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ABSTRACT

Emotional expressions have been widely used in online news. Existing research on the perception of online news has primarily focused on the effect of contextual cues on readers' reasoning and deliberation behavior; the role of discrete emotions such as anger and sadness, however, has been overlooked. This paper addresses this research gap by investigating the influence of angry and sad expressions in online news on readers' perception of the news. Drawing on the emotions as social information (EASI) theory and the appraisal-tendency framework (ATF), we find that expressions of anger in online news decrease its believability. However, sad expressions do not trigger the same effect. A further test reveals that the effect of angry expressions can be explained by the readers' perception of the author's cognitive effort: readers perceive that expressions of anger in the headlines denote a lack of cognitive effort of the author in writing the news, which subsequently lowers the believability of the news. We also show that news believability has downstream implications and can impact various social media behaviors including reading, liking, commenting, and sharing. This research extends current knowledge of the cognitive appraisals and interpersonal effects of discrete emotions (i.e., anger, sadness) on online news. The results also offer practical implications for social media platforms, news aggregators, and regulators that need to manage digital content and control the spread of fake news.

Introduction

Identification of misinformation (e.g., fake news) has become a hot topic for researchers and practitioners alike, arguably because anyone can publish information on social media that may be seen by thousands or even millions of people. Celebrities and social media influencers can also easily dominate social media by using floods of botnet puppeteers and tweet bots. Opinions on social media sites, with some manipulation, can create widespread misinformation [18, 32, 75]. With such power, social media platforms including Facebook, Twitter, YouTube, and Instagram have become a primary medium for spreading fake news [3, 81]. For example, Vosoughi et al. [124] tracked 126,000 stories that were tweeted more than 4.5 million times on Twitter from 2006 to 2017, and showed that false stories were 70% more likely to be shared than the truth, and that it takes true stories about six times longer than fake ones to be tweeted by 1,500 people. With the swift dissemination of fake news via

social media, users are being bombarded with misinformation. The Pew Research Center revealed that 54% of Americans either get their news "sometimes" or "often" from social media [106]. The spread of fake news on social media, therefore, poses a substantial challenge for both individuals and corporations [29, 55, 97].

Given the fast spread of fake news and its harmful downstream effects, researchers have approached the topic in a variety of ways [13]. One widespread field emerges from the information systems (IS) discipline, which identifies the determinants of readers' perceptions of the news—for example, the believability of the news and the readers' subsequent actions vis-à-vis the news article [61, 62, 82, 83]. Believability is an essential quality of a piece of news that influences readers' subsequent behavior. Investigating the elements that make a story trustworthy or not trustworthy can thus enable online news and social media platforms to better understand their readers' perceptions of online news, develop guidelines for content creation, and improve readers' evaluation of their content.

Within this research stream, one overlooked but worthwhile study angle is how discrete emotions, such as anger and sadness, influence news believability. Emotions play a significant role in cognitive, perceptual, and behavioral processes such as information processing and information dissemination [17, 30, 41, 66, 71, 107]. Anger and sadness, two basic negative emotions [36] that are prevalent on social media, have received increasing attention from researchers [12, 76]. For example, Aslam et al. study the news on Covid-19, the main theme of the year 2020-2021, and find that 11% of the news evoke anger, whereas 14% of the news evoke sadness [5]. Moreover, negative information (such as anger and sadness) has been demonstrated to spread faster and, therefore, has a greater impact on society than positive information [19, 24, 25, 39], partly due to human negativity bias in information processing [8, 59, 120]. Furthermore, social media posts with negative emotions are more likely to go viral than those with positive ones [86, 110, 111]. Hence, news stories with typical negative emotions, such as anger or sadness, deserve more attention in IS research.

This paper focuses on the following question: Holding constant the objective content of negative news, whether and how do overt expressions of anger or sadness affect readers' believability of the news and their subsequent social media behavior? For example, while a reader is browsing news on social media, he or she may encounter a piece of news with a headline that highlights negative tones and contains the author's overt expression of anger or sadness toward the issues described in the news. We ask, in this given situation, whether the expression of anger or sadness will impact the extent to which the reader believes the piece of news, and, if so, what the possible underlying psychological mechanism is.

Following van Kleef's theory of emotions as social information (EASI) [118, 119, 121, 122], we propose that expressed anger or sadness influences news perceptions primarily through the inferential processes by which readers form impressions of the author. According to Lerner and Keltner's appraisal-tendency framework (ATF) [71], distinct emotions have specific cognitive appraisals, which can affect judgment and behavior. We argue that readers will interpret the author's anger as a signal of inadequate reasoning, heuristic processing, and a lack of cognitive effort. Therefore, the quality of the writing outcome (i.e., the piece of news) will be questionable and less believable. On the other hand, as sadness relates to appraisals of situational control and systematic thinking, sad expression

will not lead to lower believability. Furthermore, as one of the determinants of information diffusion, believability should have a significantly positive effect on social media behaviors such as reading, liking, commenting, and sharing [61, 62, 82, 83].

To answer our research questions, we utilized an experimental method in which participants read and evaluated pieces of online news with the same headlines but vary in expressions of anger or sadness. In doing so, we aim to advance theory regarding perceptions of misinformation, while also offering implications for guiding information management on social media platforms. Our investigation makes three primary contributions. First, we contribute to the news perception studies in IS literature by providing novel perspectives from which to understand news believability determinants. Prior IS research on fake news has examined how the contextual cues (e.g., highlighted source, source rating, fake news flag, social norm messages) influence perceptions of the news via the readers' reasoning and deliberation [47, 61, 62, 83]. To the best of our knowledge, we are among the first studies to explore the effects of discrete emotions, such as anger and sadness, in the textual content on online news perceptions. Moreover, as there is robust existing literature on political news, especially fake news, we pay attention to news topics that have less political relevance and are of general interest (i.e., news related to disease and the environment). Second, previous studies on anger and sadness largely focus on the individual's own emotional states on their cognitive processing, judgment, and behavior [69, 94], but overlook the interpersonal influence of emotions. We, however, use the EASI theory and ATF to provide insights on how the interpersonal inferences of the author's cognitive processing can also affect readers' news believability. Third, we contribute to the affect literature by providing a novel investigation of two distinct emotions, anger and sadness, which are both ubiquitous and substantial in online news but have not yet been adequately studied.

Literature Review and Hypotheses Development

The Discrete Emotions: Anger and Sadness

An emotion is an affective state arising as a reaction to the situational stimulus in one's environment that is relevant to one's concerns. It emphasizes a person's "mental state of readiness that arises from cognitive appraisals of thoughts" [7, p. 184]. The feeling is transient, existing when the supporting perceptions are active and vanishing rapidly when the conditions evaporate [100, 102, 131]. Emotions also serve as a primary predictor of information processing [30] and are associated with specific resulting action tendencies and behaviors [71, 78, 107]. Existing research widely adopt a framework with two dimensions— valence (pleasant vs. unpleasant) and arousal (activated vs. deactivated)—to map emotions [50, 99]. IS literature has also shown that positive and negative emotions influence behavior in a variety of contexts, such as sharing practice [111], stock market prediction [22], usage of websites [34], information seeking [84], and television advertising [88].

This paper goes beyond the two-dimensional framework and focuses on two discrete negative emotions, anger and sadness. Anger represents "a demonstration of displeasure, hostility, frustration, or a dissatisfaction/discrepancy between an ideal and actual outcome" [76, p. 104]. Individuals become angry when they realize that an undesirable event is hampering their goals, and that the event was triggered by another party rather than by themselves or by circumstance [66]. Once they become angry, individuals are motivated to

actively oppose the causal party [44]. Consistent with the assertions of negativity bias, anger —as an emotion of negative valence—elicits stronger and faster emotional reactions and behavioral responses than emotions of positive valence, such as joy [8]. Meanwhile, according to Berger and Milkman [12], high-arousal emotions could be more viral. As a high-arousal emotion, anger has been shown to speed up information spread—that is, the number of posts or reposts—on social media [26, 76].

Sadness is another negative emotion that is on the list of universally experienced emotions with a biological basis [36, 89], is regarded as an emotion that should be regulated [38], and is also a widely-used emotion in the online news context. Sadness results from the perception of goal failure, and the impossibility of restoration given one's capability [70]. Sadness has been frequently compared with anger as they both are important negative emotions. For example, studies comparing anger and sadness have examined their effects on social judgment [14, 15, 65, 108, 115], policy preferences and perceptions of corporate crisis [60, 108], neural responses [11], online peer production [49] and the propagation of social media posts [76].

Existing studies on anger and sadness in online content can be classified into two major categories. The first category focuses on how angry or sad the readers feel when they read the online content [80]. The other category concentrates on the anger or sadness that exists in the content. Within the second category, one branch of research adopts machine learning models to classify anger or sadness as a discrete emotion in online content [26, 76, 126] or manually coding anger or sadness in the content [12]. The other branch includes the manipulation of discrete emotions by adding emotional expressions in the given content. For example, studies investigating anger embedded in online reviews manipulate the emotion by adding angry expressions in the review content [127, 129]. The current study contributes to the second branch, since anger and sadness are among the most common expressions embedded in social media news but this is still an understudied topic. Specifically, we manipulate the expressions of anger or sadness by holding the objective content constant in well-controlled experiments (more will be discussed later). In our context, we define *anger-embedded (or sadness-embedded) news* as news posts on social media containing angry (or sad) expressions in their headlines.

Emotions as Social Information (EASI) Theory

Existing research recognizes that emotions play a crucial role in social communication. People may actively share their emotions with others [98] or purposefully express feelings to affect others [40, 43]. Beyond the verbal content of a piece of information, emotional expressions provide a useful message about the information sender's intentions [119], which will affect the observer's judgments and behavior.

> Our primary hypothesis is that angry or sad expressions influence readers' perception of the news through inferences of the authors' cognitive processing. It aligns with the fundamental mechanism proposed in the EASI theory, a framework of emotion and persuasion in social contexts. The premise of the EASI model is that emotional expressions provide observers with information that may influence their behavior [119].

The EASI model is suitable for our research for three reasons. First, this model aims to explain the interpersonal effects of the emotion expressors on the observers. It goes beyond the frameworks that target the intrapersonal effects of emotions, such as the affect infusion

model [41] and the "affect-as-a-resource" hypothesis [96]. Therefore, it is appropriate for a context in which readers use emotional expressions in the news as "social information" to draw inferences about the authors. Second, the EASI model fits the context of this study. News authors are typically motivated to vary the nuances of news headlines and content in order to "persuade" readers and attract more attention and exposure as indexed by the metrics of the likes, comments, and shares on social media. The EASI model can thus go beyond traditional persuasion contexts such as negotiation, customer relationship management, and leadership [2, 23, 125], and extend to social media settings to explain the interpersonal inferences. Third, the EASI model has been applied to study the discrete emotion of anger [122, 129]. Thus, we believe that this model can explain the interpersonal effects triggered by anger-embedded or sadness-embedded news when readers view news posts on social media.

The EASI model posits that emotional expressions may affect observers' behavior by two paths: inferential processes (which provide information about the situation) and affective reactions (which affect observers' emotions). The inferential processes assert that observers can often infer information about others' feelings, attitudes, and behavioral intentions based on their emotional expressions [58]. Such inferences may, in turn, affect the observer's behavior. For example, exhibiting sadness will make the observers infer that the actor faces difficulties, leading them to want to provide help to the actor [27]. The affective reactions hold that expressions of emotions can also exert interpersonal influence by evoking affective reactions in observers. This argument is consistent with the propositions of the social-appraisal literature: the other person's emotional reaction will change the individual's own decisions [66]. For example, when individuals observe their friends' excitement about a possible outcome, they may increase their positive assessment of the results because of their own positive feelings [91].

We argue that in the context of social media news, the inferential process plays a more important role than the affective reactions. First, the affective reactions of emotional expressions primarily occur in the context of communal and exchange relationships [28], teamwork [113, 118], and negotiation [117]. Second, studies have also shown how the predictive power of affective reactions depends on the target of emotional expressions. For instance, if someone is the target of the angry or sad expressions, the target may react emotionally; otherwise, he or she may not. In the context of social media news, the story's emotional expressions rarely target a specific reader personally. Meanwhile, most news is posted through an official institutional account (though, indeed, the account can be fake). Even if the news is posted or reposted by an individual, such as a social media influencer or a celebrity, the chance of the reader being the specific target of the news content is low. Therefore, when facing emotional expression in the news on social media, readers are more likely to process the emotions through the inferential processes path, which we are going to focus on in this research.

Anger, Sadness, and Cognitive Effort: The Appraisal-Tendency Framework (ATF)

As discussed, the EASI model posits that emotions expressed in news affect readers' perceptions and behavior. We argue that readers will make inferences about the authors from the emotional expressions, and the inferences will affect the readers' believability of the news. To understand more about the detailed mechanism of this effect for angry and sad expressions, we draw on the appraisal-tendency framework (ATF) [71]. The ATF provides a basis for distinguishing the effects of specific emotions on judgment and decision-making.

Apart from affective outcomes of emotion, the appraisals that define an emotion usually have carry-over effects on perceptions and behavior [37]. According to Han et al. [51], it is crucial to look beyond the valence of emotion and identify the appraisal dimensions and themes of specific emotions. The appraisal dimensions are useful not only because they differentiate emotions in a more fine-grained way than valence approaches, but also because they break feelings down into cognitive dimensions that map emotions onto judgment and decision-making processes. Therefore, this framework is appropriate for our research context focusing on the two discrete emotions.

According to the ATF, "emotions not only arise from but give rise to an implicit cognitive predisposition to appraise future events in line with the central appraisal patterns" [51, p.166]. There are six basic cognitive appraisal patterns of emotions: certainty, pleasantness, attentional activity, control, anticipated effort, and responsibility [109]. Each appraisal pattern relates to specific appraisal tendencies; individuals tend to interpret subsequent events according to the cognitive appraisals characterizing their emotions [71, 72]. In the following, we look into the depth-of-processing induced by the appraisal-tendencies of anger and sadness [51, 73].

Anger is characterized by the appraisal pattern of certainty that arises when an undesirable event motivates individuals to oppose the causal party [51]. As a result, individuals experiencing anger and its certainty appraisal tend to feel certain in subsequent events [85]. Consequently, they are more likely to aim to punish the perceived perpetrator of the event [71, 85, 87], engage in heuristic processing that requires little direct thought [127, 129], and make more biased judgments [71, 72]. For example, angry individuals tend to rely on stereotypes to make inferences and form arguments with insufficient quality [15, 114]. In other words, the angry person relies on trivial cues rather than on deliberate thinking, which leads them to generate perceptions and judgments with lower quality. In the current setting, if the news authors are perceived to experience anger when they write news articles, readers expect them to be thinking heuristically and devoting less cognitive effort to the task.

Sadness relates to the appraisal theme of situational forces beyond anyone's control. Such appraisal themes will trigger appraisal tendencies to perceive situational control in various situations, even in other unrelated domains, such as health outcomes and job performance. Meanwhile, they are expected to evoke an implicit action tendency to change the circumstances that brought about the saddening event. By activating the "goal of reward acquisition," sadness also drives people to repair damage and seek reward [45, 69, 87, 95]. Previous studies have investigated anger and sadness by examining their underlying cognitive processing and their influences on perceptions. However, unlike anger that leads to heuristic processing, sadness results in a more systematic processing [15, 115]. Researchers also find that the differences of depth-of-processing in sadness and anger result in differences in policy preferences and interpretations of corporate crisis [60, 108]. Given that anger biases information processing, it can be assumed that individuals reading an anger-embedded news story will infer that the angry authors wrote the news without depth of thinking or sufficient cognitive effort, thus lowering the believability of the news. In contrast, for sadness-embedded news, sad authors tend to think more systematically and write with effort. As the authors are perceived to write the news with effort, the believability of the news will not be discounted.

Applying the core principles of the EASI theory and ATF to our context, we argue that expressed anger in news headlines influences news believability primarily through interpersonal inferential processes. The expressions of anger first signal to the readers that the author was angry when writing the news article. Readers then make inferences
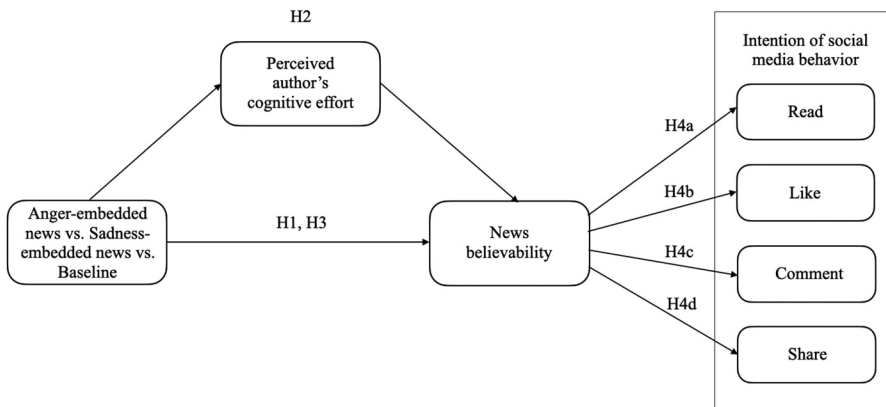
Figure 1. Research model

about the author's cognitive processing in their writing, which influences the readers' believability of the news. To interpret the author's writing, readers rely on the cognitive appraisals and the appraisal tendencies of anger proposed in ATF. Since anger is an incidental emotion associated with certainty appraisals, readers may well interpret angry authors as being less careful, which would impede the author's reasoning and systematic thinking capabilities. Meanwhile, the angry authors were less likely to remove anger from the news item carefully. Therefore, readers interpret overt expressions of anger in the news as a signal of heuristic information processing and the author's lack of cognitive effort in their writing. We emphasize that these arguments do not imply that angry authors must behave less rationally—only that readers *perceive* this to be the case. The inferences regarding the author's cognitive effort should, in turn, influence the believability of the news. When evaluating cognitive performance, observers tend to appreciate the evidence of cognitive efforts and systematic thinking. Observers perceive the judgment guided by systematic reasoning to be credible across various domains [16, 53, 94]. Hence, holding constant the objective content of a news headline, expressions of anger will lead readers to evaluate the news as less believable. To summarize, news that contains expressions of anger will result in a lower perceived level of cognitive effort on the part of the author, which in turn leads to lower news believability from the reader. Our theoretical framework is illustrated in Figure 1, and our first two hypotheses are stated as follows:

H1: Anger-embedded news (vs. baseline) lowers news believability

H2: The effect of anger-embedded news on news believability is mediated by the perceived author's cognitive effort[1]

Following the same logic, readers will also make inferences of the authors based on the expression of sadness in the news. Since sadness is related to situational control and systematic processing, sad authors will be perceived to be deliberate in their writing.

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[1]The term *perceived author's cognitive effort* refers to the level of cognitive effort of the author as perceived by readers..

Hence, the believability of their news will not be discounted compared with the baseline news, as writing with deliberation should be a default rule in news industry. Therefore, holding constant the objective content of a news headline, expressions of sadness will not lower the news believability. Therefore, our third hypothesis is as follows:

H3: Sadness-embedded news (vs. baseline) does not lower news believability

News Believability and Social Media Behavior

People interact with social media through different kinds of activities. Lee et al. [68] define different consumer engagement levels (e.g., liking, commenting, and sharing) and show how these engagement levels are affected by social media advertising content. People can consume digital content by reading it; they can join the social media community by liking, commenting on, and sharing the digital content; and they can even create their own content by writing or posting [63]. Believability can be a critical determinant of social media usage because, when someone believes the information to be correct, they are more likely to engage with it or encourage its spread by sharing it themselves [57]. Studies on news perceptions have shown that believability affects a variety of social media activities, including reading, liking, commenting, and sharing [61, 62, 83]. Therefore, we further hypothesize that believability influences users' various social media behaviors.

H4a: The believability of the news increases a reader's intention to read the news.

H4b: The believability of the news increases a reader's intention to like the news.

H4c: The believability of the news increases a reader's intention to comment on the news.

H4d: The believability of the news increases a reader's intention to share the news.

Experimental Studies

We conducted two controlled experiments to test the hypotheses we proposed, and collected three rounds of pre-tests before each round of data collection. All these exercises recruited English-speaking U.S. participants from Amazon Mechanical Turk (MTurk). This section discusses the pre-tests and main experiments in detail.

Study 1

Study 1 aimed to provide initial evidence of the relationship between anger-embedded news and news believability and its impact on readers' behavior (H1 and H4) by directly manipulating emotional expressions (i.e., words related to anger) in news headlines. For each news story, participants provided their perceptions of the author's anger, the believability of the news story, and their intention to engage in various social media behaviors. By comparing the readers' perception of the author's anger in different news conditions (anger

vs. control), we first demonstrated that our manipulation was successful. We were also able to identify the differential impact of anger by comparing the believability of the news in these two conditions. The details of the study are discussed in the following.

Stimulus materials and pre-tests

Study 1 used disease-related news headlines from news websites as our stimuli, as it is not uncommon for readers to spot disease-related news headlines embedded with anger, and readers have a natural tendency to react quickly to news reporting on social issues such as disease [126]. We conducted three pre-tests to prepare the news stimuli for Study 1. The first pre-test was conducted to see whether the original news headlines were negative in their valence and relatively neutral among basic negative emotions (e.g., anger, fear, sadness). In the beginning, we selected 15 news headlines that were considered neutral in emotions. In the pre-test, 80 participants each read 8 of the 15 news headlines one by one (randomly selected and ordered) and rated their perceptions of the author's emotions (i.e., anger, fear, sadness, happiness). Based on the results, we kept two news headlines. For each of the news headlines, participants' ratings of negative emotions were significantly higher than their ratings of happy ones ($p < .001$), but their perceptions of different negative emotions of the author (i.e., perceived author's anger, perceived author's fear, perceived author's sadness) did not show significant difference ($p > 0.5$).

After selecting the two headlines, we conducted a second pre-test to confirm readers' perceived author's emotions. We recruited another batch of 64 participants who read the two news headlines in a random order. After reading each news headline, participants rated their perceptions of the author's emotions (i.e., anger, fear, sadness, happiness). The result reconfirmed that the participants' ratings of their perception of negative emotions (i.e., anger, fear, sadness) were significantly higher than their ratings of perceived author's happiness ($p < .001$ for both news headlines). Similar to the first pre-test, the participants' rating of the three negative emotions did not show a significant difference ($p > .05$ for both news headlines). The results confirmed that the two news headlines selected had a similar level of negative valence among different negative emotions. Therefore, we were confident that the valence of the selected news is unpleasant, and the basic tone of the emotion in the news does not incline to any particular kind of negative emotions. We could then ensure that the emotion-catching manipulation would be equally consistent with the content of each news headline.

In the third pre-test, we further checked whether adding the angry expression at the beginning of the news headlines triggered different perceptions of the professional quality of the news. We recruited a different sample of 163 participants, randomly assigned them to the control news condition or the anger news condition, and asked them to rate the perceived professionalism of the two news headlines (randomly ordered). The results showed that the perceived professionalism of the news headlines was indifferent between the news with angry expressions and the baseline news ($p > .05$ for both news headlines).

An example of the news stimuli is shown in Figure 2 and more details are provided in Appendix 1.

Procedure of the main experiment

335 U.S. participants (41.19% female, $M_{age}=39$) were recruited from MTurk for a small monetary compensation (see Appendix 2 for details of screening questions and demographics). As a cover story, we asked participants to view some news headlines selected
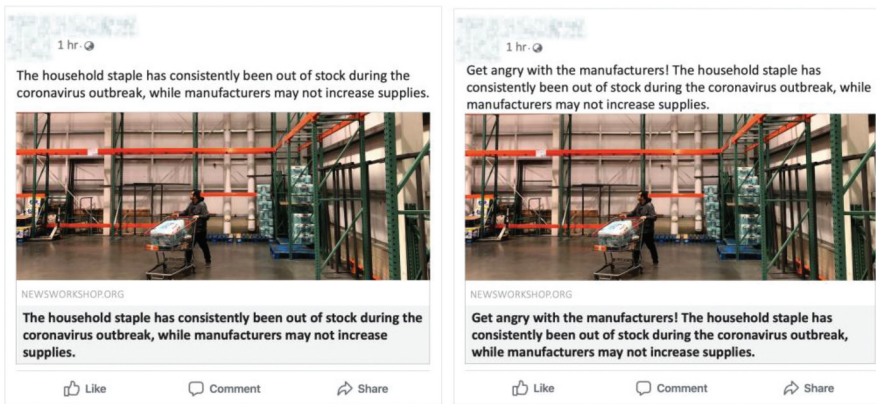
Figure 2. An example of news headline (control vs. anger) in Study 1

from a new social media platform to improve their service. Each participant was randomly assigned to one of two conditions (anger vs. control). The news displays were designed to simulate a regular Facebook post. Following the practices of prior IS studies on news perception [61], we used fabricated news sources such as "Newsworkshop.org" and "Newshour.com" to avoid the potential bias of news sources on the participants' judgment. The news sources were in an inactivated state when we experimented. Meanwhile, the information on the person who posted the news (i.e., the poster) was hidden to prevent any influence brought by perceptions of the poster (see Figure 2). Each participant viewed and read one randomly chosen headline from the two news headlines. After viewing the headline, participants reported how believable they found the news, and their intention to read, like, comment on, and share the news. They were asked to rate their perception of the author's anger, as well as to answer several questions related to the control variables and demographics. At the end of the experiment, we debriefed the participants.

Dependent variables

We measured believability by taking the average of three 7-point items adapted from Kim and Dennis [61]: "How believable do you find this article", "How truthful do you find this article", and "How credible do you find this article". The loadings of the three items were 0.951, 0.958, and 0.958, respectively. The composite reliability of the believability was 0.86. Cronbach's alpha was also adequate (0.95). We measured social media behavior by asking separately which actions the participant would take, including read, like, comment on, and share.

Control variables

Previous studies have examined several variables that affect the believability of a piece of news. Aside from demographics such as age, gender, education, and political affiliation, we controlled social media usage, confirmation bias, familiarity with the news, and general mood.

First, social media usage denotes the frequency of using social media to view news in a typical day [61]. An active user should be more familiar with social media platforms and actively interact with the digital content, whereas an inactive user might be unfamiliar with the platforms and less interested in participating on social media. The believability of news on social media may be different between active and inactive users. We measured *social media usage* by asking: "In a typical day, how often do you check your social media (e.g., Facebook, Twitter, Instagram, Weibo, WeChat, etc.)" with 1 = "Equal to or less than once", 7 = "Always".

Second, confirmation bias is an essential factor in previous fake news studies, especially in the literature on political news [61, 62]. We thus collected the readers' perception of the importance of the news and their position on the news as control variables. We measured the construct *confirmation bias* by multiplying two items, adapted from Kim and Dennis [61]. The first was the perceived importance of the headline ("Do you find the issue described in the article important" with 1 = "Not at all", 7 = "Extremely"). The second was their position on the headline ("What is your position on the headline" with -3 = "Extremely negative", +3 = "Extremely positive).

The third variable is whether the readers' familiarity with the news affects their trust in the story [74, 93, 112]. Previous studies have demonstrated that prior exposure to news content may cause "illusory truth" [92]—that is, readers tend to believe the news when they have been exposed to similar news content several times. Therefore, we controlled the participants' *familiarity with the news* in this study by measuring the construct on a 7-point scale ranging from "definitely not heard before" to "definitely heard before," which we adapted from Swire et al. [112].

The fourth variable is the participants' general mood when they read the news, which may affect their judgments. In contrast to emotion, which is intense, context-specific, intentional, and temporary, mood refers to a nonspecific feeling state that is usually mild, aimless, and long-lasting [10, 31, 36]. Mood is also considered a powerful motivation for judgment and behavior [35, 42, 51, 104, 105]. Previous studies have explored the roles of general mood in technology acceptance behavior and online trust formation [123, 132]. Moreover, mood affects people's behavior by reorganizing their cognitive states [103], such as by occupying cognitive resources [96]. Therefore, in this study, mood may occupy some cognitive resources and affect a reader's information processing of news headlines. In keeping with existing research, we measured participants' *general mood* by first classifying moods into positive and negative ones. Then, we took the difference of the average of the six items of positive feelings and the average of the six items of negative moods, adapted from Aaker et al. [1]. The details of the variables in the experiments can be found in Appendix 3.

Results

We first checked our manipulation of angry expressions. As expected, the results showed that news in the anger condition triggered a significantly higher level of the perceived author's anger than that of the control condition ($t = 8.94$, $p < .001$).

Table 1. Means and standard deviations of the variables in the two conditions in Study 1

	Baseline news (N=171)	Anger-embedded news (N=164)
Believability	4.43 (1.69)	3.70 (1.80)
Read	4.49 (1.94)	3.99 (2.15)
Like	2.50 (1.87)	2.37 (1.89)
Comment on	2.46 (1.87)	2.41 (1.98)
Share	2.32 (1.89)	2.32 (1.94)
Social media usage	4.39 (1.88)	4.76 (1.90)
Confirmation bias	-5.53 (8.93)	-4.87 (9.60)
Familiarity with the news	3.39 (1.39)	3.04 (1.45)
General mood	1.91 (2.32)	1.80 (2.48)
Age	38.09 (12.53)	39.95 (12.37)
Gender	0.63 (0.49)	0.55 (0.50)
Education	3.84 (0.87)	3.76 (0.96)
Political affiliation	2.33 (1.21)	2.26 (1.23)

Note: Standard deviations are in parentheses.

Our primary research question concerned whether the believability of news varied between anger-embedded news and baseline news. The summary of the results can be found in Table 1. Our data showed that, when compared with the baseline news, news embedded with anger leads to significantly lower believability (M_{anger} = 3.70, SD = 1.80, vs. $M_{control}$ = 4.43, SD =1.69; t = -3.79, p < .001), which supports H1.

As a robustness check, we conducted additional ANCOVA analysis with the inclusion of news topics, social media usage, confirmation bias, familiarity with the news, general mood, and participants' demographic variables (age, gender, education, political affiliation) as covariates. Preliminary analyses were conducted to confirm that the assumptions of normality and homogeneity of variables were met. The ANCOVA analysis confirmed the focal finding that angry expressions significantly reduced the believability of news on social media still holds when taking the above variables into account (F (1, 319) = 12.02, p < .001; post-hoc, t = -3.47, p < .001). The details of the results can be found in Appendix 4.

Finally, our analysis also showed that believability had downstream consequences and impacted users' actions on social media. Consistent with existing literature [61, 62, 83], we found that users were more likely to read, like, comment on, and share articles when they believed the news (p < .001 for all four cases). The results still held when taking all the control variables into account, which supported H4a to H4d. The details of the analysis can be found in Appendix 5.

Discussion

By leveraging a well-controlled experimental approach, Study 1 provided initial causal evidence for our hypotheses H1 and H4. The design of Study 1 enabled us to avoid potential confounds and further clarify the effect of anger. Pre-tests and manipulation check confirmed the effectiveness of our manipulations. This study also demonstrated that news believability has a positive effect on readers' intention to read, like, comment on, or share the news.

Study 1 leaves several questions unaddressed. First, we did not directly examine the underlying mechanism of our main effect. We speculated that, as anger acted as social information, a higher recognized level of the author's anger gave readers inferences

about the author's cognitive information processing. When authors were perceived to be angry, they were expected to think heuristically and put less cognitive effort into their writing. Therefore, the perceived author's cognitive effort may explain the effect we found in Study 1. Second, we did not address the hypothesis of the sadness-embedded news in this study. Third, it is unclear whether the effect is still robust after expanding news topics and headlines, as well as controlling more relevant variables, such as the consumption frequency of relevant news topics, the personal relevance of the news, and the perceived political connection of the news. We conducted Study 2 in order to address these questions.

Study 2

Study 2 has three primary goals. First, we explore the underlying mechanism of the effect of anger-embedded news on news believability. We expected that the perceived author's cognitive effort would explain this effect, as angry authors may be perceived to lack the depth of thinking and write the news article using less cognitive effort, which makes the news less believable (H2). Second, we aim to understand the effect of the sadness-embedded news on news believability. As we proposed, sadness-embedded news (vs. baseline news) does not lower news believability as anger-embedded news does (H3). Third, we test the robustness of our findings in Study 1 by expanding the news topics to include both disease-related news and environment-related news, and by including the additional control variables of news topic consumption, personal relevance of the news, and political connections of the news.

Stimulus materials and pre-tests

To enhance the external validity of the effect, we expanded the news topics from Study 1 and selected one disease-related news headline and one environment-related news headline for this study (see Appendix 1). Both of these news topics are natural to anger and sadness emotions and are commonly found to contain emotional expressions. We followed the pre-tests used in Study 1 to prepare the stimulus materials.

In the first pre-test, we examined 12 disease-related news headlines and 12 environment-related news headlines from real news websites. The news headlines were relatively neutral in emotions and the content was reasonable for adding angry or sad expressions. We recruited 439 participants, each read four news headlines randomly selected and ordered from the 24 news headlines. We selected one piece of disease-related news and one piece of environment-related news, for which the participants' ratings of their perception of negative emotions (i.e., anger, fear, sadness) were significantly higher than their ratings of perceived author's happiness ($p < .001$ for both news headlines). In terms of the perceived author's emotions, the participants' rating of the three negative emotions did not show significant difference ($p > .05$ for both news headlines).

We conducted the second pre-test to confirm the emotions in the two selected news headlines. We recruited 64 participants to read two news headlines in a random order. The results were similar to those in the first pre-test and reconfirmed that the participants' ratings of their perception of negative emotions (i.e., anger, fear, sadness) were significantly

higher than their ratings of perceived author's happiness ($p < .001$ for both news headlines). For the perceived author's emotions, the participants' rating of the three negative emotions did not show significant difference ($p > .05$ for both news headlines).

After adding the angry expressions or sad expressions at the beginning of the news headlines, we recruited a different sample of 246 participants, randomly assigned to one of the three conditions (anger vs. sadness vs. control), and asked them to rate their perceived professionalism of two news headlines (randomly ordered). The results showed that the perceived professionalism of the news headlines was indifferent among anger-embedded news, sadness-embedded news, and the baseline news ($p > .05$ for both news headlines). Therefore, we were confident that the emotional valences of the two news headlines were negative, the basic tone of the emotion in the news did not incline toward any basic negative emotions, and the perceived professionalism did not vary among treatment conditions and the control condition.

Procedure of the main experiment

Study 2 used the same procedure as Study 1. Each participant was randomly assigned to one of the conditions (anger vs. sadness vs. control) and read one randomly chosen news headline (either the disease-related news or the environment-related news). We used the fabricated news sources from Study 1 and hid the poster's information to avoid their potential influence on the participants' judgment. 633 U.S. participants (56.87% female, $M_{age} = 40.08$) were recruited from MTurk for a small monetary compensation for further analysis (see Appendix 2 for details of the screening questions and demographics). We also ensured that the people recruited had not participated in Study 1.

Dependent variables

We used the same dependent variables as for Study 1, asking participants about their believability of the news headline and their intention to read, like, comment on, and share the news.

Mediator

To uncover the underlying mechanism of the effect, we tested *the perceived author's cognitive effort* by taking the average of three 7-point items: "In your opinion, how much effort had the author put into writing this news"; "In your opinion, how much thought had the author given to the above news when he/she wrote it"; and "In your opinion, how much time did the author spent writing this news" with 1= "Not at all" and 7= "Very much."

Control variables

In addition to the control variables used in Study 1, we used more control variables in this study to improve the robustness of our results. The additional variables that may influence the news believability include news topic consumption, personal relevance of the news, and political connections.

First, if the readers frequently browse certain types of news in a certain period, their consumption of the news topics may affect their judgment and behavior toward news about that topic. Therefore, we controlled the news topic consumption for the corresponding news and measured it by asking, "In a typical day, how often do you browse/search disease-related (environment-related) news" with 1 = "Equal to or less than once" and 7 = "Always."

Second, people often exchange information with those with like-minded thinking. On social media, people may be more likely to believe and share information from similar people or people with shared interests [17]. In this case, people may think that information from similar people is more relevant to themselves, so they are more likely to believe the news. Therefore, we controlled the *personal relevance of the news* in this study, measuring this variable by a 7-point scale question adapted from Celsi et al. [20]: "Do you find the news is of personal importance to you" with 1 = "Not at all" and 7 = "Very much."

Third, considering that participants on the Amazon Mechanical Turk platform might evaluate content related to the pandemic or environmental issues as being politicized, we added the *political connections of the news* as a control variable. We measured this variable by asking, "To what extent do you connect the news headlines to political conditions" with 1= "Not at all" and 7 = "Very much" (see Appendix 3 for details on the variables in the experiments).

Results

To check our manipulation, we measured the perceived author's anger/sadness by asking: "In your opinion, to what extent does angry/sad describe how the author felt when he/she wrote the above news" with 1 = "Not at all" and 7 = "Very much," adapted from Yin et al. [127]. The results showed that news in the anger condition triggered a significantly higher level of the perceived author's anger than that in the control condition ($t = 9.39$; $p < .001$). In contrast, news in the sadness condition induces a significantly higher level of the perceived author's sadness than in the control condition ($t = 4.91$; $p < .001$). In summary, the results showed that our manipulation was successful.

The summary of variables in the three news conditions is shown in Table 2. We carried out an ANOVA test to examine the news believability of anger-embedded news, sadness-embedded news, and baseline news. Additional tests were also conducted to demonstrate the reliability and validity of our measurements in this study (see Appendix 6). The results showed that there was a main effect of news conditions on believability ($F (2, 630) = 7.93$, $p < .001$). Corroborating the results of Study 1, news believability was significantly lower in the anger-embedded news than

Table 2. Means and standard deviations of variables in the three conditions in Study 2

	Baseline news (N=216)	Anger-embedded news (N=206)	Sadness-embedded news (N=211)
Believability	4.31 (1.58)	3.71 (1.65)	4.19 (1.64)
Read	4.62 (1.86)	4.18 (2.08)	4.45 (1.98)
Like	2.67 (1.82)	2.37 (1.66)	2.47 (1.82)
Comment on	2.39 (1.92)	2.09 (1.54)	2.28 (1.69)
Share	2.43 (1.92)	2.01 (1.53)	2.27 (1.84)
Social media usage	4.81 (1.85)	4.61 (1.94)	4.36 (2.04)
Confirmation bias	-2.63 (8.59)	-3.21 (7.57)	-3.86 (8.29)
Familiarity with the news	2.18 (1.74)	1.71 (1.40)	2.10 (1.69)
General mood	1.53 (2.76)	1.91 (2.55)	1.73 (2.62)
News topic consumption	2.84 (1.73)	2.67 (1.74)	2.59 (1.68)
Personal relevance of the news	4.01 (1.90)	3.49 (1.94)	3.59 (1.94)
Political connection of the news	2.84 (1.83)	3.07 (1.93)	3.07 (2.00)
Age	39.84 (12.68)	39.49 (12.05)	40.89 (12.36)
Gender	0.46 (0.50)	0.42 (0.49)	0.41 (0.49)
Education	2.90 (0.73)	2.85 (0.66)	2.76 (0.67)
Political affiliation	2.06 (1.12)	2.14 (1.15)	2.21 (1.23)

Note: Standard deviations are in parentheses.

the baseline news (M_{anger} = 3.71, SD =1.65, vs. $M_{control}$ = 4.31, SD =1.58; post-hoc, t = -3.77, p < .001), which was in line with H1. Additionally, news believability did not show significant difference between the sadness-embedded news and the baseline news ($M_{sadness}$ = 4.19, SD =1.64, vs. $M_{control}$ = 4.31, SD =1.58; post-hoc, t = -.73, p = .75), supporting H3. Moreover, we found that news believability in the anger condition was significantly lower than that in the sadness condition (M_{anger} = 3.71, SD =1.65, vs. $M_{sadness}$ = 4.19, SD =1.64; post-hoc, t = -3.03, p < .01). The result is charted in Figure 3.

To examine the proposed mechanism, we formally tested whether the perception of the author's cognitive effort could explain and mediate the effect of anger-embedded news on news believability. A PROCESS Model 4 mediation analysis [52] with 5,000 bootstrapping samples confirmed that the effect of anger-embedded news on news believability could be explained by a lower level of the perceived author's cognitive effort (95% CI: [-.43, -.03]). The results supported H2 and the details of the mediation analysis can be found in Appendix 7.

Next, we performed ANCOVA to examine the news believability of anger-embedded news and sadness-embedded news while controlling for the effect of covariates such as news topics, social media usage, confirmation bias, familiarity with the news, news topic consumption, personal relevance of the news, political connections of the news, general mood, and participants' demographic variables (age, gender, education, and political affiliation). Replicating the results of the Study 1, news believability was significantly different among the three conditions (F (2, 614) = 5.43, p < .01). Post-hoc analysis showed that news believability was significantly lower in the anger-embedded news than in the baseline news (t = -2.67, p = .02) and in the sadness-embedded news (t = -3.01, p < .01). Meanwhile, news believability is indifferent between the sadness-embedded news and the baseline news (t = -.34, p = .94). The details of the results can be found in Appendix 4.
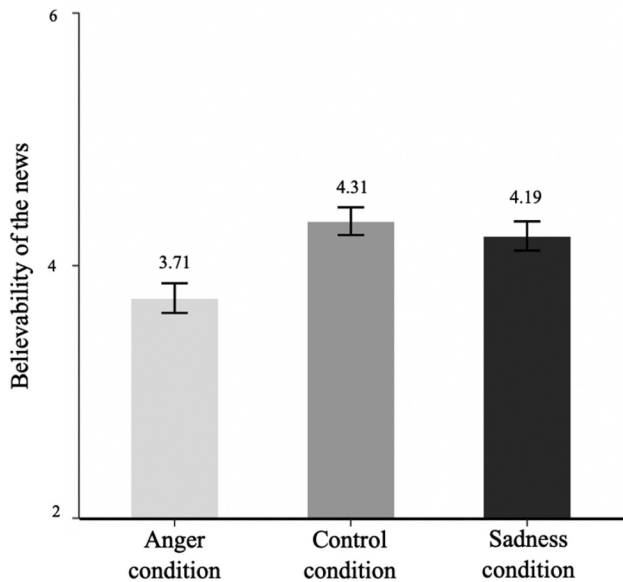

Figure 3. Plots of different news conditions on believability in Study 2

The results replicated the findings of Study 1 that believability influences users' intentions of social media behavior. Users were more likely to read, like, comment on, and share articles when they believed the news ($p < .001$ for all cases). The results still held when taking into account all of the control variables, which provided additional evidence for H4a to H4d. Details can be found in Appendix 5.

Discussion

Study 2 corroborated the findings of Study 1 that anger-embedded news would lower news believability, and also examined its underlying mechanism and confirmed that the perceived author's cognitive effort could explain the main effect. As discussed in the ATF, anger is a discrete emotion associated with the cognitive appraisal of certainty, which is closely related to the lack of thought and heuristic processing. Therefore, the expressed anger serves to signal a lack of cognitive effort in the news writing. According to the EASI theory, expressed emotions affect the recipient's perception primarily through an interpersonal inferential process, in which readers make inferences about the author's cognitive processing during their writing (i.e., the perceived author's cognitive effort) through the expressed anger. Readers will infer the expressed anger as a lack of cognitive effort for the author's writing; thus, they are less likely to believe the news.

This study also demonstrated that sad expressions in the news would not lead to lower news believability, suggesting that the effect of anger cannot be easily extended to other negative emotions. Based on the ATF, sadness is related to the appraisal tendencies of situational control and systematic information processing. Following the logic of the EASI model and the ATF, once readers observe sad authors, they may infer that sad authors think systematically and put in sufficient cognitive effort when they wrote the news article. In the default mode, news authors are supposed to write the news systematically; such inferences about sad authors will not lower readers' believability of the news. Thus, our findings echoed prior studies comparing anger and sadness, which demonstrated that angry subjects render more stereotypical judgments in social perception than sad subjects, who do not differ from those with neutral emotions [14, 15].

This study also addressed several issues remained from Study 1. First, we used shorter news headlines adapted from real news articles in this study to improve the realism of the news articles. Second, to address the fact that disease-related news may be highly impacted by context and timing, we expanded our news topics to include environment-related news. Environment-related news is another news topic that contains negative valence and can be manipulated with different negative emotions, and it is less impacted by context and timing. In this study, we tested both news topics. Compared with Study 1, the salience of the disease-related news varied at the two different time points of our data collection. By directly controlling the participants' consumption of disease-related news and environment-related news, the effect of anger-embedded news on news believability still held. Together with the findings of Study 1, we alleviated the concerns about the context and timing issue of news consumption. Third, we showed that the effect still holds even after controlling for more variables that may affect readers' believability toward the news in real life—news topic consumption, personal relevance of the news, and political connections of the news.

General Discussion

Discussion of Results

The results of our experiments support our hypotheses and provide insights into the mechanism of the effect of anger-embedded and sadness-embedded news on news believability. First, anger-embedded news headlines (vs. headlines without anger expression) lowered news believability. We draw on the EASI theory and ATF to explain this effect. Anger, as social information, can trigger interpersonal inferences and readers can infer the authors' cognition from their expressions of anger in the news article. Readers perceive the authors of anger-embedded news as lacking sufficient cognitive effort in their writing. Such inferences about the authors reduce readers' perceptions on the believability of anger-embedded news. Second, we demonstrated that sadness-embedded news would not lower news believability. We argued that, because sadness is related to the appraisals of situational control and the tendencies of systematic thinking, it will not affect readers' perception of the author's cognitive effort, since news writing is supposed to be deliberate. Third, this study cross-validated prior findings that news believability positively affects readers' intention to read, like, comment on, or share it. This effect was still robust after adding control variables. Supplementary analyses of the direct effect of anger-embedded news on readers' intention to read, like, comment on, or share it are provided in Appendix 8. By applying the EASI theory and the ATF to the social media context, we were able to go above and beyond the relationship between an individual's emotions and information processing to uncover an interpersonal effect triggered by the discrete emotion of anger or sadness on news perceptions.

One possible alternative explanation regarding the interpersonal effects of emotions is that observing an actor expressing emotion may result in observers experiencing emotion themselves through an automatic process such as emotional contagion, which affects their judgment and behavior [91]. In the context of this research, the lower believability of anger-embedded news may be explained by the reader's anger triggered by the author's anger. If the readers become angry, they may tend to think heuristically, which affects their judgment. A similar explanation may be offered for the effect of sadness-embedded news. To further rule out this alternative explanation, we checked whether the readers' feelings of anger or sadness differed between treatment groups and the control group after reading each news headline. Our results showed that anger-embedded news (vs. baseline news) did not bring a higher level of anger to the readers themselves (Study 1: $t = .26$, $p = .79$; Study 2: $t = 1.37$, $p = .17$). Meanwhile, sadness-embedded news in Study 2 did not bring a higher level of sadness to the readers themselves, compared to the baseline news ($t = .56$, $p = .58$). These results supported our claim that the emotional expressions would successfully trigger the readers' perception of the author's feeling of anger or sadness, but not the reader's own anger or sadness toward the news. We can thus rule out the alternative explanation. In other words, our results suggest that emotional expressions in the news can trigger interpersonal influence (i.e., readers' perception of the authors) through the inferential path rather than the affective path.

One may suggest that the interpersonal inferences proposed by the EASI model may not fit with the current research, as it requires readers to think systematically about their reading. In our experiment setting, we explicitly asked participants to rate their believability of the news right after reading, following the design of similar studies (e.g., [61, 83]). By asking them to make a judgment, they had to deliberately think about it. Therefore, we believe the

interpersonal inference of the EASI model is suitable and reasonable for our context. Furthermore, in practice, although people on social media have a hedonic mindset in general [61], social media content has a better chance of fitting to the users' interests. When the content fits the users' needs better, the users will read the news content more deliberately.

Moreover, unlike other fake news studies examining actual fake news, our study used news headlines from real news websites which were not reported to be fake. However, whether the original news we used is true should not affect the robustness of our findings. First, although the original news was not reported as fake news by fact-checking websites, it was not perceived to be true without any doubt. We looked into the details of the reported believability of the baseline news we used in our studies. In Study 1, 30.99% of the participants rated the believability lower than 4 out of 7; 9.36% of them rated it as neutral, while 59.65% of them rated higher than 4. In Study 2, 32.41% of the participants reported relatively lower believability (i.e., lower than 4 out of 7); 11.11% showed neutral perception, while 56.48% tended to believe the news (i.e., rated more than 4 out of 7). The results showed that the news headlines were not believed by many people. Second, the news headlines we used could be fake depending on some investigation. For example, the phrase "has consistently been out of stock" in the news headline used in Study 1 (as shown in Figure 2) could be untrue. The authors might have just observed the situation once or twice but framed it as "consistently". Third, since we manipulated the characteristics of the headlines (e.g., adding angry or sad expression in the front) in our well-controlled experiments, we were exploring the relative believability of the treatment news and the baseline news. Hence, the truth of the headlines was not an issue in this study.

Implications for Research

This paper provides important theoretical contributions by integrating the emotion as social information theory and the appraisal-tendency framework in the context of social media. In doing so, we provide novel insights into the perception of online news by assessing the impact of anger-embedded news and sadness-embedded news on news believability. First, this study contributes to news perception studies by exploring the anger and sadness embedded in the content of different news topics. Prior studies on perceptions of news, especially of fake news, largely focus on the news sources, news ratings, social norms, and other observable news or interface characteristics [47, 61, 62, 82, 83]. However, the emotions embedded in the news content have been understudied. This paper addressed this gap and contributed to this research by showing that the anger and sadness embedded in the news has influences on how the news is perceived and evaluated. Furthermore, previous studies on fake news have concentrated on political news because the threat of fake news is particularly prevalent and salient in the political arena [67, 124]. Beyond political news, Xiong et al. [126] have found that users react most quickly to news reporting on "social issues" such as diseases, crises, or natural disasters. In the domain of fake news, it is worthwhile to know people's perceptions of stories in areas other than political news. Thus, this study focused on disease-related news and environment-related news. Anger and sadness are prevalent in these two news topics. Our results show that, for these two news topics, angry expressions may harm users' believability toward the news, whereas sad expressions do not.

Second, this research provides a more comprehensive understanding of the effect of anger and sadness on judgment and behavior by applying the EASI model and the ATF to the social media context. There has been extensive research in psychology examining the relationship between emotions and cognition. These studies largely focus on the individual's own emotions on their cognitive processing, judgment, and behavior [69, 94], but overlook the interpersonal influence of emotions. Our study investigates the interpersonal effects of anger and sadness in the news content on the reader's believability by combining the inferential processes of the EASI model and the cognitive appraisals introduced by the ATF. Specifically, our findings show that, when asked to make a judgment on the news, individuals on social media can infer from the authors' anger and its underlying cognitive appraisals that the authors wrote the news with heuristic processing and less cognitive effort, which in turn lowers the individuals' believability of a piece of news. However, the expressions of sadness will not lower news believability, since the inferences of sad authors are related to the systematic thinking in their writing. Hence, the news believability will not be affected.

Third, this paper contributes to the literature on affect and its relationship with online behavior. Affect has attracted increasing attention from scholars in organizational behavior and marketing [4, 31]. In a recent study, news items with the five basic emotions of anger, disgust, joy, sadness, and fear [36] have been found to cover 87.1% of news items on social media [26]. Scholars in the IS field have promoted investigating the role of emotions as well [131]. Prior research has investigated the role of general emotions in various IS-related topics, such as website design, online trust formation, technology acceptance behavior, technology-related overload, financial decision-making, e-loyalty, online community contribution, perceived helpfulness of online reviews, perceived credibility of online reviewers, as well as attitude and intention in group buying [67, 34, 48, 54, 56, 64, 79, 101, 116, 132]. However, merely classifying emotions into positive and negative is insufficient. Even if emotions are in the same valence and arousal domains, they can induce different perceptions and behaviors [127]. Therefore, some researchers in IS have examined the role of distinct emotions on IT-related perceptions and decisions, such as frustration and behavioral beliefs [33], regret and IT real options decision making [90], detection of people with emotional distress [21], emotional trust and the use of health infomediaries [130], anxiety and technology acceptance [123], as well as discrete emotions in technology use [9]. Research also investigates how anger or fear that is embedded in the reviews affects perceived helpfulness of online reviews [127–129]. Our paper contributes to the IS research on emotions and extends the current research by investigating how the discrete emotion of anger and sadness embedded in the news content affects online news believability. Despite being the most commonly expressed emotions in social media, the impact of anger and sadness have so far received little scholarly attention in IS research. Our paper addresses this gap by examining the influences of expressions of anger and sadness in the news on online news perceptions and providing insights on critical issues concerning the spread of online news. Our research asserts that, holding the negative valence and the text of the news constant, angry impressions in the news evoke different perceptions of the authors' cognitive processing. The perception of the authors' anger would allow readers to make inferences about the authors' information processing and cognitive efforts, which subsequently affects the readers' judgment of the news. We also demonstrate that this effect does not exist for sadness-embedded news, which is in line with the EASI model and the appraisal

tendencies of sadness suggested by the ATF. The findings further validate ATF by indicating that discrete emotions, such as anger and sadness, will have differential effects on information processing, perceptions and judgement.

Implications for Practice

Although news authors and digital content creators have various goals when writing an article, an important desire is to spread information. Compared with positive news, negative news has a higher potential to influence social media users' perceptions and behaviors of reading, liking, commenting, and sharing. The believability of the news acts as an antecedent of news spread. We found that angry expressions might backfire by making users less likely to believe the news. Our results suggest that using angry expressions to capture readers' attention might be a questionable strategy under certain circumstances. Indeed, when asking readers about their judgment, angry expressions in the news reduce its believability as well as the reader's intentions of reading, liking, commenting, and sharing on social media. However, sad expression may not be a big issue, in terms of the perceived believability of the digital content and the downstream social media behaviors.

Social media platforms might use our findings to develop writing or posting guidelines to encourage more trustworthy content and improve the quality of their online community, since emotional content in the form of angry expressions may reduce users' trust and, in turn, the spread of the news. A healthy news-spreading system should focus on how to promote credible news and minimize the spread of fake news. If news articles use angry expressions, readers may have a lower believability in the news and become less likely to read, like, comment on, and share the news. Therefore, platforms should suggest that credible authors and posters carefully express their feelings and mind the tone of their words. Moreover, if the signals of anger and sadness are detected in the news, social media platforms can adjust their recommendation strategy accordingly. Our findings can be extended to other digital content contexts beyond online news, such as to online advertising and user-generated content. Information containing emotions that indicate the author's heuristic information processing may not help obtain the trust of consumers and users, especially in settings where the information recipients need to judge the quality of the information.

Limitations and Future Research

The present study has a few unaddressed limitations that offer useful insights for avenues of future research. First, as an attempt to check the EASI model and the ATF, our study examined two discrete negative emotions, anger and sadness. Since our findings provide insights into examining the influence of discrete emotions on perceptions of online news, one potential direction for future studies is to investigate the effect of other discrete emotions on individuals' perceptions. Research has explored the role of happiness in live streaming engagement [77]. In the context of online news perception, negative emotions such as disgust and fear and positive emotions such as joy and excitement would be well worth considering. Another potential direction is to compare mixed emotions in different contexts. For instance, anger and happiness are both attributed to a high level of certainty in

the appraisal-tendency framework, despite their opposite valences. Therefore, people encountering these two discrete emotions may tend to process information heuristically [51]. It would be interesting to observe whether the presence of either emotion in the news generates similar consequences on the perceptions of the users.

Second, unlike prior empirical studies using behavior-level data, which assert that emotional information spreads faster [12, 26, 76, 126], our study finds that angry expressions lead to lower news believability, resulting in lower intentions to read, like, comment on, or share the news. In terms of the "share" behavior, the results from this study seem inconsistent with the results of existing research. One explanation for this inconsistency is that sharing is not equivalent to sharing intention. Nowadays, social media users may not read an article before they share it—on Twitter, 59% of shared links are not clicked on first [46]. This suggests that users might share a piece of information without reading or making a careful judgment on it. Such judgment would, in certain cases, change their intention to share the news. For instance, people may share a news post with angry expressions simply because it is eye-catching. However, if they make careful judgments of the news first, they may find the news to be less believable, and thus will not share it. Future studies may consider whether an intervention asking people to make a judgment on news believability before taking action would mitigate the negative consequence of emotional expression. Another explanation is that discrete emotions may have different effects. In empirical studies using large-scale dataset, their conclusion is based on the analysis of a bunch of different emotions, or simply news with positive or negative emotions. Our study, however, focuses on anger and sadness. It might be that anger and sadness trigger particular effects. It inspires us to further investigate the effect of discrete emotions on news perceptions and social media behaviors.

Third, according to Brady et al. [17], news spread on social media might be the consequence of echo chambers, as individuals are likely to believe and share information from people with similar interests and mindsets. Consequently, social media users are more likely to believe or share information with those to whom they feel similar, such as their friends and other users in the same groups. Because of this, it may be worthwhile to study the posters of the news or the news sources in terms of users' perceptions and behavior toward the news. Our study used inactive news sources and hid the poster's information, but it may be hard for the participants to identify whether news items are posted from similar people or groups. Future studies may consider directly manipulating the similarity issues (e.g., news posts from friends vs. strangers, news posted by a person within an interest group vs. not) and examine how these factors may interplay with the effect of anger expression.

Finally, this study focused on only two news topics and used a limited number of news headlines in order to control the experiment design, while using the control variables of confirmation bias, personal relevance of the news, and news topic consumption to attenuate the effects brought about by different news topics and news content. However, if certain news or expressions tend to appear frequently in the media, it is unclear whether this effect will be attenuated or strengthened. To fully address this concern, further studies may examine a greater variety of news topics and news stories. Another possibility is to examine the effects of a discrete emotion as it manifests in different news topics. The effectiveness of one discrete emotion may vary among different news topics. For example, it may not be important whether an entertainment news author uses heuristic processing in writing, in

contrast to finance news, science news, or technology news. The effects of anger or happiness in relation to heuristic information processing may be weakened for the entertainment news. Additionally, future research may investigate the effect of anger-embedded content in other contexts, such as online advertising and negotiation.

Conclusion

Anger and sadness, as universally experienced emotions, affect people's perceptions and behaviors. Given the fast spread of fake news on social media, it is worth studying how angry and sad expressions in the news affect users' perceptions of its believability and their subsequent social media behavior. Using two experiments, we found that angry expressions in news headlines lead to lower news believability. Using the appraisal-tendency framework and the emotion as social information theory, we argued that the perception of the author's anger helps the readers infer that the authors wrote the news with less cognitive effort. A lower level of perception of the author's cognitive effort decreases the readers' perceptions of the believability of the news. We also found that sadness does not affect news believability. This study cross-validates prior findings that the believability of the news positively affects readers' intention to read, like, comment on, or share it. The findings of this study advance our understanding of theories regarding the emotion as a social information model, the appraisal-tendency framework, and studies of fake news, while also providing insights to practitioners and regulators on how to manage information perception and diffusion on social media.

Acknowledgements

Disclosure statement

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