

# Unveiling the Mechanisms of Online Health Rumor Dissemination: The Effects of Content Feature and Presentation Cues

You Wu, Xing Zhang

Submitted to: Journal of Medical Internet Research  
on: August 21, 2024

**Disclaimer:** © The authors. All rights reserved. This is a privileged document currently under peer-review/community review. Authors have provided JMIR Publications with an exclusive license to publish this preprint on its website for review purposes only. While the final peer-reviewed paper may be licensed under a CC BY license on publication, at this stage authors and publisher expressly prohibit redistribution of this draft paper other than for review purposes.

Table of Contents

Original Manuscript..... 4

Supplementary Files..... 22

    Figures ..... 23

        Figure 1..... 24

        Figure 2..... 25

        Figure 3..... 26

    Multimedia Appendixes ..... 27

        Multimedia Appendix 1..... 28

        Multimedia Appendix 2..... 28

# Unveiling the Mechanisms of Online Health Rumor Dissemination: The Effects of Content Feature and Presentation Cues

You Wu<sup>1</sup>; Xing Zhang<sup>1</sup>

<sup>1</sup>School of Management Wuhan Textile University Wuhan CN

## Corresponding Author:

Xing Zhang  
School of Management  
Wuhan Textile University  
No.1 Yangguang Road,  
Wuhan  
CN

## Abstract

**Background:** The proliferation of online communities has significantly amplified the volume and spread of health rumors. In the absence of authoritative voices, users may unconsciously become disseminators of medically unsound information. Consequently, there is an urgent need to investigate the factors driving the dissemination of online health rumors.

**Objective:** This study investigates how content feature (i.e., emotional valence) and presentation cues (i.e., rumor length and image presence) of online health rumors influence users' perceived credibility and dissemination intention, aiming to uncover the mechanisms driving rumor propagation and offer insights for mitigating health rumors.

**Methods:** This study conducted two experiments. In Experiment 1, a 2x2 between-subjects design was used to examine the effects of emotional valence (dread rumors vs. wish rumors) and image presence (image present vs. image absent). Then, Experiment 2 introduced rumor length as an additional factor to explore the interaction effects between rumor length, image presence and emotional valence.

**Results:** The findings indicate that dread rumors, long rumors and those accompanied by images are perceived as more credible. Furthermore, the three-way interaction between rumor length, image presence, and emotional valence exerts a significant effect on perceived credibility. Additionally, perceived credibility serves as a mediator between emotional valence and dissemination intention, as well as presentation cues and dissemination intention. Moreover, personal involvement strengthens the link between perceived credibility and dissemination intention, while health anxiety weakens it.

**Conclusions:** This study deepens the theoretical understanding of online health rumor dissemination by highlighting the complex interaction effects between content feature (i.e., emotional valence) and presentation cues (i.e., rumor length and image presence) on perceived credibility and dissemination intention. The findings also offer practical guidance for platform managers on how to effectively monitor and intervene in the spread of health rumors.

(JMIR Preprints 21/08/2024:65664)

DOI: <https://doi.org/10.2196/preprints.65664>

## Preprint Settings

1) Would you like to publish your submitted manuscript as preprint?

✓ **Please make my preprint PDF available to anyone at any time (recommended).**

Please make my preprint PDF available only to logged-in users; I understand that my title and abstract will remain visible to all users.

Only make the preprint title and abstract visible.

No, I do not wish to publish my submitted manuscript as a preprint.

2) If accepted for publication in a JMIR journal, would you like the PDF to be visible to the public?

✓ **Yes, please make my accepted manuscript PDF available to anyone at any time (Recommended).**

Yes, but please make my accepted manuscript PDF available only to logged-in users; I understand that the title and abstract will remain visible to all users.

Yes, but only make the title and abstract visible (see Important note, above). I understand that if I later pay to participate in [http](#)

## Original Manuscript

# Unveiling the Mechanisms of Online Health Rumor Dissemination: The Effects of Content Feature and Presentation Cues

## Abstract

**Background:** The proliferation of online communities has significantly amplified the volume and spread of health rumors. In the absence of authoritative voices, users may unconsciously become disseminators of medically unsound information. Consequently, there is an urgent need to investigate the factors driving the dissemination of online health rumors.

**Objective:** This study investigates how content feature (i.e., emotional valence) and presentation cues (i.e., rumor length and image presence) of online health rumors influence users' perceived credibility and dissemination intention, aiming to uncover the mechanisms driving rumor propagation and offer insights for mitigating health rumors.

**Methods:** This study conducted two experiments. In Experiment 1, a 2x2 between-subjects design was used to examine the effects of emotional valence (dread rumors vs. wish rumors) and image presence (image present vs. image absent). Then, Experiment 2 introduced rumor length as an additional factor to explore the interaction effects between rumor length, image presence and emotional valence.

**Results:** The findings indicate that dread rumors, long rumors and those accompanied by images are perceived as more credible. Furthermore, the three-way interaction between rumor length, image presence, and emotional valence exerts a significant effect on perceived credibility. Additionally, perceived credibility serves as a mediator between emotional valence and dissemination intention, as well as presentation cues and dissemination intention. Moreover, personal involvement strengthens the link between perceived credibility and dissemination intention, while health anxiety weakens it.

**Conclusions:** This study deepens the theoretical understanding of online health rumor dissemination by highlighting the complex interaction effects between content feature (i.e., emotional valence) and presentation cues (i.e., rumor length and image presence) on perceived credibility and dissemination intention. The findings also offer practical guidance for platform managers on how to effectively monitor and intervene in the spread of health rumors.

**Keywords:** Online health rumor dissemination; Content feature; Presentation cues; Perceived credibility; Personal involvement; Health anxiety

## Introduction

### Background

The rapid evolution of new media platforms has substantially accelerated the flow of information [1]. However, the ambiguity of information sources and the fragmented nature of content have introduced significant uncertainties in the dissemination of health-related information [2], often provoking fear and anxiety among recipients [3]. Information that is not supported by reliable evidence is typically classified as a rumor, with its authenticity inherently questioned [4,5]. A key characteristic of rumors is the uncertainty surrounding their validity, rendering them unverified assertions [6]. Social media platforms, in particular, are replete with a variety of health-related rumors [7], especially those concerning wellness practices and dietary guidance. The ubiquity of such rumors increasingly challenges users' ability to discern the quality of health information, potentially leading to severe consequences. A crucial factor influencing the propagation of rumors is their perceived credibility—the degree to which information is considered trustworthy and reliable, which is central to its acceptance and

subsequent dissemination by users [8]. While existing research has demonstrated that unchecked rumors can rapidly gain traction and become widespread [9], there remains a scarcity of studies that thoroughly investigate the factors influencing the credibility of health-related rumors and, consequently, their dissemination. This gap in the literature underscores the necessity for further exploration into this crucial issue.

Previous research has predominantly concentrated on rumor dissemination in the context of social crises [10,11]. Although there has been growing scholarly attention to health-related rumors, comprehensive investigations analyses of the factors that drive their spread are still limited. The dissemination of rumors is influenced not only by the inherent feature of the content (i.e., content feature) but also by the manner in which it is presented (i.e., presentation cues). Content features include attributes such as emotional intensity and polarity, which reflect the intrinsic nature of the information [12], while presentation cues pertain to the observable formats in which content is conveyed, such as the length of text, and the inclusion of visual elements like images [13,14]. Although the limited literature on rumor sharing has explored the effects of emotional valence, rumor length, and the presence of images, the findings have been inconsistent. For example, some studies suggest that shorter rumors may be perceived as more credible and therefore more likely to be shared [15], while others argue that longer rumors, due to their detailed nature, may be deemed more trustworthy [16]. Conversely, there is also evidence indicating that rumor length does not significantly affect perceived credibility [17]. These conflicting findings may stem from variations in research contexts or the lack of consideration of boundary conditions.

To address these discrepancies, the present study examines the impact of content feature (i.e., emotional valence: dread or wish) and presentation cues (i.e., rumor length and image presence) on the perceived credibility of health rumors. Consequently, the first research question is to explore how content feature (i.e., emotional valence) and presentation cues (i.e., rumor length and image presence) influence the perceived credibility of health rumors. Additionally, the interaction between presentation cues and content feature has received limited attention in previous studies. It is imperative to explore whether the perceived credibility of rumors is influenced by their content features—namely, whether they evoke dread or wish—and by their presentation cues, such as whether they are long or short, and whether images are included or not. Thus, the second research question seeks to examine how these presentation cues (i.e., rumor length and image presence) might moderate the relationship between content feature (i.e., emotional valence) and perceived credibility.

Moreover, while credibility and dissemination intention are closely related, they are distinct constructs [18]. A belief in the credibility of health rumors does not necessarily translate into a greater likelihood of sharing them [19]. On the other hand, individuals may still choose to spread rumors when they have doubts about their credibility, driven by factors such as community engagement, entertainment, or social interaction [20]. This nuanced relationship suggests that the effect of credibility on dissemination intention may depend on other factors. Consequently, this study examines whether personal involvement and health anxiety act as moderating factors in this relationship. Given that prior research highlights the pivotal roles of personal involvement and health anxiety in rumor dissemination [6,21], the third research question is to investigate how personal involvement and health anxiety moderate the relationship between perceived credibility and dissemination intention.

## Literature Review and Research Hypotheses

### *The Impact of Content Feature on Credibility*

A rumor is a widely circulated statement whose veracity remains unverified at the time of posting [4,22]. Rumors are typically classified into two types based on emotional valence: wish and dread rumors [18]. Wish rumors generate optimism by suggesting potential future benefits, whereas dread rumors evoke fear by exaggerating portrayals of current threats [23]. Research shows that individuals tend to respond more intensely to dread rumors than to wish rumors, a phenomenon attributed to the theory of negativity bias [18]. This theory posits that negative information exerts a stronger influence on human perception and behavior than positive information, which is often taken for granted [24]. As a result, negative rumors tend to be more memorable than positive ones [6]. Within the field of rumor research, dread rumors are typically seen as more newsworthy and attention-grabbing compared to wish rumors [16]. For instance, Chua and Banerjee [18] found that dread rumors are more credible and easier to spread than wish rumors. Additionally, Kimmel and Audrain-Pontevia [6] observed that respondents are more likely to believe and disseminate negative, fear-oriented rumors compared to positive ones. These findings suggest that the dissemination of fearful health rumors is more widespread and appealing, leading to the conclusion that negative information is often more valued than positive information [25]. It is generally easier for individuals to trust and share alarming health rumors than optimistic ones. Compared to rumors that predict positive outcomes, those emphasizing negative consequences are frequently regarded as more credible [26]. Some scholars also argue that people are inclined to spread rumors they perceive as credible, even when the information within those rumors is implausible [27]. Therefore, we propose the following hypotheses:

*H1: Dread rumors are perceived as more credible than wish rumors.*

### *The Impact of Presentation Cues on Credibility*

Different presentation cues of online health rumors, such as length and the presence of images, have been shown to significantly influence people's perceptions [25]. Rumors can be categorized as long or short rumors based on their length [17]. Some studies suggest that human memory constraints lead to shorter rumors being perceived as more credible than longer ones [15]. The length of health information often serves as an indicator of its perceived trustworthiness. As rumors spread, they tend to become shorter and more concise, with details being omitted, making them more coherent and engaging [28]. Knapp [15] argued that any successful rumor is unlikely to exceed the memory capacity of the group spreading it. The effectiveness of a rumor relies heavily on the memory of the disseminator; successful rumors are typically short, simple, and prominent. Long rumors, on the other hand, can overwhelm recipients, making it difficult for them to extract key information efficiently. This often leads to impatience and a higher likelihood of the rumor being disregarded. Thus, we propose the following hypotheses:

*H2a: Short rumors are perceived as more credible than long rumors.*

Furthermore, rumors can be classified based on their presentation forms, specifically whether they include images or are text-only [17]. Sutcliffe [29] suggested that information accompanied by visual aids, such as images, is more likely to capture the interest and attention of recipients. Chua et al. [30] demonstrated that information containing appealing images tends to be perceived as more credible and persuasive, increasing the likelihood of retransmission. Rumors with images are generally more popular and receive more views compared to text-only rumors [31]. The presence of images appears to enhance users' belief in the information, while text-only rumors are often regarded as less credible [32]. Images are perceived as reliable indicators of authenticity, as users see them as difficult to manipulate [31]. Consequently,



rumors accompanied by images are considered more convincing than those presented in plain text [17]. Thus, we propose the following hypotheses:

*H2b: Rumors with images are perceived as more credible than those without images.*

### **The Effects of Presentation Cues on Content Feature**

The potential ramifications of being misled by dread rumors are substantial, prompting individuals to assess the credibility of such information with greater scrutiny. Users often interpret the richness of information—evidenced by its length and the inclusion of visual elements—as indicative of its credibility [33]. Research suggests that dread rumors with detailed text and images tend to be perceived as more credible. The cognitive effort required to process long rumors with images exceeds that needed for shorter, image-free rumors [17]. In contrast, when information is presented in a simpler format, such as brief text without images, users may exhibit a greater propensity to trust wish rumors [17]. Thus, the presence of images and the length of the rumor tend to bolster trust in dread rumors, while exerting a less impact on wish rumors. Previous research also indicates that users are particularly receptive to rumors featuring images that portray negative outcomes [31]. Lengthy dread rumors with images, as well as short wish rumors without images, are deemed the most credible [17]. Consequently, we propose the following hypotheses:

*H3a: Among long rumors, dread rumors are perceived as more credible, whereas among short rumors, wish rumors are perceived as more credible.*

*H3b: Among rumors with images, dread rumors are perceived as more credible, whereas among rumors without images, wish rumors are perceived as more credible.*

### **The Impact of Credibility on Dissemination Intention**

For recipients of information, evaluating its credibility is a critical preliminary step before deciding whether to share it with others [6]. The perceived credibility of information plays a pivotal role in determining its dissemination effectiveness [34]. The likelihood that a rumor will be communicated further increases markedly when it is perceived as credible rather than implausible [8]. Credibility, along with persuasive elements, are essential determinants in the decision to share information, particularly in the realm of health-related content [35]. Users are more likely to share information on social media if they consider it trustworthy. Sharing dread rumors may help individuals alleviate the feeling of fear and anxiety, whereas disseminating wish rumors might reinforce their hope for positive outcomes [25]. Conversely, individuals are generally reluctant to share rumors that lack credibility, as such actions might result in unnecessary anxiety from dread rumors or disappointment from wish rumors. Thus, we propose the following hypotheses:

*H4: The perceived credibility of rumors positively influences users' dissemination intention.*

### **The Moderation Effects of Personal Involvement and Health Anxiety**

Personal involvement refers to an individual's perception of the relevance and significance of rumors [36], highlighting how personally meaningful these rumors are to the individuals [37]. The perceived importance of a rumor is a crucial factor in determining its likelihood of being shared [38]. Earlier research has demonstrated that personal involvement is a primary driver of rumor dissemination [39,40] and constitutes a fundamental element in the study of rumors [18]. Individuals are less likely to share rumors they consider irrelevant or unimportant. Liu et al. [37] found that personal involvement in microblog rumors is predictive of the likelihood that those rumors will be forwarded. In the context of health information, which often relates to issues like disease recovery or survival, the perceived relevance and significance of the information have been shown to significantly promote its dissemination [28]. Consequently,



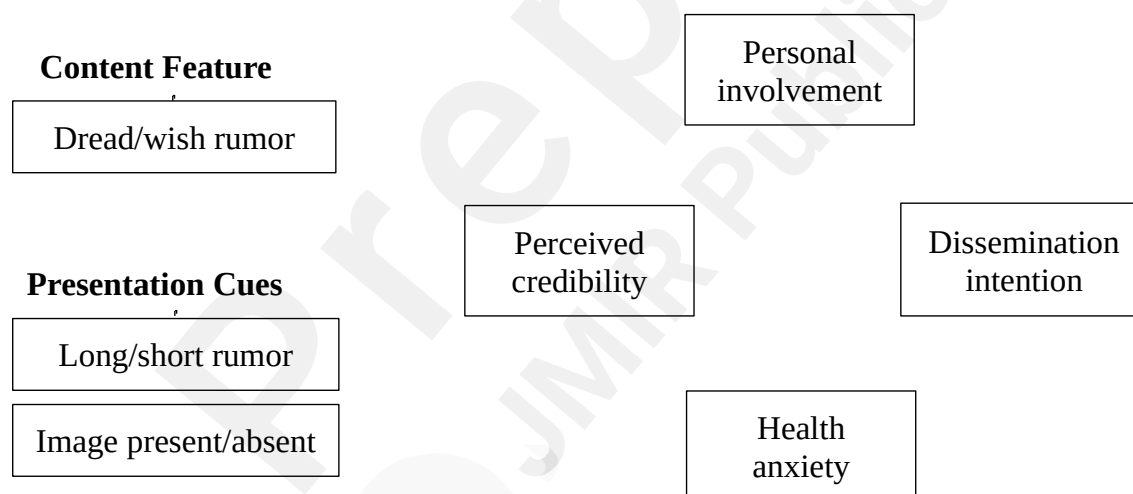
when users encounter health rumors of equal credibility, those with greater personal relevance or significance are more likely to be shared, as users aim to validate the authenticity of the information. Thus, we propose the following hypotheses:

*H5a: Personal involvement positively moderates the relationship between perceived credibility and dissemination intention.*

Moreover, individual psychological states, such as health anxiety, play a significant role in the spread of health-related rumors. Health anxiety is characterized by an excessive concern about one's health, often disproportionate to the actual medical evidence [37]. This heightened level of anxiety can drive individuals to more actively share rumors, as they seek to alleviate their fear and make sense of ambiguous or uncertain information [41]. According to Festinger's theory of cognitive dissonance, encountering conflicting or unclear information generates psychological discomfort [42]. To mitigate this discomfort, individuals might resort to disseminating rumors as a means of resolving their cognitive dissonance and managing their anxiety [28]. Therefore, when users are presented with health rumors of comparable credibility, those with higher levels of health anxiety are more inclined to share these rumors as a way to address their negative emotions. Thus, we propose the following hypotheses:

*H5b: Health anxiety positively moderates the relationship between perceived credibility and dissemination intention.*

Based on the analysis presented above, we have developed the research model, as illustrated in Figure 1.



**Figure 1.** Research model.

## Methods

### Experiment 1

#### *Experimental stimuli*

The objective of Experiment 1 is to examine how emotional valence and image presence influence the perceived credibility of rumors. This experiment employed a 2 (emotional valence: dread rumors vs. wish rumors)  $\times$  2 (image presence: image present vs. image absent) between-subjects design. The experimental materials were based on cancer-related rumors. To construct the stimuli, we initially gathered health-related information using the keyword

"cancer" from two reputable foreign rumor verification websites—Snopes.com and TruthOrFiction.com—as well as China's anti-rumor platform "liuyanbaike.com." From these sources, we selected the top 50 instances of health information, resulting in a total of 150 English rumors. These were then translated into Chinese by three research assistants, leading to a compiled dataset of 150 translated rumors. Then, the translated rumors were randomized and independently coded by three research assistants to classify them as either dread or wish rumors. Only those that received unanimous coding decisions and included images were retained as stimuli. This process yielded 11 dread rumors and 12 wish rumors. From these, we selected four representative dread rumors and four wish rumors for the experiment.

For Experiment 2, we further categorized the selected rumors into three length variations—short, moderate, and long—to investigate the impact of rumor length. Based on established criteria [17,35], short rumors were defined as 25-70 words, long rumors as 110-145 words, and moderate rumors as 80-100 words. Each variant was accompanied by an appropriate image. To maintain consistency across conditions, all eight types of rumors in Experiment 1 were set to moderate length. We simulated a webpage design similar to "Baidu Tieba" (see Appendix I) and created four health rumors for each length condition.

### Measurement items

The measurement of all latent constructs utilized five-point Likert scales, ranging from "strongly disagree" (1) to "strongly agree" (5). Table 1 presents the final measurement items for the four constructs.

**Table 1.** Variable Measurement Items.

Constructs	Measurement items
Perceived credibility [43]	1. I thought the message that I received were believable; 2. I thought the message that I received contained accurate information; 3. I thought that the message that I received were based on truth; 4. I thought that the message that I received contained enough information; 5. I thought that the message that I received provided objective information; 6. I believed the message that I received.
Personal involvement [18]	1. The message is important to me; 2. The message is related to outcomes that are relevant to me.
Health anxiety [44]	1. I do not worry about my health; 2. I notice aches (pains) less than most other people (of my age); 3. As a rule, I am not aware of bodily sensations or changes; 4. Resisting thoughts of illness is never a problem; 5. As a rule, I am not afraid that I have a serious illness; 6. I do not have images (mental pictures) of myself being ill; 7. I do not have any difficulty taking my mind off thoughts about my health;

	8. I am lastingly relieved if my doctor tells me there is nothing wrong;
	9. If I hear about an illness, I never think I have it myself;
	10. If I have a bodily sensation or change, I rarely wonder what it means;
	11. I usually feel at very low risk for developing a serious illness;
	12. I never think I have a serious illness;
	13. If I notice an unexplained bodily sensation, I don't find it difficult to think about other things;
	14. My family/friends would say I do not worry enough about my health;
	15. If I had a serious illness, I would still be able to enjoy things in my life quite a lot;
	16. If I developed a serious illness there is a good chance that modern medicine would be able to cure me;
	17. A serious illness would ruin some aspects of my life;
	18. If I had a serious illness, I would not feel that I had lost my dignity.
Dissemination intention [18]	1. I will share the message with others; 2. I intend to share the message with others.

### Manipulation check

A pretest was conducted with 40 subjects, who were randomly assigned to one of four conditions, each consisting of 10 participants. Each participant evaluated the "emotional valence" of four health rumors using a five-point Likert scale, where "1" indicated a strong preference for "wish" and "5" indicated a strong preference for "dread." The results from an independent samples t-test revealed that the average score for dread rumors was significantly higher than for wish rumors ( $M_{\text{dread rumors}} = 4.15$ ,  $M_{\text{wish rumors}} = 2.00$ ,  $t = -8.826$ ,  $p < .001$ ), confirming the effectiveness of the emotional valence manipulation.

### Experiment procedure

The measurement items for perceived credibility, personal involvement, health anxiety, and dissemination intention demonstrated good reliability and validity. Therefore, these measurement items were deemed suitable for use in the formal experiment. The formal experiment was conducted on SoJump, a leading online survey system in China. Links to the survey were distributed across various social media platforms to reach a broad participant pool. The survey targeted college students, faculty members, and residents from the surrounding community. Participants were randomly and evenly assigned to one of four experimental conditions. To avoid bias, the questionnaires did not explicitly indicate that the items were "rumors" or "unverified information". Each questionnaire contained four dread or wish rumors.

Participants first provided demographic information, including gender, age, and educational background. They then reviewed four health rumors and completed the related measurement

items. Participants were also asked whether they had previously encountered the health information presented. To ensure the validity of the data, we excluded responses from individuals who completed the survey in under four minutes (the minimum duration established in the pretest), as well as those who answered all questions identically. We also removed responses from participants who reported prior exposure to the health information. Ultimately, we collected 25 valid responses per condition, resulting in a total of 100 valid questionnaires. Only after completing the survey were participants informed that the eight health rumors used in the experiment were unverified online rumors, thereby clarifying any potential misunderstandings.

## Experiment 2

### *Experimental stimuli*

Building on the findings from Experiment 1, Experiment 2 introduced rumor length as a variable to examine whether the interaction between rumor length and image presence influences the relationship between emotional valence and credibility, while also validating the findings from Experiment 1. In experiment 2, a 2 (emotional valence: dread rumors vs. wish rumors)  $\times$  2 (rumor length: long rumors vs. short rumors)  $\times$  2 (image presence: image present vs. image absent) between-subjects design was employed, resulting in eight different conditions. Participants were randomly assigned to one of these eight conditions. Rumor length was operationalized in two forms: long (110-145 words) and short (25-70 words) [17,35].

### *Experimental procedure and manipulation check*

The experimental procedure in Experiment 2 followed the same protocol as in Experiment 1. To enhance the representativeness of the sample, Experiment 2 expanded its participant pool to include not only college students, faculty members, and community residents but also employees from various enterprises. Participants were randomly assigned to one of the eight conditions, resulting in a total of 120 valid responses. An independent samples t-test confirmed that the perceived length of long rumors ( $M = 4.30$ ) was significantly greater than that of short rumors ( $M = 1.90$ ,  $t = -11.027$ ,  $p < .001$ ), verifying the success of the rumor length manipulation.

## Results

### Results of Experiment 1

Data analysis was conducted using SPSS 24.0. The results of ANOVA showed no significant differences in gender ( $F = 1.024$ ,  $p = .39$ ), age ( $F = 1.286$ ,  $p = .28$ ) or educational attainment ( $F = 0.453$ ,  $p = .72$ ) across the four experimental conditions, indicating successful randomization.

Credibility was assessed using six items, while personal involvement and dissemination intention were each measured with two items. The results indicate that for each rumor, the Cronbach's  $\alpha$  values of credibility, personal involvement and dissemination intention are greater than 0.8, showing high levels of reliability.

Consequently, we average the scores of measurement items of these three constructs, after which the credibility (Cronbach's  $\alpha = 0.885$ ), personal involvement (Cronbach's  $\alpha = 0.847$ ) and dissemination intention (Cronbach's  $\alpha = 0.911$ ) of the four dread or wish rumors indicate high

perceived credibility and are suitable for the average value method. The eighteen items of health anxiety also demonstrated excellent reliability (Cronbach's  $\alpha = 0.948$ ) and were averaged accordingly.

### ***Interaction between emotional valence and image presence***

In a  $2 \times 2$  ANOVA, emotional valence and image presence were treated as independent variables, while perceived credibility served as the dependent variable. The results revealed a significant main effect of emotional valence ( $M_{\text{dread rumors}} = 3.752$ ,  $M_{\text{wish rumors}} = 3.377$ ,  $F = 5.776$ ,  $p = .02$ ), indicating that dread health rumors are perceived as more credible than wish health rumors. Similarly, a significant main effect was observed for image presence ( $M_{\text{image present}} = 3.805$ ,  $M_{\text{image absent}} = 3.323$ ,  $F = 9.529$ ,  $p = .003$ ), suggesting that health rumors with images are deemed more credible. However, the interaction effect between emotional valence and image presence was not significant ( $F = 1.616$ ,  $p = .21$ ).

### ***The influence of perceived credibility on dissemination intention***

A regression analysis was conducted to examine the relationship between credibility and dissemination intention. The results indicate that perceived credibility has a positive effect on dissemination intention ( $\beta = 0.745$ ,  $t = 7.143$ ,  $p < .001$ ).

### ***The moderation effects of personal involvement and health anxiety***

To test the moderation effect of personal involvement and health anxiety on this relationship, both variables were mean-centered. The analysis shows that the interaction between personal involvement and perceived credibility significantly influences dissemination intention ( $\beta = 0.160$ ,  $t = 3.083$ ,  $p = .003$ ), suggesting that personal involvement positively moderates the relationship between perceived credibility and dissemination intention. Additionally, the interaction between health anxiety and perceived credibility also significantly affects dissemination intention ( $\beta = 0.310$ ,  $t = 2.632$ ,  $p = .01$ ).

### ***The mediation effect of perceived credibility***

This study employs the bootstrap mediation effect test method to evaluate the mediating role of perceived credibility. The results reveal that when dissemination intention is the dependent variable and emotional valence is the independent variable, the mediation effect value of perceived credibility is  $-0.134$ , with a 95% confidence interval (CI) of  $[-0.277, -0.022]$ . As the CI excludes 0, this indicates that perceived credibility mediates the relationship between emotional valence and dissemination intention. Moreover, when image presence is the independent variable, the mediation effect value of perceived credibility is  $0.170$ , with a 95% CI of  $[0.058, 0.300]$ . As the CI excludes 0, it suggests that perceived credibility plays a mediating role between image presence and dissemination intention.

## **Results of Experiment 2**

The ANOVA results show no significant differences in gender ( $F = 0.410$ ,  $p = .89$ ), age ( $F = 0.200$ ,  $p = .99$ ), or educational attainment ( $F = 0.330$ ,  $p = .94$ ) across eight groups, suggesting successful randomization.

Then, we applied the same measurement validation procedure as in Experiment 1. The results indicate that the Cronbach's  $\alpha$  values of credibility, personal involvement, dissemination intention, and health anxiety all exceed 0.8, demonstrating high reliability.

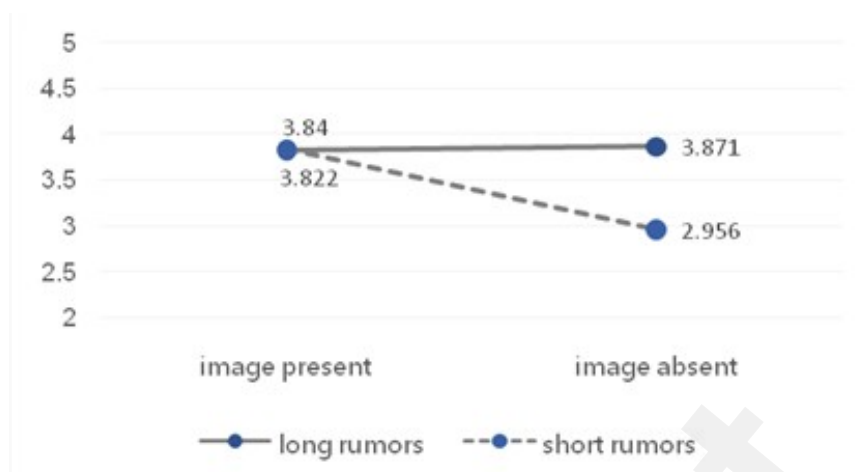
### *Interaction between content feature and presentation cues*

A  $2 \times 2$  ANOVA was conducted, revealing that dread rumors are perceived as more credible than wish rumors ( $M_{\text{dread rumors}} = 3.781$ ,  $M_{\text{wish rumors}} = 3.463$ ,  $F = 4.945$ ,  $p = .03$ ), consistent with the findings of Experiment 1, thereby supporting H1. Additionally, long rumors were found to be more credible than short rumors ( $M_{\text{long rumors}} = 3.847$ ,  $M_{\text{short rumors}} = 3.398$ ,  $F = 9.837$ ,  $p = .002$ ). Therefore, H2a is not supported. One possible explanation is that in the context of health rumors, shorter information may undermine credibility [16]. The more detailed the health information, the greater its perceived authenticity. Thus, long health rumors are considered more credible than short ones. Furthermore, the interaction effect between emotional valence and rumor length on credibility was not significant ( $F = 1.497$ ,  $p = .22$ ), leading to a lack of support for H3a. A plausible explanation is that when the emotional valence of health rumors is established, its influence on perceived credibility may overshadow users' consideration of the information's presentation cues. Regardless of the rumor's length, users may prioritize the emotional tone conveyed by the content itself.

Next, a  $2 \times 2$  ANOVA was performed, confirming again that dread rumors are perceived as more credible than wish rumors ( $M_{\text{dread rumors}} = 3.781$ ,  $M_{\text{wish rumors}} = 3.463$ ,  $F = 4.852$ ,  $p = .03$ ). Health rumors with images were also found to significantly enhance credibility ( $M_{\text{image present}} = 3.831$ ,  $M_{\text{image absent}} = 3.413$ ,  $F = 8.382$ ,  $p = .005$ ), which aligns with the results of Experiment 1, thereby supporting H2b. However, similar to Experiment 1, the interaction effect between emotional valence and image presence on credibility was not significant ( $F = 0.563$ ,  $p = .46$ ), so H3b is not supported. A plausible explanation is that the proliferation of advanced image processing software enables the creation of highly realistic fictional images. This technological advancement may blur the line between virtual and real, making it easy for users to generate virtual images that appear authentic. Consequently, compared to the emotionally charged dread and wish rumors, the impact of images on credibility does not appear particularly pronounced.

### *Interaction between rumor length and image presence*

The results indicate a significant interaction effect between rumor length and image presence on credibility ( $F = 11.959$ ,  $p < .001$ ). To explore this further, the sample was divided into two groups: image-present and image-absent conditions. In the image-present group, there was no significant difference in perceived credibility between long and short rumors ( $M_{\text{long rumors}} = 3.822$ ,  $M_{\text{short rumors}} = 3.840$ ,  $t = 0.106$ ,  $p = .92$ ). However, in the image-absent group, long rumors were significantly more credible than short ones ( $M_{\text{long rumors}} = 3.871$ ,  $M_{\text{short rumors}} = 2.956$ ,  $t = -4.381$ ,  $p < .001$ ). The interaction effect between rumor length and image presence on credibility is illustrated in Figure 2.



**Figure 2.** The effect of rumor length and image presence on perceived credibility

### *The three-way interaction effect of emotional valence, rumor length and image presence*

The three-way interaction effect of emotional valence, rumor length and image presence was significant ( $F = 4.908, p = .03$ ). Further subgroup analysis revealed that within the dread rumor group, the interaction effect between rumor length and image presence was not significant ( $F = 0.743, p = .39$ ). Conversely, in the wish rumor group, this interaction effect was significant ( $F = 23.541, p < .001$ ). Specifically, in the group without images, long rumors were more credible than short rumors ( $M_{\text{long rumors}} = 3.889, M_{\text{short rumors}} = 2.511, t = -6.442, p < .001$ ). However, in the group with images, there was no significant difference in credibility between long and short rumors ( $M_{\text{long rumors}} = 3.661, M_{\text{short rumors}} = 3.792, t = 0.579, p = .57$ ), as shown in Figure 3.



**Figure 3.** Interaction effect of rumor length and image presence on perceived credibility of wish rumors

### *The influence of perceived credibility on dissemination intention*

The regression analysis results indicated that perceived credibility significantly affected dissemination intention ( $\beta = 0.723, t = 6.992, p < .001$ ), thus supporting H4.

### *The moderation effects of personal involvement and health anxiety*

Personal involvement positively moderated the relationship between perceived credibility and



dissemination intention ( $\beta = 0.141, t = 2.516, p = .01$ ), confirming support for H5a. Furthermore, the interaction between health anxiety and credibility significantly impacted dissemination intention ( $\beta = 0.245, t = 2.110, p = .04$ ), which was consistent with Experiment 1. Given that the measurement items for health anxiety are reverse-scored on a scale from 1 to 5, an increase in score corresponds to a decrease in health anxiety. Thus, the experimental results demonstrate that health anxiety weakens the relationship between perceived credibility and dissemination intention. Therefore, H5b was not supported. A possible explanation for this finding is that anxious users hope to alleviate their anxiety and uneasiness after forwarding health information. However, studies have shown that users' anxiety often increases rather than diminishes after engaging with health-related content [45,46]. Consequently, users with health anxiety might develop an avoidance behavior towards online health information, choosing not to share it to prevent further exacerbation of their anxiety.

### *The mediation effect of perceived credibility*

Experiment 2 employs the bootstrap mediation effect test method to evaluate the mediating role of perceived credibility. Results demonstrated that when dissemination intention served as the dependent variable and emotional valence as the independent variable, perceived credibility had a significant mediation effect of -0.105, with a 95% CI of [-0.221, -0.013], consistent with the findings from Experiment 1. Additionally, when rumor length was the independent variable, the mediation effect of perceived credibility was 0.147, with a 95% CI of [0.058, 0.251], suggesting that perceived credibility mediates the relationship between rumor length and dissemination intention. Furthermore, when image presence was the independent variable, perceived credibility demonstrated a mediation effect of 0.138, with a 95% CI of [0.047, 0.252], reaffirming its mediating role, in line with Experiment 1.

## **Discussion**

### **Principal results**

This article thoroughly examines the influence of content features and presentation cues of health rumors, along with moderating variables of personal involvement and health anxiety, to explore the mechanisms affecting dissemination intention. Several key findings emerge from this study.

First, dread rumors are perceived as more credible than wish rumors; longer health rumors are seen as more credible than shorter ones; and health rumors accompanied by images are considered more credible than those without images.

Second, image presence significantly impacts the relationship between rumor length and credibility. Specifically, in the group with images, there is no significant difference in credibility between long and short rumors. However, in the group without images, long rumors are perceived as more credible than short ones. Additionally, the three-way interaction effect of emotional valence, rumor length and image presence was also significant.

Third, perceived credibility mediates the relationship between emotional valence and dissemination intention. Lastly, personal involvement positively moderates the relationship between perceived credibility and dissemination intention, while health anxiety weakens this relationship.

## Theoretical Implications

This study makes several important theoretical contributions to the field of rumor research. Firstly, it clarifies the role of presentation cues in influencing the relationship between content feature and user perception. Specifically, it demonstrates that the relationship between emotional valence and perceived credibility is significantly moderated by the combination of rumor length and image presence. This insight advances our understanding of how content emotional valence and visual presentation cues interact in the propagation of health-related rumors.

Secondly, this study uncovers that perceived credibility serves as a mediator in the relationship between emotional valence and dissemination intention, as well as presentation cues (i.e., rumor length and image presence) and dissemination intention. By elucidating the central role of credibility perception in shaping how content feature and presentation cues converge to influence an individual's decision to further disseminate a given rumor, this study advances a more nuanced theoretical model of the psychological processes underlying the viral spread of digital health rumors.

Third, this study addresses a critical gap by exploring how personal involvement and health anxiety moderate the relationship between perceived credibility and dissemination intention. The results reveal that higher personal involvement strengthens the relationship between perceived credibility and dissemination intention, whereas greater health anxiety weakens this relationship. These findings offer new insights into the differential effects of personal involvement and health anxiety, providing valuable perspectives on how these moderating factors influence the relationship between perceived credibility and dissemination intention in the context of health-related rumors.

## Practical Implications

This study offers important guidance for social media users and platform administrators on managing the spread of health-related rumors. Firstly, the findings highlight the need for users to be particularly cautious with dread rumors, long rumors, and rumors with images. Platforms should implement rigorous verification procedures to evaluate the accuracy and authenticity of such content. By clarifying the truth through mass media and other communication channels, it can help curtail the spread of misinformation and diminish its impact.

Secondly, the study highlights that long health rumors with images are perceived as more credible. Consequently, platform administrators should prioritize monitoring and scrutinizing this type of content. The development of advanced automated systems for detecting and reviewing lengthy posts and those featuring images can facilitate prompt and effective intervention. Furthermore, educating users with clear, actionable guidelines on how to evaluate the credibility of information—especially concerning its length and visual content—can enhance their critical assessment skills.

Thirdly, when health information is related to personal health issues, users should seek guidance from medical professionals rather than relying on unverified online sources. Platforms could enhance their services by incorporating features that provide seamless access to resources and professional consultations, thereby reducing the likelihood of misinformation.

proliferation.

## Limitations

This study has several limitations that warrant consideration. Firstly, the focus was restricted to two specific presentation cues: rumor length and image presence. Future research could benefit from examining a broader range of presentation cues, including linguistic style and the inclusion of web links. Secondly, while the experimental approach provided valuable insights, it may lack ecological validity and could be subject to participant bias. To address these concerns, future research could incorporate more naturalistic settings and explore alternative methodological approaches. Moreover, employing meta-analytic techniques could enhance the robustness of the findings by systematically analyzing the correlations between key variables and reducing subjective biases.

## Acknowledgements

This work was supported by the National Natural Science Foundation of China [grant numbers:71974152]. We deeply appreciate the Research center of Enterprise Decision Support, a key research institute of humanities and social sciences in universities of Hubei province.

## Conflicts of Interest

None declared.

## Abbreviations

ANOVA: Analysis of variance

CI: Confidence Interval

## References

1. Shin J, Jian L, Driscoll K, et al. The diffusion of misinformation on social media: Temporal pattern, message, and source. *Comput. Hum. Behav.* 2018;83: 278-287.
2. Zhao R, Lu X, Yang J, et al. Understanding the Impact of Communicating Uncertainty About COVID-19 in the News: Randomized Between-Subjects Factorial Experiment. *J. Medical Internet Res.* 2024;26: e51910.
3. Ahmed S, Rasul M E. Social media news use and COVID-19 misinformation engagement: survey study. *J. Medical Internet Res.* 2022;24(9): e38944.
4. Wu Y, Shen XL, Sun Y. Establishing the typology and the underlying structure of rumor-combating behaviors: a multidimensional scaling approach. *Inf. Technol. People.* 2023;36(7): 2661-2686.
5. Xiong S, Zuo L, Chen Q, et al. A Serious Game ("Fight With Virus") for Preventing COVID-19 Health Rumors: Development and Experimental Study[J]. *JMIR Serious Games*, 2024, 12(1): e45546.
6. Kimmel AJ, Audrain-Pontevia AF. Analysis of commercial rumors from the perspective of marketing managers: Rumor prevalence, effects, and control tactics. *J. Mark. Commun.* 2010;16(4): 239-253.

7. Suarez-Lledo V, Alvarez-Galvez J. Assessing the role of social bots during the COVID-19 pandemic: Infodemic, disagreement, and criticism. *J. Medical Internet Res.* 2022;24(8): e36085.
8. Lin TC, Huang SL, Liao WX. Examining the antecedents of everyday rumor retransmission. *Inf. Technol. People.* 2022;35(4): 1326-1345.
9. Shen XL, Wu Y. From whispers to warriors: Public atmosphere's role in mobilizing social media users against rumors. *Telemat. Inform.* 2024;90: 102133.
10. Guo F, Zhou A, Zhang X, et al. Fighting rumors to fight COVID-19: Investigating rumor belief and sharing on social media during the pandemic. *Comput. Hum. Behav.* 2023;139: 107521.
11. King KK, Wang B. Diffusion of real versus misinformation during a crisis event: A big data-driven approach. *Int J Inf Manage.* 2023;71: 102390.
12. Schreiner M, Fischer T, Riedl R. Impact of content characteristics and emotion on behavioral engagement in social media: literature review and research agenda. *Electron. Commer. Res.* 2021;21: 329-345.
13. Schüler A, Scheiter K, Gerjets P. Is spoken text always better? Investigating the modality and redundancy effect with longer text presentation. *Comput. Hum. Behav.* 2013;29(4): 1590-1601.
14. Thees M, Kapp S, Strzys MP, et al. Effects of augmented reality on learning and cognitive load in university physics laboratory courses. *Comput. Hum. Behav.* 2020;108: 106316.
15. Knapp RH. A psychology of rumor. *Public Opin Q.* 1944;8(1): 22-37.
16. DiFonzo N, Robinson NM, Suls JM, et al. Rumors about cancer: Content, sources, coping, transmission, and belief. *J Health Commun.* 2012;17(9): 1099-1115.
17. Chua AYK, Banerjee S. Analyzing users' trust for online health rumors//Digital Libraries: Providing Quality Information: 17th International Conference on Asia-Pacific Digital Libraries, ICADL 2015, Seoul, Korea, December 9-12, 2015. Proceedings 16. Springer International Publishing, 2015;33-38.
18. Chua AYK, Banerjee S. Intentions to trust and share online health rumors: An experiment with medical professionals. *Comput. Hum. Behav.* 2018;87: 1-9.
19. Seifert HA, Malik RE, Bhattacharya M, et al. Enabling social listening for cardiac safety monitoring: Proceedings from a drug information association-cardiac safety research consortium cosponsored think tank. *Am. Heart J.* 2017;194: 107-115.
20. Oh S. The characteristics and motivations of health answerers for sharing information, knowledge, and experiences in online environments. *JASIST.* 2012;63(3): 543-557.
21. Oh HJ, Lee H. When do people verify and share health rumors on social media? The effects of message importance, health anxiety, and health literacy. *J Health Commun.* 2019;24(11): 837-847.
22. Zhang Y, Su Y, Weigang L, et al. Rumor and authoritative information propagation model considering super spreading in complex social networks. *Physica A.* 2018;506: 395-411.
23. Meng L, Li T, Huang X, et al. Lift the veil of rumors: The impact of the characteristics of information sources on the effectiveness of rumors spreading. *Internet Res.* 2022;32(1): 90-119.
24. Robertson C E, Pröllochs N, Schwarzenegger K, et al. Negativity drives online news consumption. *Nat. Hum. Behav.* 2023;7(5): 812-822.
25. Qi J, Banerjee S, Chua A. Analyzing medical personnel's perceptions of online health rumors//Proceedings of the International MultiConference of Engineers and Computer Scientists. 2017;1.
26. Renard JB. Denying rumours. *Diogenes.* 2007;54(1): 43-58.

27. Rosnow RL. Rumor and gossip in interpersonal interaction and beyond: A social exchange perspective. 2001, In R. M. Kowalski (Ed.), *Behaving badly: Aversive behaviors in interpersonal relationships*, American Psychological Association, pp. 203–232.
28. Guerin B, Miyazaki Y. Analyzing rumors, gossip, and urban legends through their conversational properties. *Psychol. Rec.* 2006;56(1): 23-33.
29. Sutcliffe A. Assessing the reliability of heuristic evaluation for Web site attractiveness and usability//*Proceedings of the 35th Annual Hawaii International Conference on System Sciences*. IEEE, 2002;1838-1847.
30. Chua AYK, Tee CY, Pang A, et al. The retransmission of rumor-related tweets: Characteristics of source and message//*Proceedings of the 7th 2016 international conference on social media & society*. 2016b;1-10.
31. Lambert A. *Intimacy and friendship on Facebook*. Springer, 2013.
32. Lee J, Hameleers M, Shin SY. The emotional effects of multimodal disinformation: How multimodality, issue relevance, and anxiety affect misperceptions about the flu vaccine. *New Media Soc.* 2023; 14614448231153959.
33. Donath J. Signals in social supernets. *J Comput-Mediat Comm.* 2007; 13(1): 231-251.
34. Tseng HT. Shaping path of trust: the role of information credibility, social support, information sharing and perceived privacy risk in social commerce. *Inf. Technol. People.* 2023;36(2): 683-700.
35. Chua AYK, Banerjee S, Guan AH, et al. Intention to trust and share health-related online rumors: Studying the role of risk propensity//*2016 SAI computing conference (SAI)*. IEEE, 2016a;1136-1139.
36. Shen XL, Qian Q, Wu Y. Understanding the Motivations Behind Knowingly Spreading Rumors on Social Media Using Q Methodology//*International Conference on Information*. Cham: Springer Nature Switzerland, 2024;157-174.
37. Liu F, Burton-Jones A, Xu D. Rumors on social media in disasters: Extending transmission to retransmission. In *PACIS*. 2014;49-65.
38. Liu WJ, Yao ZT, Ding YH, et al. The influence of involvement and emotional valence on accuracy judgments and sharing intention of fake news. *Cogn Psychol.* 2023, 35(8): 839-855.
39. Allport GW, Postman L. *The psychology of rumor*. Henry Holt, 1947.
40. Rosnow RL. Inside rumor: A personal journey. *Am Psychol.* 1991;46(5): 484–496.
41. Zheng H, Wang X, Luo C, et al. Skip the checking step: Investigating the pathways from online health information scanning to unverified health information sharing. *Comput. Hum. Behav.* 2024;158: 108279.
42. Thamrin MH, Bafadhal OM, Santoso AD. What promotes cognitive dissonance among anti-vaccine members in Indonesia. *Int J Public Health.* 2023;12(1): 203-214.
43. Lee J, Choi Y. Informed public against false rumor in the social media era: Focusing on social media dependency. *Telemat. Inform.* 2018;35(5): 1071-1081.
44. Salkovskis PM, Rimes KA, Warwick HMC, et al. The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. *Psychol Med.* 2002;32(5): 843-853.
45. Baumgartner SE, Hartmann T. The role of health anxiety in online health information search. *Cyberpsychol Behav Soc Netw.* 2011;14(10): 613-618.
46. Singh K, Brown RJ. Health-related Internet habits and health anxiety in university students. *Anxiety Stress Coping.* 2014;27(5): 542-554.

## Appendix

### An example for dread /long/image present rumor:



### An example for wish/short/image present rumor:

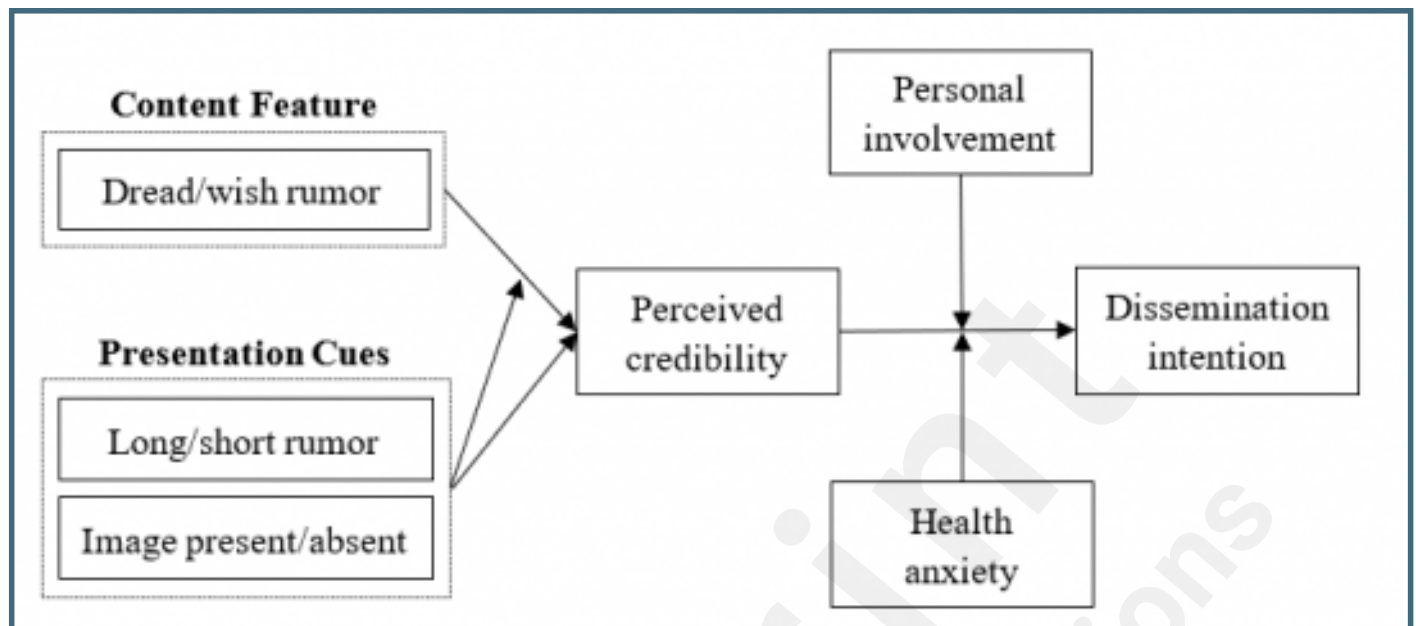


## Supplementary Files

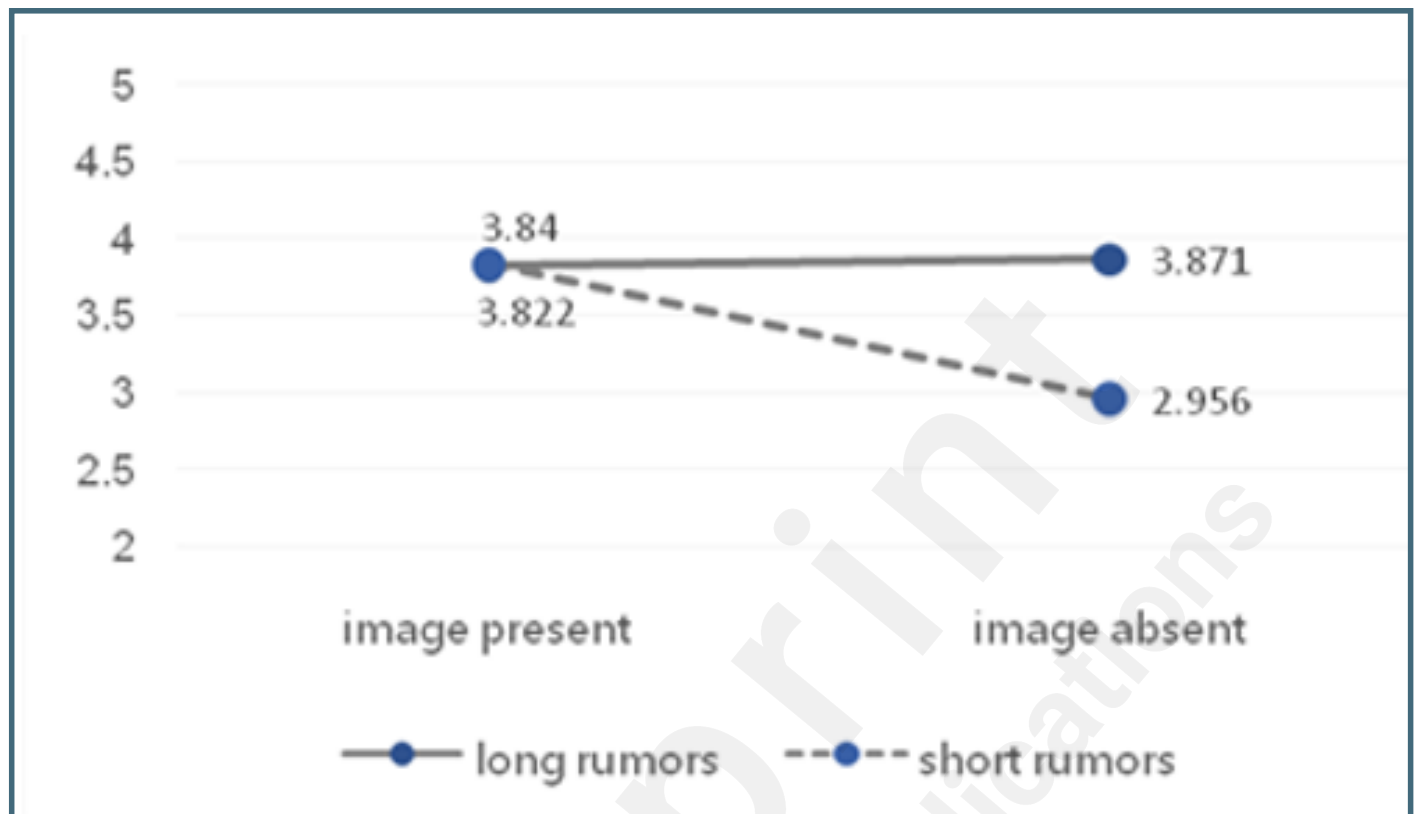


## Figures

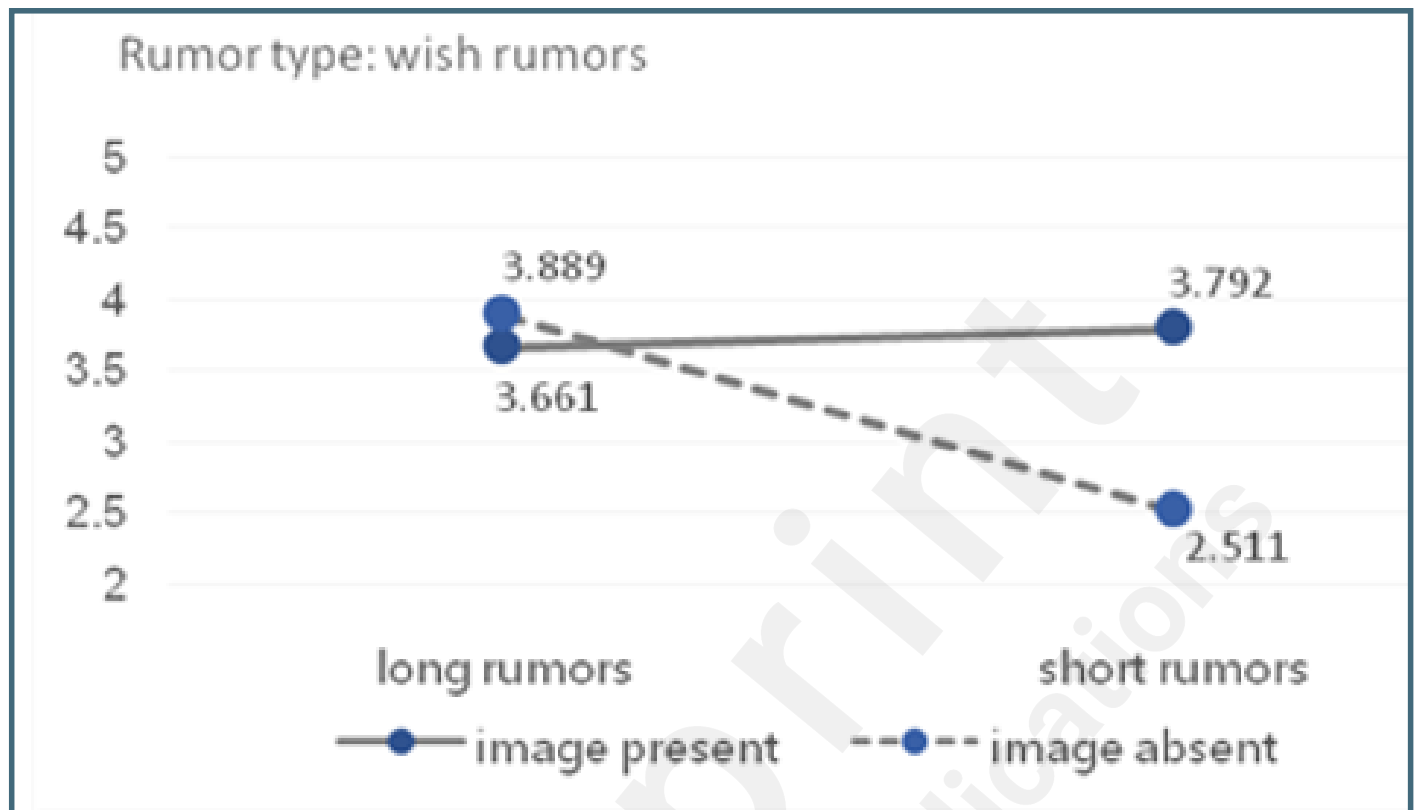
Research model.



The effect of rumor length and image presence on perceived credibility.



Interaction effect of rumor length and image presence on perceived credibility of wish rumors.



## **Multimedia Appendixes**

An example for dread /long/image present rumor.

URL: <http://asset.jmir.pub/assets/78026fd259333a248f9f98309888af59.png>

An example for wish/short/image present rumor.

URL: <http://asset.jmir.pub/assets/a2af17e2af3ab08feeb12b592b122705.png>

