intention.

During the initial stage of the pandemic, the quantity of threat information (e.g., transmission) surpassed that of protection information (e.g., wearing a mask and vaccination). In such a situation, individuals naturally develop a heightened need for efficacy information as a coping response (Lazarus & Folkman, 1984). Subsequently, when exposed to this desired efficacy information, which is difficult to come by, they may perceive it as highly valuable and may want to believe in its validity. This desire to obtain highly efficacious protection against COVID-19 was expected to influence individuals' processing of efficacy information, such that they would be more likely to (want to) believe in the credibility and accuracy of the message in providing efficacious protection. This perceived message credibility would then promote social sharing as articulated earlier. Thus, another mechanism through which efficacy information may induce sharing intention was proposed:

H9. Misinformation with higher efficacy information leads to greater levels of perceived credibility, which in turn increase sharing intention.

The preceding discussion that formed the basis for H1 through H9 suggests the presence of largely two distinct mechanisms that explain the effects of the novelty and efficacy of misinformation on sharing intention. Given the anticipated effects of novelty and efficacy, it would be interesting to examine whether these two factors jointly produce unique effects on top of the two proposed main effects. Thus, in addition to studying the main effects of these two message features, their interaction effects were to be examined:

RQ1. Will the levels of novelty and efficacy interact to influence sharing intention?

3. Method

3.1. Overview

A randomized online experiment was conducted in May 2020. The relevant university's institutional review board approved all aspects of this study. Data were collected by a professional research company in South Korea. A national sample was recruited using stratified sampling proportionate to the 2019 census data. An initial invitation email was sent to 3,000 randomly selected individuals from the research panel. About 33.7% of them completed the study and received a small monetary compensation. The final sample included 1,012 adults aged 20–69 years (M = 44.2, SD = 13.4). There were slightly more male (51.1%) than female participants.

Once participants' consent was obtained, they were asked questions about their perceptions of COVID-19, pertaining to personal susceptibility, severity, and message fatigue (So et al., 2016). They were then presented with a message containing misinformation about COVID-19 depending on the experimental condition they were randomly assigned to. After reading the message, they responded to a series of questions measuring emotions, surprise, message credibility, and message sharing intention, as well as basic demographics and manipulation check items. Debriefing information was offered at the end to inform participants that the manipulated messages were created expressly for the experiment and contained inaccurate information, thereby correcting false information they had been presented.

3.2. Design and stimuli

A 2 (novelty conditions: high vs. low) × 2 (efficacy conditions: high vs. low) between-subjects design was employed. Participants were randomly assigned to one of four conditions: high novelty and high efficacy (n = 254); high novelty and low efficacy (n = 254); low novelty and high efficacy (n = 253); and low novelty and high efficacy (n = 251). Each group read a different version of the misinformation message as if they had been exposed to it on social media. All stimulus messages were of similar text length (see Appendix). The message discussed a protective behavior to cope with COVID-19, with variations in the novelty of the introduced behavior and the efficacy in enacting it. Novelty was manipulated by stating that COVID-19 is preventable through taking a certain action, either relatively common and well-known (low novelty: handwashing) or relatively new and uncommon (high novelty: mushroom intake). Efficacy was manipulated by changing the degree of both response- and self-efficacy based on the extended parallel process model (Witte, 1992). For example, in the high-efficacy condition, the handwashing method was detailed with high self-efficacy information (relatively easy action: washing hands with soap for 45 s) and high response-efficacy information (more effective: 99.99% effective in killing the virus). By contrast, in the low-efficacy condition, handwashing was detailed with low self-efficacy (more difficult action: washing hands with antibiotic soap for 1 min every 2 hr) and low response-efficacy information (less effective: 80% effective in killing the virus).

3.3. Measures

Sharing intention. Participants' intention to share the message they had just read during the experiment was measured using two items: "I am willing to share this information with my friends or family" and "I think this information is worth sharing with my friends or family." Responses were rated on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*) and averaged into a scale (α = 0.97, M = 4.21, SD = 1.75).

Intensity of emotions. Participants were asked to indicate how much they felt each of the primary discrete emotions on a 7-point scale (1 = *not at all* to 7 = *very much*) (see Nabi, 2010 for a discussion on discrete emotions). Following convention (e.g., Dillard & Peck, 2001), responses for anger, fear, anxiety, and irritation were summed up to measure the intensity of negative emotions (α = 0.86, M = 12.43, SD = 3.79), whereas responses for relief, hope, and interest were summed to assess the intensity of positive emotions (α = 0.83, M = 11.75, SD = 5.18).

Surprise. Participants were asked how much they were surprised after reading the message (1 = *not at all* to 7 = *very much*; M = 3.79, SD = 1.61).

Message credibility. Message credibility was assessed using three items suggested by Appelman and Sundar (2016). We asked participants to indicate their judgement on a 7-point scale with a set of three bipolar adjectives: *inaccurate* (= 1)—*accurate* (= 7), *fake—authentic*, *unbelievable—believable*. Responses were then averaged (α = 0.93, M = 4.12, SD = 1.60).

Control variables. Age, gender, COVID-19 infection history of self (0.1%) or family members (1.38%), daily news exposure on COVID-19 (1 = *less than 10 min* to 6 = *3 hr or more*; M = 2.64, SD = 1.14), perceived severity of COVID-19 (M = 3.77, SD = 1.76), perceived susceptibility to COVID-19 (M = 3.49, SD = 1.25), and message fatigue toward COVID-19 messages (M = 4.11, SD = 1.25) were measured as covariates.[1]

4. Results

4.1. Manipulation check

Manipulation checks were conducted to confirm whether participants perceived the high or low degree of novelty and efficacy in the message as intended by the researchers. Specifically, perceived novelty was computed by averaging scores on two items asking participants to rate the message on a 7-point scale using bipolar adjectives: *ordinary* (= 1)—*novel* (= 7) and *common—unique* (r = 0.71, M = 4.15, SD = 1.48). A univariate analysis of covariance (ANCOVA) with novelty, efficacy, and their interaction term as predictors and the aforementioned control variables as covariates confirmed that participants in the high-novelty condition rated the message as significantly more novel (M = 4.38, SD = 1.43) than did those in the low-novelty condition (M = 3.92, SD = 1.50), $F(1, 1001) = 25.95$, $p < .001$, $\eta_p^2 = 0.03$.[2] Thus, the novelty manipulation was deemed successful.

Similarly, a univariate ANCOVA was used to perform manipulation checks with reference to efficacy. Self-efficacy was computed by averaging responses to two items concerning the given behavior mentioned

[1] Perceived severity was assessed with one item, "I will feel like the end of the world if I am infected with COVID-19" (1 = *not at all* – 7 = *very much*); perceived susceptibility was an average score of two items, e.g., "I am susceptible to COVID-19" (1 = *not at all* – 7 = *very much*; α = 0.77); and message fatigue was assessed by averaging responses to four items, e.g., "There are simply too many health messages about COVID19 nowadays" (1 = *not at all* – 7 = *very much*; α = 0.85).

[2] The novelty and efficacy manipulations also had an interaction effect on perceived novelty, $F(1, 1001) = 13.82$, $p < .001$, $\eta_p^2 = 0.01$, such that the effect of novelty was stronger in the high-efficacy condition, but was much weaker in the low-efficacy condition.

in the message (e.g., "It is easy for me to perform the behavior mentioned in the message") on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*; $r = 0.87$. $M = 5.01$, $SD = 1.59$). Response-efficacy was an average score of two items assessed on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*): e.g., "The behavior is effective in preventing the coronavirus" ($r = 0.90$, $M = 4.55$, $SD = 1.58$). Univariate ANCOVAs were conducted, respectively for self-efficacy and response efficacy as an outcome. The efficacy manipulation had a significant main effect on self-efficacy, $F(1, 1001) = 115.18$, $p < .001$, $\eta_p^2 = 0.10$, and on response-efficacy, $F(1, 1001) = 30.43$, $p < .001$, $\eta_p^2 = 0.03$. Participants in the high-efficacy condition reported a higher degree of self- and response-efficacy ($M = 5.47$, $SD = 1.37$ and $M = 4.77$, $SD = 1.52$, respectively) than did those in the low-efficacy condition ($M = 4.56$, $SD = 1.66$ and $M = 4.33$, $SD = 1.61$, respectively). Thus, the efficacy manipulation was deemed successful.[3]

4.2. Effects of misinformation message features on sharing intention

H1 proposed that high-novelty misinformation enhances participants' intention to share the message more strongly than does low-novelty misinformation. H6 proposed that high-efficacy misinformation induces greater intention to share the message than does low-efficacy misinformation. RQ1 aimed to explore the possible effect of the interaction between these two message features on sharing intention. To test these hypotheses and to address the research question, a univariate ANCOVA was conducted with the novelty manipulation, efficacy manipulation, and interaction between the two as independent variables, and sharing intention as the dependent variable. The analysis included the aforementioned control variables as covariates.

Novelty had a significant main effect on sharing intention, $F(1, 1001) = 102.40$, $p < .001$, $\eta_p^2 = 0.09$. However, the direction of the influence was opposite to that proposed in H1. Specifically, the high-novelty message induced lower sharing intention ($M = 3.69$, $SD = 1.71$) as compared to the low-novelty message ($M = 4.74$, $SD = 1.63$). Thus, H1 was not supported.

Efficacy also had a significant main effect on sharing intention, $F(1, 1001) = 24.23$, $p < .001$, $\eta_p^2 = 0.02$. As expected, participants in the high-efficacy condition reported greater sharing intention ($M = 4.48$, $SD = 1.64$) than did those in the low-efficacy condition ($M = 3.95$, $SD = 1.82$). Therefore, H6 was supported.

Regarding RQ1, novelty and efficacy had a significant interaction effect on sharing intention, $F(1, 1001) = 3.88$, $p = .049$, $\eta_p^2 = 0.004$. Specifically, the role of efficacy in increasing sharing intention was stronger in the high-novelty than the low-novelty condition. As shown in Fig. 1, the difference in sharing intention between the high- and low-efficacy conditions was larger among those in the high-novelty condition, $F(1, 507) = 22.63$, $p < .001$, $\eta_p^2 = 0.04$, than the difference among those in the low-novelty condition, $F(1, 503) = 4.68$, $p = .031$, $\eta_p^2 = 0.01$. In other words, the influence of efficacy on sharing intention was more pronounced when the misinformation was more novel. In addition, among the covariates, age had a negative association with sharing intention ($p < .001$), while perceived severity ($p = .01$) and news exposure ($p = .02$) had positive associations with it.

[3] Notably, the novelty manipulation also had a significant main effect on self-efficacy, $F(1, 1001) = 292.96$, $p < .001$, $\eta p^2 = 0.23$, and response-efficacy, $F(1, 1001) = 664.46$, $p < .001$, $\eta p^2 = 0.40$. Participants in the high-novelty condition exhibited lower self- and response-efficacy ($M = 4.30$, $SD = 1.52$ and $M = 3.57$, $SD = 1.32$, respectively) than those in the low-novelty condition ($M = 5.74$, $SD = 1.30$ and $M = 5.54$, $SD = 1.16$, respectively). Novelty and efficacy also had a significant interaction effect on self-efficacy, $F(1, 1001) = 15.56$, $p < .001$, $\eta p^2 = 0.02$, such that the efficacy manipulation had a more prominent effect on participants in the high-novelty condition than the low-novelty condition.

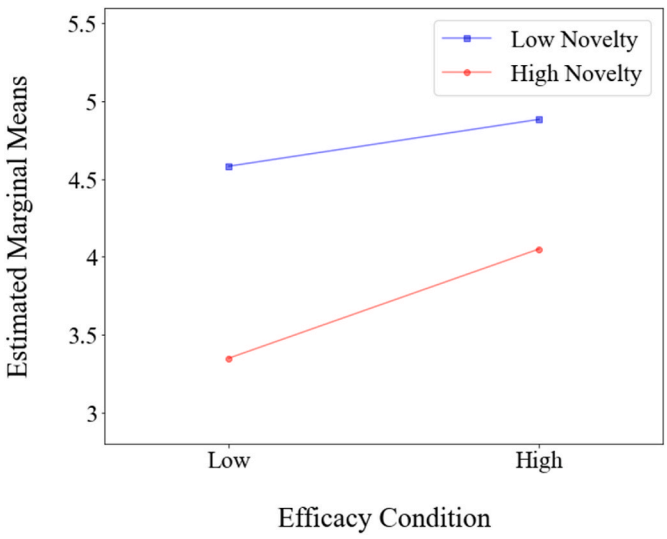

Fig. 1. The effects of novelty and efficacy on sharing intention. The y-axis indicates the estimated marginal means of sharing intention from the analysis of covariance testing the effects of novelty and efficacy with covariates.

4.3. Mechanisms underlying the effects of the novelty and efficacy of misinformation

H2 through H5 proposed mechanisms whereby the novelty of misinformation influenced sharing intention, while H7 through H9 proposed mechanisms through which the efficacy of misinformation influenced sharing intention. These mediational hypotheses were tested simultaneously with a path analysis using *Mplus* version 8.4 (Muthén & Muthén, 1998–2017). The analysis was conducted with novelty, efficacy, and their interaction term as exogenous variables predicting positive emotion, negative emotion, surprise, and message credibility, which subsequently predicted sharing intention. Novelty and efficacy were entered after being dummy coded (*high* = 1, *low* = 0). The direct paths from the exogenous variables to sharing intention were also specified, and control variables were entered as covariates. Model fit was assessed primarily with the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Additionally, the bootstrapping approach was employed for a formal test of the indirect, direct, and total effects. This was used to empirically bootstrap the sampling distribution of the effects and to obtain its 95% confidence interval (CI); the effect was considered statistically significant if zero was not included within the CIs.

Fig. 2 presents the results. The model exhibited excellent fit to the data: CFI = 0.998, RMSEA = 0.04 (0.00, 0.08), SRMR = 0.004, $\chi^2/df = 2.50$ (Hu & Bentler, 1999). The bootstrapping results are presented in Table 1. As hypothesized, the novelty of the COVID-19 misinformation increased participants' surprise response ($\beta = 0.18$, $p < .001$), which in turn predicted greater intention to share the information ($\beta = 0.20$, $p < .001$). Thus, H4 was supported. Contrary to expectations, novelty was associated with decreased positive emotion ($\beta = -0.09$, $p = .002$) and perceived credibility ($\beta = -0.14$, $p < .001$). Positive emotions ($\beta = 0.47$, $p < .001$) and credibility ($\beta = 0.07$, $p = .002$) in turn were associated with increased sharing intention. Moreover, novelty led to greater negative emotions ($\beta = 0.08$, $p = .009$), which decreased sharing intention ($\beta = -0.10$, $p < .001$). In sum, the observed effect of novelty on the three mediators departed from the hypothesized effect, but these mediators confirmed the hypothesized effects on sharing intention. Thus, H2, H3, and H5 were not supported. As reported in Table 1, the total effect of novelty on sharing was negative and statistically significant. All the specific indirect effects were significant, including the positive indirect effect via surprise and the negative effects via the other three mediators.

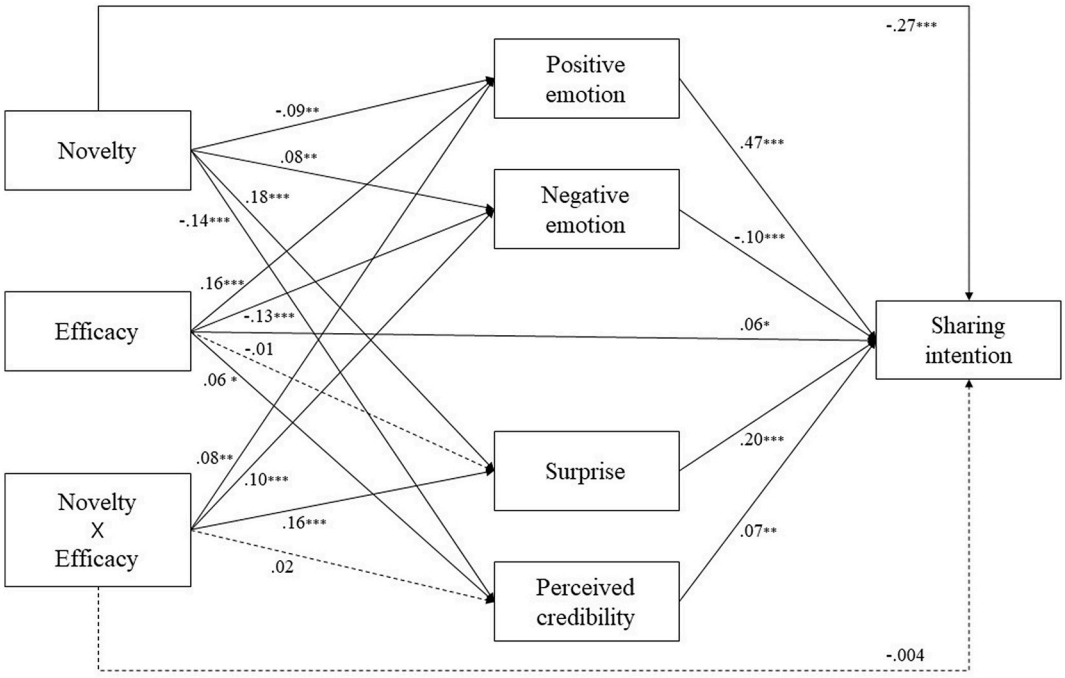

Fig. 2. Path model of the effects of novelty and efficacy of misinformation on sharing intention. * $p < .05$, ** $p < .01$, *** $p < .001$. Significant and non-significant paths are indicated with solid and dotted lines, respectively. Novelty and efficacy were entered as dummy variables (*high* = 1, *low* = 0). Covariates were included in the model but are not shown in the figure for parsimonious reporting. The path from efficacy to surprise was not a part of the hypotheses, but it was included for completeness in testing the roles of the four mediators in the model.

Table 1
A formal test of the total, direct, and indirect effects in the path model with multiple mediators.

	Estimate	SE	*p*	95% CI
Overall Effect				
Novelty → Sharing Intention				
Total Effect	−.52***	.05	<.001	[−.621, −.423]
Direct Effect	−.47***	.04	<.001	[−.551, −.393]
Indirect Effect	−.05	.04	.174	[−.121, .024]
Efficacy → Sharing Intention				
Total Effect	.25***	.05	<.001	[.155, .352]
Direct Effect	.10*	.04	.014	[.019, .173]
Indirect Effect	.16***	.03	<.001	[.089, .223]
Specific Indirect Effect				
Novelty → Positive Emotion → Sharing Intention	−.08**	.03	.002	[−.128, −.028]
Novelty → Negative Emotion → Sharing Intention	−.01*	.01	.027	[−.030, −.003]
Novelty → Surprise → Sharing Intention	−.06***	.01	<.001	[.035, .094]
Novelty → Message Credibility → Sharing Intention	−.02*	.01	.010	[−.038, −.004]
Efficacy → Positive Emotion → Sharing Intention	−.13***	.03	<.001	[.079, .181]
Efficacy → Negative Emotion → Sharing Intention	−.02**	.01	.003	[.009, .040]
Efficacy → Surprise → Sharing Intention	−.01	.01	.655	[−.026, .016]
Efficacy → Message Credibility → Sharing Intention	−.01†	.01	.064	[.001, .021]

Note. † $p < .07$, * $p < .05$, ** $p < .01$, *** $p < .001$. The 95% CIs were obtained from a path analysis employing the bootstrapping technique, whereas the unstandardized coefficient estimates, SEs, and *p*-values were obtained without bootstrapping. Bootstrap sample size = 10,000.

The influence of efficacy level on sharing intention was mediated by the three variables, and these results were consistent with the hypothesized direction. Specifically, the high-efficacy message led to greater levels of positive emotions ($\beta = 0.16, p < .001$) and perceived credibility ($\beta = 0.06, p = .038$), which in turn predicted greater sharing intentions. Thus, H7 and H9 were supported. Efficacy also led to lower negative emotions ($\beta = -0.13$, $p < .001$), which in turn decreased sharing intention. Thus, H8 was supported. The total effect of efficacy on sharing was positive and statistically significant, and all three hypothesized specific indirect effects were also positive and significant (see Table 1).

5. Discussion

5.1. Discussion of findings

During the COVID-19 pandemic, widespread misinformation has posed an additional threat to and burden on public health, hindering collective efforts to fight the virus (Gabarron et al., 2021; Van Bavel et al., 2020; Walter et al., 2020). As social media is a major channel through which misinformation is transmitted (Allcott et al., 2019; Chou et al., 2018, 2020), this study investigated the intrinsic message factors affecting the intention to share a message on social media as well as mechanisms underlying the effects.

The findings revealed the direct and indirect effects of two message features on message sharing intention, namely, novelty and efficacy. Both message features played important yet different roles in inducing sharing intention. First, as expected, misinformation with high efficacy increased sharing intention to a greater extent than that with low efficacy. That is, individuals were more likely to express an intent to share information with their friends and family via social media when the message contained details on highly effective (i.e., high response-efficacy) and relatively easy (i.e., high self-efficacy) protective actions. At the early stages of the COVID-19 outbreak, relatively little was known about how to effectively cope with COVID-19, and vaccines were not available. This lack of knowledge was particularly acute, thereby leading the public to rely primarily on social media for information (Zhang &

Cozma, 2022) in May 2020, when this study was conducted. Considering these circumstances, it is possible that individuals sought efficacy information on social media, whether it later turned out to be accurate or not, as a coping response (Lazarus & Folkman, 1984).

Following previous studies (Cappella et al., 2015; Vosoughi et al., 2018) that found that more novel information is more likely to be shared, novelty was expected to increase sharing intention. However, unexpected yet interesting results were observed. Novelty had a significant impact on sharing intention, but the direction of this effect was contrary to the hypothesis. Specifically, less novel misinformation led to greater intention to share the message on social media. This result could be partly explained by contextual factors. The context of the experiment was the initial stage of COVID-19 pandemic, during which individuals had been dealing with particularly high levels of uncertainty and are highly vigilant (Van Bavel et al., 2020). A message with very novel and unfamiliar protective actions could have triggered a possible red flag. This supposition finds support in the present findings, in that novelty reduced positive emotions and message credibility but increased negative emotions, which in turn reduced sharing intention. Another explanation for the unexpected result could lie in the channel through which the message was delivered. In the present experiment, participants were prompted to think that the manipulated message was posted by a friend on social media. Kim (2015) found a positive relationship between novelty and message sharing when the news was delivered via email; however, a negative relationship was observed when the message was viewed on social media. Lee and Shin (2021) also stated that communication channels affect the believability of misinformation, such that misinformation on social media is consumed with greater skepticism. As the present study was also based on social media, our results may have been influenced by these channel effects.

The present study also examined the underlying mechanisms through which the efficacy and novelty of misinformation affect sharing intention. Two mechanisms were suggested and tested. One mechanism was based on the theory of social sharing of emotion (Rimé, 1995a, 1995b, 2009), which suggests that information with high novelty and efficacy would evoke strong emotional responses, which would in turn influence sharing intention. The present findings supported this mechanism, showing that high-efficacy information, for example, increased positive emotions such as hope and relief while reducing negative emotions such as anger, fear, worry, and irritation. This result corroborates the findings of Nabi (2010), who showed that efficacy information replaces fear with relief and hope. Emotional response was an important mechanism for novelty as well. However, as discussed before, novel information evoked negative emotions and surprise while decreasing positive emotions in the context of COVID-19. Also notably, we found a negative association between negative emotions and sharing intention, in contrast to some past findings on the role of negative emotions, such as fear, in evoking online rumor spread (e.g., Luo et al., 2021). Therefore, our findings highlight the need for further investigations regarding the role of different emotional valences in misinformation sharing on social media.

The present findings also confirmed the importance of the other mechanism related to the credibility of the misinformation (Lee & Shin, 2021). Information with high novelty and efficacy affects the perceived credibility level, which either enhances or lowers sharing intention. In the present study on COVID-19 misinformation, the higher efficacy of the protective action described in the message rendered it more believable, and therefore it increased the participants' sharing intention. In contrast, novelty rendered the misinformation less believable, leading to lower intention to share it. These results suggest that the crucial role of message credibility that is observed in persuasion research (Appelman & Sundar, 2016) also holds true for misinformation sharing. Furthermore, when the two mechanisms were compared based on the size of their indirect effects, with reference to COVID-19 misinformation, social sharing of emotion, especially positive emotion, emerged as a relatively stronger mechanism than credibility. More research is needed to further investigate the differential roles of the two mechanisms in misinformation sharing.

Lastly, we found an interaction effect between two independent variables such that the role of efficacy in increasing sharing intention was stronger in the high-novelty than the low-novelty condition. Thus, whether or not the health behavior was efficacious mattered more when the message was novel. This finding might be explained by attention enhanced by novelty, which motivates individuals to evaluate their ability to implement the behavior as well as the effectiveness of the behavior.

5.2. Theoretical and practical implications

This study has several important implications. It holds theoretical significance in providing further support to the theory of social sharing of emotion (Rimé, 1995a, 1995b, 2009) and demonstrates that the theory can be expanded to explain the underlying mechanism behind the spread of misinformation. In addition, the present study showed that the effects of both positive and negative emotions play an important and distinct role in message sharing on social media. It is worth noting that each of these effects persisted even after controlling for the other. Contrary to the common assumption that a low score on positive emotion implies high negative emotion and vice versa, this finding suggests that positive and negative emotions may not always have an inverse relationship. Similarly, So et al. (2016) argued that positive and negative emotions do not always have opposing patterns of influence on social sharing. Accordingly, it is recommended that future studies, at least those on the social sharing of emotion, should examine both positive and negative emotions to derive more accurate information.

The study also provides practical implications. It revealed two important characteristics that may facilitate the transmission of misinformation to a wider audience on social media and explained the underlying mechanisms. To alleviate the possible negative consequences of misinformation spread in the pandemic situation, we believe that healthcare professionals and policymakers should more proactively inform the public about the characteristics of misinformation that facilitate social transmission. The present findings could be used to develop the content of such educational messages, especially in the context of social media (Lin et al., 2016). Specifically, this study warns against misinformation that is seemingly credible due to usualness and low novelty, as participants in this study were relatively apt at guarding against very novel misinformation. The present study showed that novelty does not have the same effect universally in a unilateral way. This finding calls for more research on novelty to reveal factors that influence the positive, negative, or no effect of novelty on sharing intention. This information will further help healthcare professionals and policymakers in both identifying the quickly spreadable misinformation and designing education messages to identify them.

In addition, as misinformation that contains highly efficacious ways of prevention was more likely to be socially shared, public interventions designed to curb the spread of health-related misinformation should also sensitize the public about the dangers of disseminating information that seems to offer easy and effective solutions. As discussed earlier, perceived high efficacy is often considered a positive state that should be achieved through public health promotion. However, in the context of health-related misinformation transmission, we found that the higher efficacy of an inaccurate protective action may play an undesirable role by promoting misinformation sharing on social media. This finding suggests that efficacy should be considered as one of the predictors of quickly spreadable misinformation. Further, it expands the scope of efficacy research and highlights the need to study efficacy in more diverse contexts.

5.3. Limitations and future research

There are several limitations to this study. Novelty and efficacy had

an unexpected, significant interaction effect on perceived efficacy, as reported on the manipulation check. The manipulation conducted in the present study was successful in that the main effects of the experimental conditions were significant and in the intended direction. However, this significant interaction effect was an unexpected finding. There can be two possible explanations for this result. First, information with high efficacy is highly likely to be considered novel. Given the initial uncertainty and lack of clarity about effective ways to protect oneself, it is reasonable to expect that highly effective protection behaviors that are also easy to implement would be perceived as being novel. Another possibility may be related to the specific setting of the current experiment. Handwashing was chosen for the message in the low-novelty condition because it has been frequently communicated as an important protection behavior against COVID-19. Thus, the participants were likely to be well aware of it. However, handwashing could have also been perceived as efficacious information. Although the suggested duration of handwashing was different in the two experimental scenarios, the public has been practicing handwashing consistently, and therefore their self-efficacy level is probably high. Future studies need to investigate the relationship between the efficacy and novelty of misinformation to determine whether the interaction effect observed in this study applies to other types of misinformation or contexts. Lastly, the present findings should be interpreted with caution in terms of generalizability. The COVID-19 pandemic represents a unique situation, and it is different from other health emergencies or disasters. Therefore, these findings may not be relevant in other contexts and may have limited generalizability.

5.4. Conclusion

In conclusion, this study examined two major message features that increase the likelihood of the spread of misinformation on social media. Further research is recommended to reveal the contributing factors that render misinformation more appealing and likely to spread widely. This will help provide a better understanding of the nature of misinformation sharing and would further contribute to winning the fight against not only misinformation about the COVID-19 pandemic itself but also other severe societal crises we may encounter in the future.

Credit author statement

Hayeon Song: conceptualization, methodology, resources, writing, funding acquisition; Jiyeon So and Minsun Shim: conceptualization, methodology, writing, formal analysis; Jieun Kim, Eunji Kim, and Kyunha Lee provided assistance in investigation and writing.

Declaration of competing interest

We have no known conflict of interest to disclose.

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APPENDIX

[High novelty, high efficacy]

According to a recent issue of the medical journal *Immunology,* a study has shown that COVID-19 can directly destroy human immune cells as AIDS does. However, this study revealed that mushrooms can promote the reproduction of T cells (a type of immune cells) by 150%, which results in protecting T cells from the virus. The research team explained that any type of mushroom cooked using any method would have such effects.

[High novelty, low efficacy]

According to a recent issue of the medical journal *Immunology*, a study has shown that COVID-19 can directly destroy human immune cells as AIDS does. However, this study revealed that mushrooms such as *Naematoloma sublateritium, Coriolus versicolor,* and *Clavaria botrytis,* which are found in deep forests, can promote the reproduction of T cells (a type of immune cells) by 5%, which results in protecting T cells from the virus. The research team explained that these three types of mushrooms should be boiled in water for several hours and consumed twice a day to benefit from this effect.

[Low novelty, high efficacy]

According to the CDC (Centers for Disease Control and Prevention), handwashing for 30 seconds is the most effective way to prevent infection from COVID-19. However, according to a recent issue of the medical journal *Immunology*, a study found that washing hands with soap for more than 45 seconds is 99.99% effective in killing the virus, resulting in a much higher infection-prevention effect. The researchers recommended washing your hands for 45 seconds when you come home from outside.

[Low novelty, low efficacy]

According to the CDC (Centers for Disease Control and Prevention), handwashing for 30 seconds is the most effective way to prevent infection from COVID-19. However, according to a recent issue of the medical journal *Immunology*, a study found that washing hands with anti-bacterial soap for more than 1 minute is 99.99% effective in killing the virus, resulting in a much higher infection-prevention effect. The researchers recommended washing your hands for one minute not only when you come home from outside but also every 2 hours while staying at home.

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