Routledge
Taylor & Francis Group

Health Communication

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/hhth20

Fun with Frustration? TikTok Influencers' Emotional Expression Predicts User Engagement with COVID-19 Vaccination Messages

Ellie Fan Yang, Lauren A. Kriss & Yibing Sun

To cite this article: Ellie Fan Yang, Lauren A. Kriss & Yibing Sun (27 Sep 2023): Fun with Frustration? TikTok Influencers' Emotional Expression Predicts User Engagement with COVID-19 Vaccination Messages, Health Communication, DOI: 10.1080/10410236.2023.2259621

To link to this article: https://doi.org/10.1080/10410236.2023.2259621

Published online: 27 Sep 2023.

Submit your article to this journal

View related articles

View Crossmark data

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=hhth20

HEALTH COMMUNICATION
https://doi.org/10.1080/10410236.2023.2259621

Routledge
Taylor & Francis Group

Check for updates

Fun with Frustration? TikTok Influencers' Emotional Expression Predicts User Engagement with COVID-19 Vaccination Messages

Ellie Fan Yang[a], Lauren A. Kriss[b], and Yibing Sun[b]

[a]School of Communication and Mass Media, Northwest Missouri State University; [b]School of Journalism and Mass Communication, University of Wisconsin-Madison

ABSTRACT

This study examined what kinds of TikTok video and message features are associated with user engagement in the context of COVID-19 vaccination. Content analysis was applied to study a sample of 223 COVID-19 vaccination-related videos from creators with at least 10,000 followers. The content analysis involved coding themes, video formats, the valence of attitude toward vaccination, and emotional expressions from the influencers. A majority of videos showcased personal vaccination experiences, followed by fictitious dramas and instructional information. More fictitious dramas expressed unclear attitudes, neither explicitly supporting nor opposing the COVID-19 vaccine, compared to personal vaccination stories and instructional videos. Some imaginative and dramatic scenes, such as zombie transformation or dramatic spasms after taking the vaccines, were widely imitated across influencers, perhaps humorously, and raised concerns about diminishing positive images of vaccine uptake. Videos with simultaneous expression of humor and frustration significantly predicted engagement when the video content opposed or was uncertain about taking the vaccine, implying the effectiveness of mixed emotional attributes within a message. This study provides insight into how social context and message choices by creators interact to influence audience engagement.

Once efficacious vaccinations against COVID-19 became available during the pandemic wave, it became imperative to promote vaccination worldwide (Peretti-Watel et al., 2020). However, recent research revealed that medical concerns were amplified on social media and the climate of political polarization fortified vaccine hesitancy (Jiang et al., 2021; Puri et al., 2020). Though spreading false information on social media undoubtedly harms vaccine uptake, some messages are neither disinformation nor misinformation, instead falling into the subjective and emotional realm (Burki, 2019). For example, social media influencers shared side effects and their medical suspicions, which may have influenced public trust in the vaccine. There was also pro-vaccination promotion by influencers as well. There is a lack of evidence about the relationship between content produced by influencers and subsequent engagement on newer platforms like TikTok. Understanding these relationships will help media professionals develop interventions (Sun & Lu, 2023).

This study investigates the emotional expressions, video types, and stances toward COVID-19 vaccination used by influencers on TikTok, a short-form video sharing application known for lip-sync clips, comedy videos, dancing, and instructional content. TikTok was downloaded over three billion times on smartphones in 2019 and engaged over one billion monthly active users (Bursztynsky, 2021). The lip-sync app TikTok witnessed a rapid growth during the COVID-19 pandemic, especially in places where lockdown restrictions were implemented and the platform was used for entertainment, distraction, and social interaction (Chapple, 2020). Many users also form parasocial relationships with creators who share similar experiences (Klug et al., 2023). Unlike other platforms such as Facebook and Twitter, this mobile app-based social media seems to have an optimal combination of recommendation algorithms with a simple graphical user interface (GUI) that may strengthen user engagement. Since message features and the subsequent effects vary depending on health context (Nan et al., 2022; Shen et al., 2015), and video-based health messages are becoming popular in public health advertisements (Myrick & Oliver, 2015), the present study investigated how the issue of COVID-vaccine was confronted by TikTok influencers. Of particular importance is the examination of the audience's online engagement with various categories of COVID-19 vaccine videos.

Literature review & research questions

The influencer strategy for online marketing is powerful, as their followers often identify more with influencers than traditional celebrities and place greater trust in them (De Veirman et al., 2017; Djafarova & Rushworth, 2017). Further, audiences perceive social media influencers as psychologically similar (Schouten et al., 2021). When a parasocial relationship between the influencer and the audience develops, the audience is more likely to engage with the content from the influencer and value them as a credible source (Rubin & Step, 2000). As a result, influencers impact audiences' choices and behaviors (Nisbet & Kotcher, 2009). To remain influential in the market, social media influencers must interact with their followers regularly to maintain their audience (Zhou et al., 2021).

CONTACT Ellie Fan Yang eyang@nwmissouri.edu School of Communication and Mass Media, Northwest Missouri State University
© 2023 Taylor & Francis Group, LLC

Professional influencing reflects a new form of "aspirational labor" that requires investment in unpaid work to make a self-image appealing to brand cooperation (Duffy, 2017). Even when influencers receive sponsorship, they still must keep producing unpaid, original content to sustain the relationship with followers because too much paid content is likely to push the audience away (E. Kim et al., 2021). To draw followers' attention, influencers share their own experiences or reactions to current events.

It is well-known that the public likes to engage with trending health news like COVID-19 (e.g., Chen & Wang, 2021; Zhong et al., 2021). One reason is that humans rely on information and knowledge to cope with anxiety and mental stress caused by illness uncertainties (Ratcliff et al., 2023) and social media is an information source used by some to cope with such uncertainties. However, research shows that people who identify social media as their primary source of information scored lower on COVID-19 knowledge (Sallam et al., 2020). It is imperative to inspect what messages were produced by social influencers that triggered user engagement with the content so that public health practitioners can know how to intervene in the future. The present study concentrates explicitly on TikTok due to its widespread usage in the U.S. and the enhanced immersive design of its interface.

TikTok affordances and the social dilemma

TikTok is popular due to its mobile communication affordances and immersive interface design. The affordance framework connects both the design features of a tool and users' perceptual reactions (Evans et al., 2017; Swartz et al., 2019). TikTok differs from other apps for its unique interface design. The graphical user interface (GUI) of TikTok is more likely to create an isolated, immersive, and focused environment in terms of user exposure. One prominent characteristic is its folding in comments and other content when navigating the screen. Unlike Facebook, Twitter, and Instagram, which all display text, audiovisual content in a square and leave space for other users' responses (see Figure 1), TikTok's content display occupies the whole screen on mobile. As such, users are pushed to interact with one video at a time with no social feedback. This GUI feature seems to afford the most algorithmic advantage because it can keep the content streaming without showing irrelevant or comparative content for attention distraction. As the recommendation algorithm mostly functions on user engagement history (Holtz et al., 2020), the enclosed GUI pushes similar messages persistently. Moreover, TikTok allows users to duplicate videos they like and retrofit them to their own needs, which makes the audience more likely to engage with content that resonates with

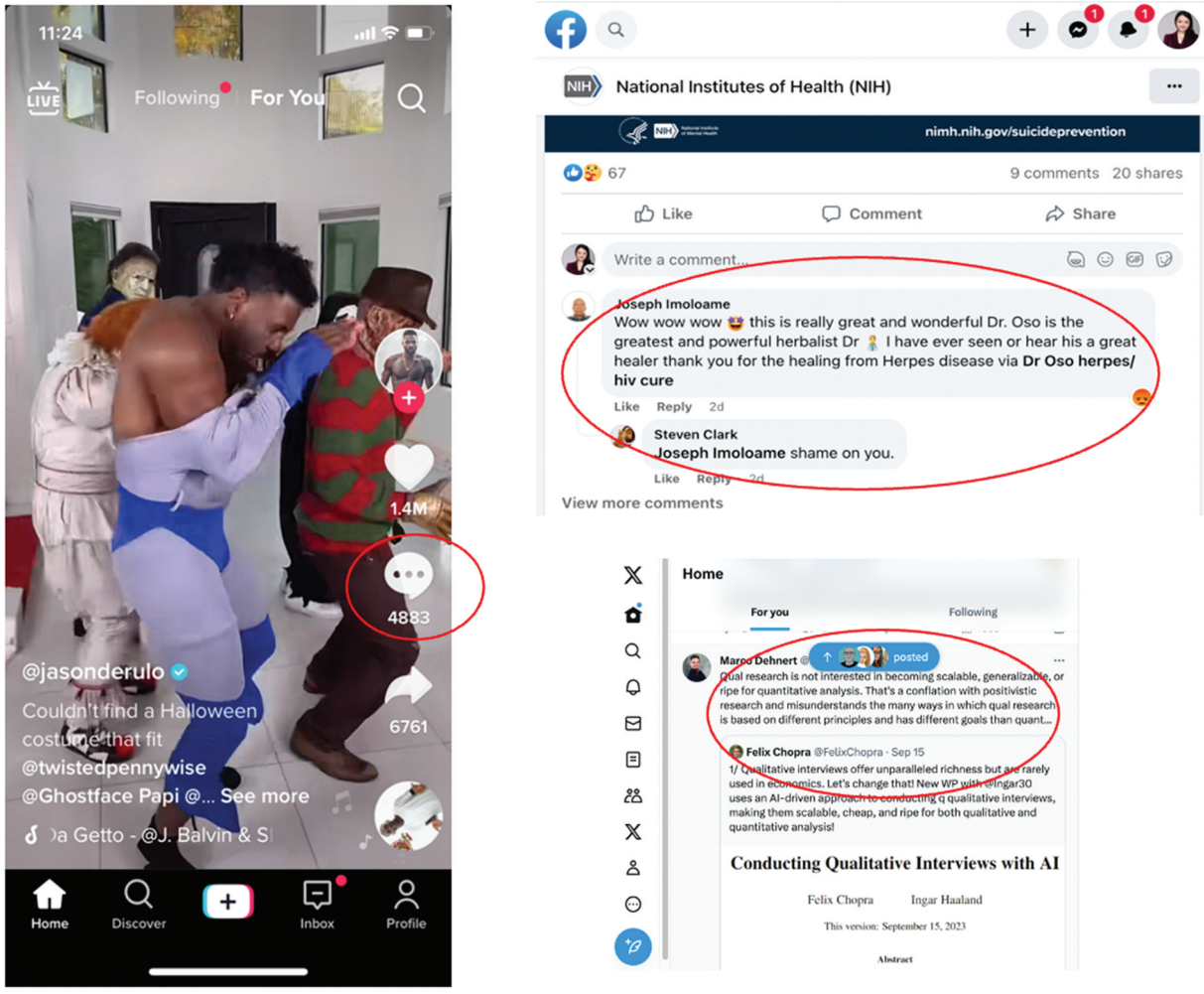

Figure 1. Visual comparison of graphic user interfaces for TikTok, Facebook and Twitter. *Note*. On the left side, a screenshot of the TikTok graphical user interface shows that comments are entirely folded on TikTok and no parallel messages from commentators are displayed on TikTok, unlike Facebook and Twitter (right side).

their preferences. In the context of political communication, for example, Medina Serrano et al. (2020) found stronger partisan interactions among Republicans and cross-ideological interactions from Democrats to Republicans on TikTok. Despite ongoing uncertainty about the functioning of TikTok algorithms, qualitative interviews with users have revealed that the platform's hyper-personalized content curation is tailored to individual interests and becomes more effective with increased time spent on the platform (Bhandari & Bimo, 2022). Consequently, video creators aim to elicit stronger emotional responses from like-minded users by producing content that aligns with their interests (Van Poucke, 2023). The algorithm maximizes content similar to what a user already engages with, and the GUI minimizes access to competing messages and social feedback.

Along with the interface features with which TikTok is designed, users are strongly encouraged by the platform to engage with "trending" activities. For example, the dare-like challenge "slap a teacher" went viral in Connecticut (Douek, 2021) and the fake trend warning of school violence (Fung & Sands, 2021). Other social media platforms emphasize connection and networking through text and clickable buttons, but TikTok encourages interactive trends, whether it be responding to a hashtag, creating a parody video, or learning a dance. The platform has set up several incentive programs to encourage creators to increase views and engagement from the audience. Influencers receive rewards based on the number of views and the level of audience engagement for each video (TikTok, 2021). For example, creators can only be reimbursed when they gathered at least 100K authentic views in the last 30 days (TikTok, 2021). Therefore, influencers are motivated to attract and retain viewers' attention for the monetary incentives. As social media influencers try to attract attention (Fischer et al., 2022), they weigh in on current issues, including the global COVID-19 pandemic. There is a need to understand what influencers communicated about COVID-19 vaccination and what messaging strategies they use.

This study sought to examine TikTok videos in theoretically relevant categories. Although there is a discordance between applying theoretical categories from persuasion to forms of expression where the author's intent is unclear, there is enough overlap between mass mediated persuasion efforts and user-generated content to apply persuasion theory to the social media space. In particular, the content types examined in this study imperfectly correspond to the types of evidence examined in the persuasion literature. In their review of message features, Shen and Bigsby (2012) identify four types of evidence used in persuasion, a) statistical, b) testimonial, c) anecdotal, and d) analogical. In real life, these types of evidence are often blended together. In this study, testimonial evidence and statistical evidence were operationalized as instructional informative content, as most expert testimonials use statistics and data. Anecdotal evidence was indicated as videos about personal experience.

The number of videos that were satire or spoof content are difficult to categorize, but this study grouped all videos that relied on dramatizing (i.e., creating a story) together which is referred to as "fictitious drama." The most relevant communication category is "satire" which Lichtenstein and Nitsch (2023) define as "a communication style that is typically associated with aggression, judgment, mockery, play, laughter, and references to societal norms," which seeks to provide "social commentary and criticism, attacks power structures, and can add to controversial societal debates," (p. 277). However, the nascent field of satire research is focused on political content (Lichtenstein & Nitsch, 2023). The only papers in the health communication literature are an analysis of blockbuster *Don't Look Up* by Little (2022) and a study of *The Daily Show with John Stewart* clip arguing in favor of MMR vaccination conducted by Moyer-Gusé et al. (2018). User-generated satire and comedy has yet to be explored *en masse* in the communication literature.

RQ1: *What patterns of the three video types (i.e., personal vaccination story, fictitious drama, and instructional information) about COVID-19 vaccination are produced by TikTok influencers?*

Indicators of user engagement can be used to determine how audiences responded to various categories of videos. As laid out in *The Social Dilemma*, the fundamental goal of social media companies is to keep users on their apps so that they can a) serve them more advertising and b) collect more data that can be used to further target advertising. Engagement, observed as likes, shares, and comments, is the fundamental driver of profit in the digital space, particularly on social media (Orlowski, 2020). The insiders of Silicon Valley freely admit that the best way to drive engagement is outrage, and that the algorithms maximize negative emotion (Orlowski, 2020). In a sinister example, researchers for Facebook explicitly reduced the amount of content with positive emotions in users' feeds and showed that "people produced fewer positive posts and more negative posts," (Kramer et al., p. 8878). Even worse, in addition to negative content being favored on social media, it also greatly favors out-group animosity (Rathje et al., 2021). The more a piece of content is viewed, liked, commented on, or re-shared, the more that content will be propelled by algorithms maximizing engagement (Orlowski, 2020). Therefore, basic indicators of engagement – like, share, and comment – are measures of social influence and proxy measures for content "reach."

However, as the three engagement indicators may differ in terms of their levels of mental effort (Macafee, 2013), the present study aims to disentangle the three. It is said that "like" involves the least cognitive effort, compared to "share" and "comment," in that "share" indicates the audience's motivation to spread the video in their network along with more consideration. In contrast, "comment" involves message production that reflects the commitment and anticipation of liability such as other users' evaluations (Shah, 2016). The three types of engagement represent the distinct level of public deliberation (C. Kim & Yang, 2017; Molina et al., 2023). There is reason to suspect that video types will associate with engagement indices distinctly, since they may activate mental effort distinctly. But no studies have compared these content types in the user-generated space to each other, so the nature of the differences cannot be hypothesized *a priori*.

RQ2: *Does user engagement (i.e., (a) like, (b) share, and (c) comment) differ by video content types?*

Attitudes are psychological constructs which reflect an individual's "latent disposition or tendency to respond with some degree of favorableness or un-favorableness to a psychological object" (Fishbein & Ajzen, 2010, p. 76)., In this study, the "psychological object" being investigated is the set of approved COVID-19 vaccines. The attitudes of interest are those held by TikTok influencers. However, not all attitudes are clearly stated. There is a recognition that many attempts at persuasion do not state explicit conclusions so that the audience's defensive mechanisms will be lowered (Shen & Bigsby, 2012). In this study, the influencers' attitudes toward vaccination are hard to disentangle clearly, particularly when they had no strong opinion or were intentionally being implicit. This study utilized the category of "ambiguous" attitudes to identify all videos in which the attitude of the creator toward the vaccine was unclear. Since the COVID-19 pandemic was novel, there was no *a priori* reason to predict a directional relationship between content choices and the creator's overall attitude toward COVID-19 vaccination conveyed by videos on TikTok.

RQ3: *Do TikTok influencers' attitudes toward vaccination differ by video content types?*

In addition to understanding the video content released by the influencers, the study also delved into the impact of time for the topic treading. In sociology, time has four dimensions in leading the research – as a social factor, a causal link, a measure for quantitative relationships, and a qualitative measure (Heirich, 1964). For social issues such as COVID vaccination, time is primarily a social factor, for which influencers intend to retain viewership in the long run. To accomplish this, influencers must consider creating videos that reflect the current vibe as time goes by, such as the changing public opinion toward vaccine-taking during the COVID pandemic. As digital trace data enables researchers to collect timestamps and comprehend online behaviors (Peng & Zhu, 2023; Yang et al., 2023), it transforms time into a crucial variable for gauging the quantitative relationship between influencers and their views on social issues.

RQ4: *Do the video content types produced by TikTok influencers change as time goes by?*

Effects of TikTok influencers' emotional expression on user engagement

Social media activities are full of affective expression and are easily amplified by platforms laden with multi-modalities like TikTok (Hautea et al., 2021). Prior research found that TikTok (re)produced affective publics in terms of climate discourse (Hautea et al., 2021) and a digital community to share grief (Eriksson Krutrök, 2021). As social media provides chances for connection, engagement, networking, and community building through affective expression (Papacharissi, 2015, 2016), expression on social media (partially) reverberates emotions shared by the public. Consequently, exposure to discrete emotions expressed by influencers may impact user engagement with COVID-19 vaccination content. Discrete emotions are categories of emotional states that capture more nuanced motivations for message processing and effectiveness (Nabi, 2010). Unlike the dimensional perspective that emphasizes emotion arousal and valence (i.e., positive or negative), the discrete approach purports that emotions should be understood as discrete entities such as fear, disgust, joy, etc (Harmon-Jones et al., 2017).

There are two directions of discrete emotion research in health communication. The first direction is to test emotional messages as a persuasion strategy to change health attitudes and behaviors. For example, some studies found that moderate use of fear appeal in a persuasive message predicted positive attitudes toward cancer screening (Dillard et al., 2012) and tobacco control (Shen, 2017). The second realm is to analyze emotions in media discourse. For example, fear and anger appeals were more likely to be used by trailing candidates in political advertisements, while leading politicians adopted more enthusiastic and proud appeals (Ridout & Searles, 2011). Researchers also found climate activists such as Great Thunberg deployed the emotional appeal of hope to engage audiences (Molder et al., 2022). Emotional elements in media content are also closely related to online sharing behavior, which may amplify the message effects (Kramer et al., 2014). Accordingly, TikTok influencers may strategically deploy emotional attributes in their video-making to increase performance on engagement metrics. Given the entertaining nature of TikTok as a platform and the social context of the COVID-19 pandemic, the present research focuses on two discrete emotions that may impact user engagement: humor and frustration.

Humor has been utilized in preventive healthcare and social marketing campaigns (e.g., Borden & Suggs, 2019; Eisend, 2009; Zhao et al., 2019). Research found that humor was positively associated with message processing motivation that led to cancer self-examination behaviors (Nabi, 2016). More importantly, compared with serious messages containing fear appeals, the intention-behavior relationship was stronger when exposed to humorous messages (Nabi, 2016). TikTok is known for encouraging the creation of funny characters and humorous commentary, so influencers will likely use humor as a message strategy to attract web traffic.

RQ5: *Will TikTok videos with expressions of humor be (a) liked, (b) shared, and (c) commented on more than videos that do not express humor?*

Because negative emotion dominates the polarized discourse during the COVID-19 pandemic crisis (Shao & Hao, 2021), video creators' stance toward vaccination may influence the relationship between humor and engagement. Therefore, the study also proposed understanding the relation between humor expression and the video's stance.

RQ6: *Will the effect of humor on engagement differ depending on the video's stance toward vaccination?*

The other genre of emotion analyzed for TikTok influencers is frustration. Defined as "an interference with the occurrence of an instigated goal-response in the behavior sequence" (Dollard et al., 1939, p. 7), a key negative emotion "that roots in disappointment" and "irritable distress after a wish collided with an unyielding reality" (Jeronimus & Laceulle, 2017, p. 2)., Frustration is one common emotional state during an enduring pandemic due to the conflict between wishes for normality and lack of control. Originated from an emotional response to failing a goal expectation (Amsel, 1958; Berkowitz, 1989), frustration has been studied in sensing algorithms (Matthews et al., 2020), developmental psychology before adulthood (McCrae et al., 2005; Putnam et al., 2001), mental health service (Punton et al., 2022), and consumers' disposal behavior (Graham-Rowe et al., 2014; Raab et al., 2020). It is closer to the appraisal and functional perspective that regards emotion as the response to the environment when pursuing to achieve a goal. Specifically, frustration emerges when there is a collision between individuals' expectation and their loss of control of the environment, a psychological appraisal process that leads to negative emotions (Franken et al., 2017; Jeronimus & Laceulle, 2017). Frustration can be understood as a negative feeling toward not achieving expectations, which may or may not cause anger and aggression, depending on the intensity of individuals' tolerance (Berkowitz, 1989). It is a bold but factual claim that "all people suffer from frustration because our needs cannot always be adequately satisfied in all situations" (Jeronimus & Laceulle, 2017, p. 2). Though TikTok is supposed to be entertaining, when the issue itself is out of control at the individual level, such as the uncertainty about scientific findings (Ratcliff et al., 2023), frustration is likely a shared emotion not only for the mass audience but for the influencers themselves.

RQ7: *Will TikTok videos with expressions of frustration be (a) liked, (b) shared, and (c) commented on more than videos that do not?*

RQ8: *Will the effect of frustration on engagement differ depending on the video's stance toward vaccination?*

Apart from observing humor and frustration separately, the study will also investigate the interaction effect of humor and frustration. A mixture of emotional messages was found to be effective in promoting vaccine uptake and combating anti-vaccine disinformation in the context of COVID-19 vaccine communication (Chou & Budenz, 2020). Prior health communication studies also claimed that negative and positive emotions can be aroused by the same message and audiences' mixed emotional reactions facilitate message processing (Myrick & Oliver, 2015). Vaccine videos created on TikTok may employ simultaneous appeals to humor and frustration, for the reason that humor appears to be the dominant attribute favored on TikTok for its entertaining nature, while the COVID-19 vaccination context may provoke universal frustration. Therefore, it is possible that influencers' followers may resonate with videos containing both humor and frustration appeals. Further, there is reason to suspect that a video's overall attitude toward vaccination will change the relationship between mixed emotional appeals and engagement since engagement is predicted by negative emotion and out-group animosity (Orlowski, 2020), which in the context of COVID-19 could be partisan or more specific pro-vaccine and anti-vaccine coalitions.

RQ9: *For TikTok influencers' videos not explicitly supportive of COVID-19 vaccination, does the combination of humor and frustration increase the rate at which users' like, share, and comment on the posts?*

RQ10: *For TikTok influencers' videos with supportive vaccination attitudes, does the combination of humor and frustration increase the rate at which users' like, share, and comment on the posts?*

Methods

Data collection

To collect COVID-19 vaccination TikTok videos, a third-party social listening tool called "Infegy" was used. Infegy provides URL information from social media platforms such as Twitter, Facebook, and Reddit, and is also the first social listening tool to provide TikTok data (Infegy Research Team, 2023). We used COVID-19 vaccine related keywords ("COVID" and "vaccination," "COVID" and "vaccine") to collect TikTok content from September 15, 2020 through July 17, 2021. We further selected video creators with more than 10,000 followers, which is the threshold for earning monetary incentives from the TikTok platform (TikTok, 2021). Then we applied the built-in Python function "random sample" to randomly select 381 videos whose creators have more than 10,000 followers for this study. Python package *TikTokApi* was applied to the URLs to retrieve raw videos for content coding. The script for scraping videos from URLs is accessible at https://github.com/YibingSun96/TT_Download/tree/main.

Procedures and sample

Among the 381 videos, 158 were removed ($N = 223$). Videos were excluded because the TikTok platform removed the video content during data collection ($n = 50$) or coders manually removed videos that they unanimously agreed were irrelevant to COVID-19 vaccination ($n = 108$). It is common practice for content creators to use trending tags and popular terms to promote their unrelated content (e.g., tagging #covid onto a simple dance video). Therefore, coders flagged videos unrelated to vaccination and later met and agreed unanimously if the video content was or was not about COVID-19 vaccination. Once the initial code sheet was devised, it was pilot tested with trained coders on randomly selected videos. After training, coders met to resolve coding discrepancies before going back and re-coding videos. To evaluate intercoder reliability, 39.58% of the episodes ($n = 76$) were coded by all three coders. Once intercoder reliability was sufficient, the three coders were each given an

equal proportion of the remaining videos to code independently. Krippendorff's (2004) alpha (α) was utilized to determine if there was a sufficient agreement between the coders using the KALPHA macro for SPSS (Hayes & Krippendorff, 2007). Following guidelines from Krippendorff (2004), reliability values above α = .80 were interpreted as reliable. In contrast, values between α = .67 and α = .80 were interpreted as "only for drawing tentative conclusions," and values α < .67 were interpreted as unacceptable (pp. 241–242). See Table 1 for the finalized coding book and α values.

Engagement variables

Apart from coding items, this study also counted the number of likes, shares, and comments for each video through Infegy. These metrics were analyzed as user engagement outcomes.

Likes. "Likes" were counted for each video. The "like" engagement corresponds to the "heart" button on the interface.

Shares. The number of "shares" were counted for each video. The "share" engagement corresponds to the curving arrow button on the interface.

Comments. The number of comments were counted for each video. The "comment" engagement corresponds to the "dialog box" button on the interface.

Covariates

Number of human actors. The number of human figures were counted for each video. Persuasion studies found that similarity is effective in audience engagement (Teng et al., 2017). Therefore, the present study controlled for human actors, one indicator of similarity, to observe the engagement change.

Music background. Music was dummy coded to control whether the video applied music or any melody, as opposed to not having any music. Research found that as TikTok was basically a multi-media design app, background music and sound were likely to influence whether a video was enjoyable (Klug et al., 2021).

Sound effect. Sound effects dummy coded to control whether the video included unnatural voice (i.e., not consistent with the original video-shooting background) or other sound not from the original video, as opposed to having no sound effects.

Subtitles. Subtitles were dummy coded to control whether the video included any text overlaid on the video or not.

Count of followers. Analyses controlled for the number of followers that the creator of each video had because a video created by influencers with a larger following is more likely to be propelled by the algorithm and engaged with (Haenlein et al., 2020).

Analytical strategies

As RQ1 is a descriptive question, the study did not apply any inferential statistical models. For RQ2, ANOVA was used to investigate whether there were differences in user engagement regarding video types. Chi-square analyses were deployed to

Table 1. Coding categories and intercoder reliability.

Coded Variable	α	Operational Definition	Example
Personal Vaccination Story	.72	Creator shares their own COVID-19 vaccination experience	A man shares his vaccination experience in the clinic with his nurse. He expresses his excitement about getting vaccinated. ID: 6909519110007262469
Fictitious Drama	.82	Video features dramatization, including realistic, unrealistic or supernatural scenes	A teenage boy acts out a skit in which the COVID-19 vaccination turns him into a robot-like character.ID: 6954225419218423045
Instructional Information Sharing	.89	Video conveys information, especially referencing expertise and statistics	A journalist interviews public health official Anthony Fauci about the COVID-19 vaccination.ID: 6979567827497897221 ID: 6979567827497897221
Supernatural Effects	.81	Video contains an element of supernatural fantasy, including fake background	A man uses a common voice over, "Am I tripping?" and pretends to have spasms. The video features visual distortions. ID: 6901050515728108806
Sound Effects	.92	Any video which has sound overlaid	A young man shows his experience getting the COVID-19 vaccine and uses the feature on TikTok in which the creator's caption is voice narrated by artificial intelligence. ID: 6954011282831887622
Music	.80	A video includes music, songs, or sound mash-ups including songs	A man announces he has an appointment for the COVID-19 vaccination while dramatic music plays in the background. ID: 6938934622071835906
Captions or Subtitles	.92	A video includes overlaid text, comment box	A humorous sketch in which someone pretends to have gotten more than the recommended dose of the COVID-19 vaccine to achieve the "power of all five companies." The video overlays the same words the characters say. ID: 6954226816273976577
Attitude Toward COVID-19 Vaccination	.74	The general valence of attitude toward COVID-19 as supportive, oppositional or unclear	A man dances while several other graphics appear on the screen. (Coded as unclear attitude) ID: 6904361993877130498
Coded Variable	α	Operational Definition	Example
Frustration	.79	Creator appeals to frustration or expresses frustration	A woman expresses exasperation at people criticizing her choice to get the COVID-19 vaccine by asking a series of rhetorical questions.ID: 6951767579790789894 ID: 6951767579790789894
Humor	.70	Creator appeals to humor or expresses humor	A man uses a common voice over, "Am I tripping?" with a scary monster mask after taking the COVID-19 vaccination.ID: 6875439084689460486 ID: 6875439084689460486

Note. URL id of each video is presented and the original videos are available upon request. People can type in their web browser: "https://www.tiktok.com/@whateverstring/video/" and video ID to view the video examples. Using ID 6906155152256896262 as example, you can view the example video by type in: https://www.tiktok.com/@whateverstring/video/6906155152256896262. If the linked page shows the video was removed, the authors can provide the raw video in the data archive upon request.

answer RQ3, which detects differences in a three-level categorical variable depending on video types. For the RQ4, the Dickey – Fuller test was used to see if the time-series trends for the three narrative types were stationary (Dickey & Fuller, 1979). OLS regressions were employed to address RQ5 through RQ10, which are either testing the main effect or interaction effect. The statistical programming language *R* was used to run the analyses.

Results

The data suggests that, on average, videos received 3307.31 likes, 186.64 shares, and 98.68 comments. The average creator had 230,166.32 followers. Pertaining to RQ1, after applying the coding book, we found that the most common theme was personal vaccination experiences ($n = 128$, 57.40%), followed by fictitious drama ($n = 67$, 30.04%) and instructional information ($n = 53$, 23.77%). As ANOVA requires testing assumptions such as no significant outliers, normality distribution of outcomes, and the homogeneity of variance (Kozak & Piepho, 2018), we logged the three engagement outcomes and performed Levene's test and residual plot on them for diagnosis. The results were presented in the Appendix Table A1 and Appendix Figure A1. To validate our results, we also ran the ANOVA with the outliers removed and presented the results in the Appendix Table A2. There were no differences in terms of the significance and size change for the two datasets. ANOVA for RQ2, for the full dataset, showed no significant group variation for the engagement indexes, although videos for instructional information sharing had a marginal difference ($F(2, 87) = 2.42$, $p = .091$). Videos of personal vaccination stories had the highest number of likes ($M = 6668.27$, $SD = 778.45$) and sharing ($M = 323.42$, $SD = 178.57$), whereas videos about instructional information received most comments (Mean = 181.60, SD = 59.82). Table 2 presents the details of the output.

Chi-square analyses showed differences in vaccination stances or attitudes among the three video types for RQ3. The relationship between personal experience videos and vaccination stances was significant, $\chi^2(2, N = 223) = 32.17$, $p < .001$. Significant relationships between instructional information videos and vaccination stance emerged, $\chi^2(2, N = 223) = 10.45$, $p = .005$, as well as for fictitious dramas and stance, $\chi^2(2, N = 223) = 64.83$, $p < .001$. Specifically, we found that 77.34% of personal experience videos and 64.15% of instructional information videos were explicitly supportive. In contrast, 74.63% of fictitious dramas belong to the "not sure" category, meaning coders could not clearly interpret the video creators' attitudes toward vaccination.

For the RQ4, the Dickey – Fuller test was used to see if the time-series trends for the three narrative types were stationary or not (Dickey & Fuller, 1979). The estimation results suggest that all three narrative types were stationary ($Z_{(t)\text{personal experience}} = -12.47$, $Z_{(t)\text{fictitious drama}} = -9.43$, $Z_{(t)\text{instructional information}} = -12.73$). In other words, the fluctuation of three narratives produced by TikTok influencers remained within a stable range as time went by ("no change"). The autocorrelation function (ACF) was applied to examine if any prior video production would lead to the subsequent emergence of similar types of videos. However, no significant results were detected for the three video types. Figure 2 displays the ACF graphs, confirming that the time trends of video type production were random during the study period (September 15, 2020 through July 16, 2021).

To answer RQ5 and RQ6, we conducted OLS regression for humor expression and its interaction term with the video's stance. Table 3 presents the results, in which Model 1 tested the effect of humor expression while Model 2 tested the interaction effects. For RQ5, the main models for like, share, and comment did not show significant differences in engagement between videos expressing humor or not expressing humor (Table 3). However, there was a significant interaction effect between humor and stance toward vaccination on "share" behaviors, as well as a marginal relationship to "comment" behaviors (Table 3). Videos with opposing vaccination content were predicted to increase "share" behavior. At a marginal level, the blend of humor and opposing stance could also explain a proportion of variance in "comment" engagement. No significant results were found for "like" in terms of the moderation effect of humor with opposing vaccination stances. Table 3 displays the detailed estimation from the model.

The results also showed that the number of human actors and the usage of sound effects predicted engagement. Though the two covariates were not the main focus, there was a consistent pattern showing videos with more human actors and the use of sound effects were more likely to be liked, shared, and commented on.

As for the effect of frustration expression (RQ 7 & 8), Table 4 shows no independent effect was found for engagement outcomes; that is, frustration expression did not predict user engagement. Similar to humor, the effect of frustration expression only appeared when associated with the video's vaccination stance. When a video advocated not taking the vaccine, frustration significantly increased the "share" engagement (Table 4). However, the effect of expressing frustration with opposing vaccination videos did not change the "like" and "comment" engagement (Table 4). As a covariate, the sound effect was still a significant factor in increasing the three types of engagement.

Table 2. Means, standard deviations, and one-way analyses of variance in likes, shares, and comments.

	Personal vaccine experience		Fictitious drama		Instructional information sharing				
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	η^2	*p*
Likes	6668.27	778.45	2380.97	870.20	3550.71	1297.89	1.14	.01	.321
Shares	323.42	178.57	280.43	125.54	311.00	166.55	1.31	.02	.273
Comments	159.74	68.49	77.40	34.96	181.60	59.82	2.42	.02	.091

Note. ANOVA model was applied to the log format of the three engagement indicators.

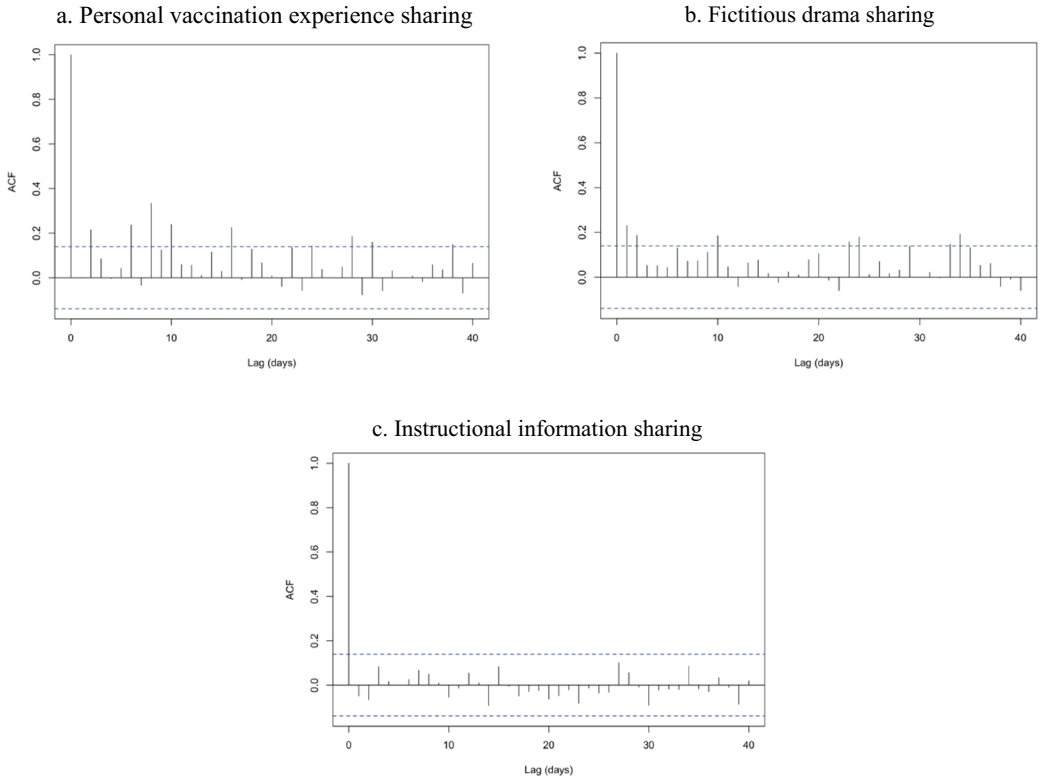

Figure 2. Auto-correlation function for the three video types (N = 198 days). *Note.* The graphs show the auto-correlation between the lagged 40 days and the first day. The days afterward were removed from the plot as they would remain insignificant.

RQ9 asked about the interaction effect of "humor X frustration" for videos that oppose or hold ambiguous attitudes toward vaccination. For a subset of videos that did not explicitly support the COVID vaccination, results showed that the interaction term was significant across the three engagement indicators, all of which increased (Table 5). In other words, the presence of frustration and humor in a video opposing or not clearly supporting the vaccination increased the likelihood of liking, sharing, and commenting. Table 5 displays the details of the estimates.

Figures 3–5 visualizes the interaction results for the three engagement indicators for videos that do not explicitly support vaccination, which clearly demonstrates a reinforcing effect of humor and frustration in predicting the audience engagement of TikTok videos from the influencers. Additionally, the model also indicates a significant impact of the video types. Videos with the narrative of personal vaccine experience or instructional information positively related to likes, shares, and comments from the audience, when their creators did not explicitly support COVID-19 vaccination.

The same modeling process was deployed to answer RQ10 among videos that advocate vaccination. In contrast to videos that opposed or did not explicitly support vaccination, the interaction term "humor X frustration" did not predict engagement when a video advocated for COVID-19 vaccination ($\beta_{\text{like}} = .10$, $t(123) = .19$, $p = .850$; $\beta_{\text{share}} = .14$, $t(72) = .22$, $p = .830$; $\beta_{\text{comment}} = .15$, $t(115) = .28$, $p = .781$). Namely, the effects of expressing humor and frustration did not relate to audience engagement when influencers' videos were supporting the vaccination.

Discussion

This study collected TikTok videos during the COVID-19 pandemic to understand how types of videos, emotions expressed by influencers and video features related to user engagement. Results showed that sharing personal vaccination experiences, creating fictitious dramas, and sharing instructional information were the three main video themes used when influencers created videos related to vaccination (RQ1). Though the video content themes did not differ in user engagement (RQ2) and did not change over time (RQ4), they did differ in the influencers' attitudes toward COVID-19 vaccination (RQ3). Notably, more videos showing personal experience or sharing instructional information supported COVID vaccination, while more videos with fictitious dramatic content conveyed ambiguous attitudes toward vaccination, meaning the influencers did not explicitly support or oppose vaccination. Future research should move beyond effects studies to investigate why creators are interested in refraining from drawing explicit conclusions, a common tactic in persuasion that is seen as generally less effective (Shen & Bigsby, 2012). It is intriguing that the content categories using anecdotal evidence and using expert testimonials or statistics were more often pro-vaccine, whereas the category of fictitious drama, which has a lot of overlap with satire, was more ambiguous. Clearly, more research defining and operationalizing user-generated satire is warranted.

As for specific emotional attributes, adding humor and frustration did not change user engagement significantly when looking at all content (RQ5 & RQ7). Sub-group analyses

Table 3. Moderation effects of humor on engagement behaviors for videos not supportive of COVID-19 vaccination.

	Like				Share				Comment			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	β	t	β	t	β	t	β	t	β	t	β	t
Humor appeal	−.03	−.37	−.0	−.64	.06	.54	−.10	−.94	−.05	−.47	−.11	−1.06
	(.09)		(.10)		(.11)		(.11)		(.10)		(.10)	
Oppose versus support vaccination	−.02	−.37	−.05	−.59	.14	1.55	−.05	−.50	.04	.50	−.02	−.26
	(.07)		(.08)		(.09)		(.09)		(.08)		(.08)	
Ambiguous versus support vaccination	−.04	−.46	−.07	−.63	−.01	−.06	−.07	−.57	−.05	−.55	−.11	−.99
	(.09)		(.11)		(.11)		(.13)		(.09)		(.11)	
Fear (Yes = 1)	−.04	−.47	−.04	−.48	−.12	−1.28	−.10	−1.08	−.04	−.62	−.04	−.52
	(.08)		(.08)		(.09)		(.09)		(.08)		(.08)	
Frustration (Yes = 1)	−.01	−.06	−.0	−.17	.15	1.41	.10	.98	.03	.33	.01	.12
	(.09)		(.09)		(.11)		(.10)		(.09)		(.09)	
Number of human actors	.19**	2.67	.19**	2.69	.12	1.46	.15	1.90	.14	1.91	.14*	1.99
	(.07)		(.07)		(.08)		(.08)		(.07)		(.07)	
Music background (Yes = 1)	−.07	−.91	−.07	−.94	−.02	−.23	−.02	−.23	−.09	−1.12	−.09	−1.14
	(.07)		(.07)		(.09)		(.08)		(.08)		(.08)	
Sound effect (Yes = 1)	.25**	2.81	.26**	2.83	.21*	1.95	.28**	2.76	.22*	2.39	.23*	2.47
	(.09)		(.09)		(.11)		(.10)		(.09)		(.09)	
Subtitle (Yes = 1)	−.07	−1.04	−.06	−.89	−.17*	−1.98	−.10	−1.26	−.08	−1.13	−.06	−.81
	(.07)		(.07)		(.09)		(.08)		(.07)		(.07)	
Personal vaccine experience (Yes = 1)	.07	.62	.06	.59	.17	1.36	.16	1.39	.11	.95	.10	.88
	(.11)		(.11)		(.12)		(.11)		(.11)		(.11)	
Fictitious drama (Yes = 1)	−.07	−.53	−.08	−.61	−.02	−.10	−.01	−.05	−.04	−.28	−.07	−.48
	(.12)		(.13)		(.15)		(.15)		(.13)		(.14)	
Instructional information sharing (Yes = 1)	.05	.49	.05	.47	.15	1.21	13	1.12	.11	1.06	.11	1.02
	(.10)		(.10)		(.12)		(.11)		(.11)		(.11)	
Count of followers	.02	.33	.02	.32	−.02	−.25	−.02	−.31	.03	.41	.03	.40
	(.07)		(.07)		(.08)		(.08)		(.07)		(.07)	
Humor × Oppose vaccination			.06	.80			.43***	5.05			.15	1.87
			(.07)				(.09)				(.08)	
Humor × Ambiguous about vaccination			.07	.45			.13	.75			.14	.89
			(.15)				(.17)				(.15)	
R^2	.08		.09		.14		.27		.08		.10	
R^2 Adj.	.03		.02		.05		.19		.02		.03	
RMSE	36814.18		36741.79		1184.44		1085.19		577.88		571.76	

Note. URL id of each video is presented and the original videos are available upon request. People can type in their web browser: "https://www.tiktok.com/@whateverstring/video/" and video ID to view the video examples. Using ID 6906155152256896262 as example, you can view the example video by type in: https://www.tiktok.com/@whateverstring/video/6906155152256896262. If the linked page shows the video was removed, the authors can provide the raw video in the data archive upon request.

of videos with supportive or opposing vaccine attitudes showed some effects. When videos opposed vaccination, humor predicted "share" behaviors (RQ6). Frustration also predicted "share" behaviors among videos opposing vaccination (RQ8). The combination of humor and frustration predicted all three engagement indicators, among videos with opposing or unclear attitudes toward vaccination (RQ9), but not for videos supportive of vaccination (RQ10).

The most intriguing finding was the interaction effect of humor and frustration for videos that do not explicitly support vaccination (RQ9). Humor was positively related to "share" and "comment" engagement when the video content was against vaccination or ambiguous toward vaccination. Moreover, if a humorous video also included a frustration element, it was more likely to be engaged with. Prior research found that negative emotion is one type of emotion contagion phenomenon that digital media companies can leverage to increase user engagement (Goldenberg & Gross, 2020), but few have delved into message attributes that may intensify the contagion. The present research identified humor and frustration as the two factors that may contribute to the amplification of negative emotion contagion. Interestingly, the variance explained was highest for "sharing" behavior. This may reflect the nature of TikTok, which emphasizes social feedback less and "trending" activity more. It may also reflect that emotions predict posting behavior as opposed to simply likes. Future research should probe what TikTok users perceive different types of engagement indices are for.

Moreover, since individuals are more susceptible to emotions expressed on social media (Lee & Theokary, 2021), our findings may suggest a potential need to improve TikTok influencers' awareness of current issues when producing engaging content related to public health. There are signs that public officials are strategizing about social media. It made national headlines when the White House briefed TikTok stars on the Ukraine war (Lorenz, 2022) and the briefing was subsequently parodied on *Saturday Night Live*.

From a broader message effects perspective, it is intriguing that TikTok creators utilized multiple emotional appeals, perhaps attempting to create emotional flux. Nabi (2015) demonstrates that a health message may trigger several emotional states and a mixture of emotions may promote message elaboration. Moreover, the strength of a message can be enhanced through an emotional flow that the audience experiences "one emotional state to the next, in sequence" (Nabi, 2015, p. 121)., For humor especially, it may lead to a switch from negative emotions by reducing defensive processes, which may facilitate persuasion (Nabi, 2015). In our study, the emotional flow may

Table 4. Moderation effects of frustration on engagement behaviors for videos not supportive of COVID-19 vaccination.

	Like				Sharing				Comment			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	β	t	β	t	β	t	β	t	β	t	β	t
Humor appeal	−.03	−.37	−.04	−.43	.06	.54	.03	.25	−.05	−.47	−.05	−.56
	(.09)		(.09)		(.11)		(.11)		(.10)		(.10)	
Oppose versus support vaccination	−.02	−.31	−.23	−.66	.14	1.55	−1.02**	−2.64	.04	.50	−.59	−1.18
	(.07)		(.35)		(.09)		(.39)		(.08)		(.50)	
Ambiguous versus support vaccination	−.04	−.46	−.01	−.03	−.01	−.06	−.43	−1.20	−.05	−.55	−.21	−.68
	(.09)		(.32)		(.11)		(.36)		(.09)		(.32)	
Fear (Yes = 1)	−.04	−.47	−.04	−.62	−.12	−1.28	−.16	−1.71	−.04	−.25	−.05	−.60
	(.08)		(.08)		(.09)		(.09)		(.08)		(.16)	
Frustration (Yes = 1)	−.01	−.06	−.01	−.03	.15	1.41	−.12	−.63	.03	.33	−.05	.33
	(.09)		(.16)		(.11)		(.18)		(.09)		(.16)	
Number of human actors	.19**	2.67	.19**	2.66	.12	1.46	.12	1.44	.14	1.91	.14	1.90
	(.07)		(.07)		(.08)		(.08)		(.07)		(.07)	
Music background (Yes = 1)	−.07	−.91	−.07	−.94	−.02	−.23	−.03	−.38	−.09	−1.12	−.09	−1.18
	(.07)		(.07)		(.09)		(.09)		(.08)		(.08)	
Sound effect (Yes = 1)	.25**	2.81	.26**	2.82	.21*	1.95	.23**	2.18	.22*	2.39	.21*	2.26
	(.09)		(.09)		(.11)		(.10)		(.09)		(.09)	
Subtitle (Yes = 1)	−.07	−1.04	−.07	−.97	−.17*	−1.98	−.14	−1.70	−.08	−1.13	−.07	−.97
	(.07)		(.07)		(.09)		(.09)		(.07)		(.07)	
Personal vaccine experience (Yes = 1)	.07	.62	.06	.59	.17	1.36	.17	1.38	.11	.95	.11	.99
	(.11)		(.11)		(.12)		(.12)		(.11)		(.11)	
Fictitious drama (Yes = 1)	−.07	−.53	−.07	−.53	−.02	−.10	.00	.02	−.04	−.28	−.02	−.14
	(.12)		(.13)		(.15)		(.15)		(.13)		(.13)	
Instructional information sharing (Yes = 1)	.05	.49	.04	.41	.15	1.21	.09	.73	.11	1.06	.11	1.00
	(.10)		(.10)		(.12)		(.12)		(0.11)		(.11)	
Count of followers	.02	.33	.02	.33	−.02	−.25	−.01	−.13	.03	.41	.03	.46
	(.07)		(.07)		(.08)		(.08)		(.07)		(.07)	
Frustration × Oppose vaccination			.21	.58			1.27**	3.14			.66	1.40
			(.36)				(.41)				(.51)	
Frustration × Ambiguous about vaccination			−.03	−.08		1.32	.58				.22	.54
			(.39)				(.44)				(.40)	
R^2	.08		.09		.14		.19		.08		.09	
R^2 Adj.	.03		.02		.05		.11		.02		.01	
RMSE	36814.18		36777.68		1184.44		1043.11		577.88		575.27	

Note. All the coefficient estimates are standardized in regression models to compare their relative importance for the outcome, as well as to control the unit differences among independent variables. Standard deviations in parentheses.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

occur between the frustration and humor, inducing a "frustration-then-relief" elaboration process, given that frustration is physiological arousal at high-level activation and humor can reframe a stressful situation and lead to positive feelings such as hope (Nabi, 2015).

In addition, when investigating the covariates, we also noticed that there were two widely created series related to the influencers' video-making for vaccine effects: turning people into zombies and causing unusual spasms. One is the voiceover from Samuel Isaiah Hunter's short video about the zombie effect after taking the vaccine. The other is the soundtrack "Bmoved," a drumbeat rhythm initiated by one influencer with 78,600 followers. The addition of sound effects, such as the usage of Samuel Isaiah Hunter's voice-over, was widely imitated among influencers to make fun of the side effects of the COVID vaccine. Such trending could have been a "challenge" picked up by some influencers to attract video viewing as their sound effect was the same. The ripple sharing of sound among influencers may be another factor worth considering in the social amplification framework proposed by Zhang and Cozma (2022).

This study shows a need to tackle vaccine hesitancy outside the "misinformation" paradigm and a much wider range of negative and ambiguous expressions. For example, a creator with 78,000 followers discussed his opposing attitudes toward the vaccine explicitly and questioned the conflicts of interest of Bill Gates's vaccine promotion in the current pandemic (video id = 901). For the trend where TikTokers used the same zombie sound to post fictitious scenes of fantastical vaccine side effects, often meant as parodies, still bring about negative emotions among audiences. These examples, and the descriptive results of the study, indicate a wider middle ground in vaccine hesitancy that should be addressed differently from outright opposition. Further, the line of inquiry about satire should be explored more systematically.

There are three major limitations to the current study. First, there were sampling issues. Videos can be removed, and many creators will use trending hashtags even if the content of their video is unrelated. Therefore, keyword hits can dramatically over-estimate the actual number of videos about the topic searched for. The inability to predetermine the number of relevant videos based on keywords made the sample size of this study arbitrary. Second, we only searched video captions with the keywords "COVID" and "vaccination" or "COVID" and "vaccine," which did not capture all the variations of COVID-19 related keywords. One reason for this deficit is that no consistent recommendations for keyword searches were established at the time the current study was undertaken, which was during the pandemic. Finally, we did not distinguish the intensity of emotion in the coding process. Instead,

Table 5. Moderation effects of humor and frustration expression on engagement behaviors for videos not supportive of COVID-19 vaccination.

	Like				Sharing				Comment			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	β	t	β	t	β	t	β	t	β	t	β	t
Humor appeal	.15	.75	−.77	.11	.34	1.39	−.58	−1.12	−.11	−.44	−1.48	−2.71
	(.20)		(.48)		(.25)		(.52)		(.25)		(.55)	
Ambiguous versus oppose vaccination	−.13	−1.07	−.16	−1.32	−.25	−1.79	−.27	−2.00	−.24	−2.01	−.30	−2.54
	(.12)		(.12)		(.14)		(.13)		(.12)		(.12)	
Fear (Yes = 1)	−.07	−.59	−.03	−.21	−.14	−1.03	−.11	−.80	−.09	−.68	−.02	−.17
	(.13)		(.13)		(.13)		(.13)		(.13)		(.12)	
Frustration (Yes = 1)	.20	1.55	−.13	−.66	.38	2.63	−.04	−.17	.33	2.36	−.09	−.43
	(.13)		(.20)		(.14)		(.25)		(.14)		(.20)	
Number of human actors	−.11	−.96	−.05	−.46	−.05	−.41	.05	.41	−.11	−.95	−.04	−.39
	(.11)		(.11)		(.13)		(.13)		(.11)		(.11)	
Music background (Yes = 1)	−.04	−.33	−.01	−.09	.13	.95	.19	1.39	.01	.10	.06	.46
	(.12)		(.12)		(.13)		(.13)		(.12)		(.11)	
Sound effect (Yes = 1)	−.12	−.77	−.13	−.86	−.07	−.41	−.04	−.22	−.05	−.30	−.04	−.26
	(.15)		(.15)		(.16)		(.16)		(.15)		(.14)	
Subtitle (Yes = 1)	−.19	−1.69	−.16	−1.43	−.30	−2.41	−.24	−1.95	−.27	−2.30	−.23	−2.08
	(.11)		(.11)		(.12)		(.12)		(.12)		(.11)	
Personal vaccine experience (Yes = 1)	.43**	2.59	.57**	3.27	.47**	2.75	.61***	3.39	.55**	3.04	.83***	4.15
	(.16)		(.17)		(.17)		(.18)		(.18)		(.20)	
Fictitious drama (Yes = 1)	.38	1.55	.49	1.98	.01	.04	.08	.27	.61	1.91	.89	4.15
	(.25)		(.25)		(.29)		(.28)		(.32)		(.32)	
Instructional information sharing (Yes = 1)	.45*	2.41	.59**	3.03	.31	1.41	.51*	2.15	.57**	2.66	.84***	3.71
	(.19)		(.20)		(.22)		(.24)		(.22)		(.23)	
Count of followers	.22	2.05	.22	2.08	.03	.25	.03	.25	.10	.91	.10	1.00
	(.11)		(.11)		(.12)		(.12)		(.11)		(.10)	
Humor × frustration			1.13*	2.10			1.24	1.99			1.57**	2.79
			(.54)				(.62)				(.56)	
R^2	0.24		0.29		0.33		0.38		.29		.36	
R^2 Adj.	0.12		0.16		0.18		0.23		.16		.24	
RMSE	5779.82		5610.61		1166.81		1124.62		250.48		236.88	

Note. All the coefficient estimates are standardized in regression models to compare their relative importance for the outcome, as well as to control the unit differences among independent variables. Standard deviations in parentheses.
*$p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

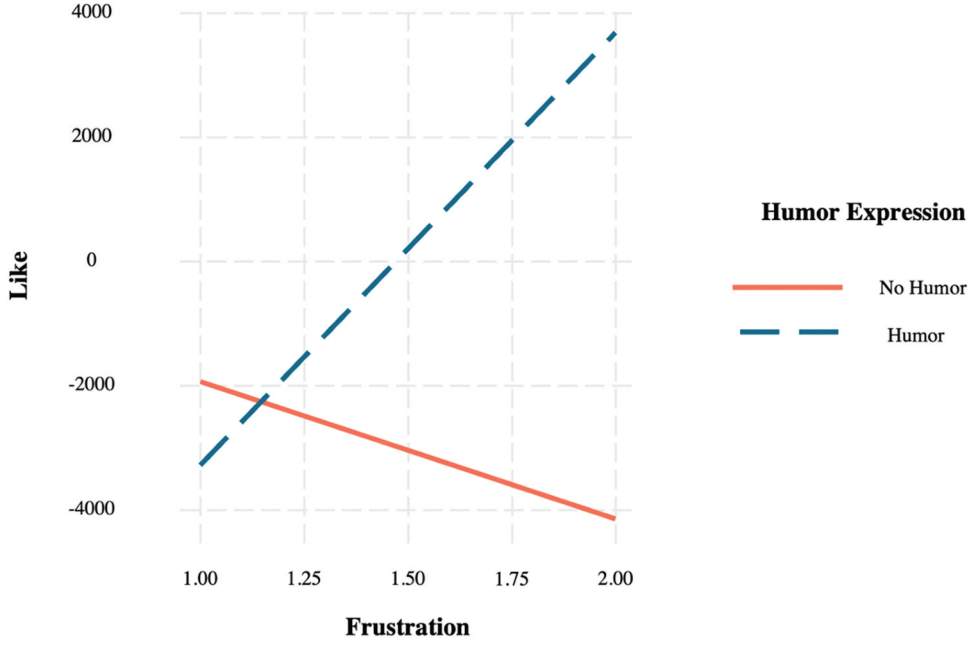

Figure 3. Interaction effects of humor and frustration on likes of videos not supportive of COVID-19 Vaccination.

we coded dichotomously for whether the video expressed discrete emotions. Future research may refine the emotion coding for their intensity since prior studies found that the intensity of emotional expression and social network structures increased digital emotion contagion (Goldenberg & Gross, 2020).

Nonetheless, this research contributed to the study of communication technology and health communication research in two aspects. First, this study recognized the unique capabilities of TikTok and analyzed message production styles on the platform. Platforms like Twitter and

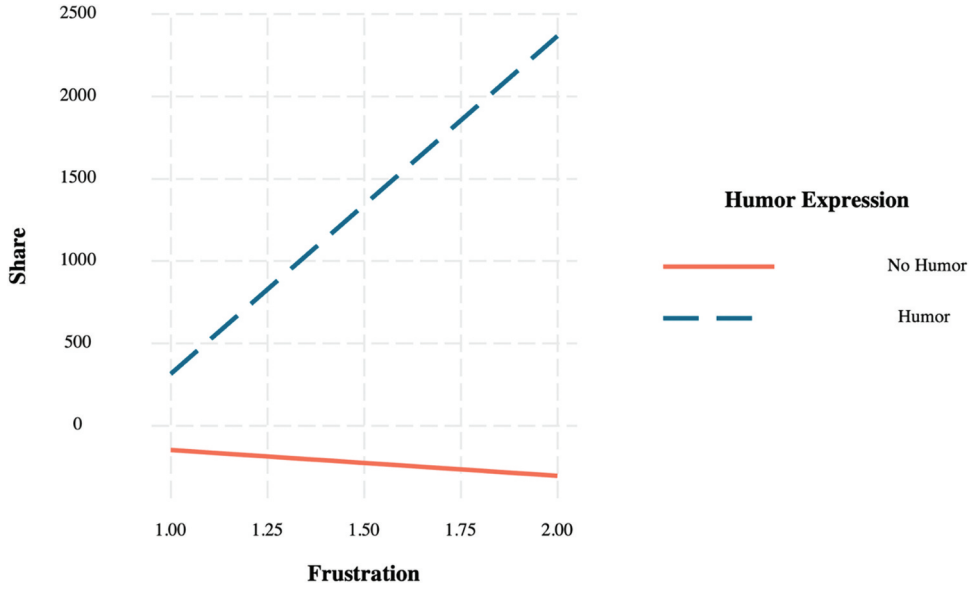

Figure 4. Interaction effects of humor and frustration on shares of videos not supportive of COVID-19 vaccination.

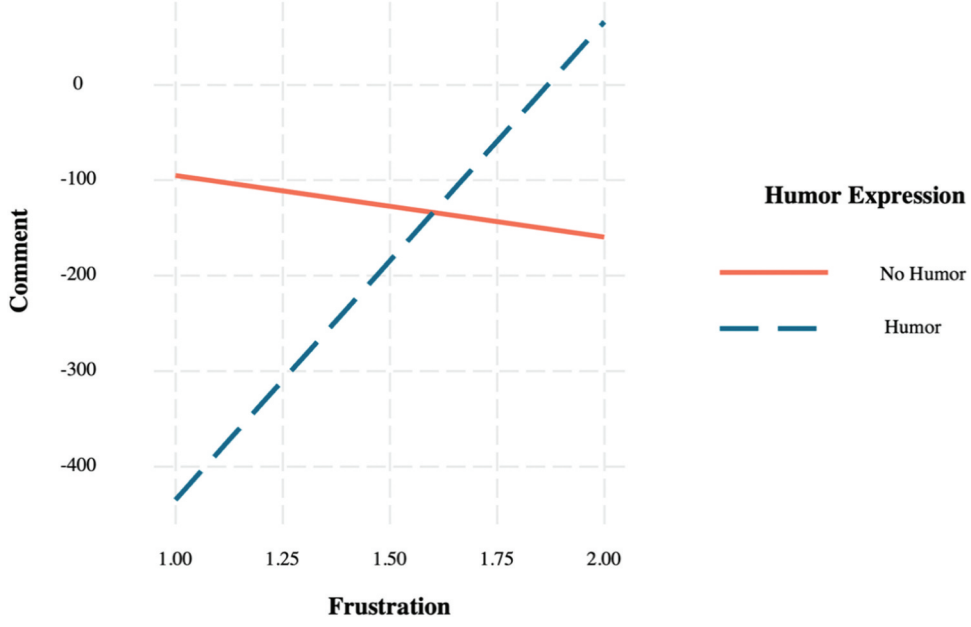

Figure 5. Interaction effects of humor and frustration on comments on videos not supportive of COVID-19 vaccination.

Facebook are widely studied in online political expression using computational approaches (Shah et al., 2015), leaving a vacuum for exploring other platforms. TikTok's more immersive GUI may construe conversational ecology in a different way that heightens the echo chamber. For example, the video modality presentation on the entire mobile screen may amplify the message's pure exposure effect. The format of video modality can also leave digital space for fictional dramas capable of building negative vaccination images without outright opposition.

Second, content analysis was applied to distinguish video types from influencers' videos that were related to user engagement measurements. Understanding video features related to negative vaccination images, particularly from humorous drama videos that also express frustration, could help counter-messaging efforts. Future studies could examine whether TikTok affordances produce "flow" experiences that may cause full involvement and addiction to the app use (Csikszentmihalyi, 1996) or the sequence of emotion flux (Nabi, 2015). In all, results from this research aim to improve understanding of the types of content presented during major public health events, how those content choices drive engagement, and ultimately aid in the counter-message design for vaccine hesitancy.

Acknowledgements

The authors thank the Mass Communication Research Center (MCRC) led by Professor Dhavan Shah at the University of Wisconsin-Madison for supporting our data collection and feedback

for this manuscript. We would also like to thank the editors and reviewers of *Health Communication* for their constructive suggestions and helpful feedback.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The author(s) reported there is no funding associated with the work featured in this article.

ORCID

Ellie Fan Yang http://orcid.org/0000-0001-7862-1374

Data availability statement

The data underlying this article will be shared on reasonable request by the corresponding author

References

Amsel, A. (1958). The role of frustrative nonreward in noncontinuous reward situations. *Psychological Bulletin*, *55*(2), 102–119. https://doi.org/10.1037/h0043125

Berkowitz, L. (1989). Frustration-aggression hypothesis: Examination and reformulation. *Psychological Bulletin*, *106*(1), 59–73. https://doi.org/10.1037/0033-2909.106.1.59

Bhandari, A., & Bimo, S. (2022). Why's everyone on TikTok now? The algorithmized self and the future of self-making on social media. *Social Media + Society*, *8*(1), 205630512210862. https://doi.org/10.1177/20563051221086241

Borden, D. S., & Suggs, L. S. (2019). Strategically leveraging humor in social marketing campaigns. *Social Marketing Quarterly*, *25*(3), 193–208. https://doi.org/10.1177/1524500419854068

Burki, T. (2019). Vaccine misinformation and social media. *Lancet Digital Health*, *1*(6), e258–e259. https://doi.org/10.1016/S2589-7500(19)30136-0

Bursztynsky, J. (2021, September 27). TikTok says 1 billion people use the app each month. *CNBC*. https://www.cnbc.com/2021/09/27/tiktok-reaches-1-billion-monthly-users.html

Chapple, C. (2020, April). TikTok crosses 2 billion downloads after best quarter for any app ever. *Sensor Tower*. https://sensortower.com/blog/tiktok-downloads-2-billion

Chen, J., & Wang, Y. (2021). Social media use for health purposes: Systematic review. *Journal of Medical Internet Research*, *23*(5), e17917. https://doi.org/10.2196/17917

Chou, W.-Y. S., & Budenz, A. (2020). Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Communication*, *35*(14), 1718–1722. https://doi.org/10.1080/10410236.2020.1838096

Csikszentmihalyi, M. (1996). *Creativity: Flow and the psychology of discovery and invention*. Harper Collins.

De Veirman, M., Cauberghe, V., & Hudders, L. (2017). Marketing through Instagram influencers: The impact of number of followers and product divergence on brand attitude. *International Journal of Advertising*, *36*(5), 798–828. https://doi.org/10.1080/02650487.2017.1348035

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366a), 427–431. https://doi.org/10.1080/01621459.1979.10482531

Dillard, A. J., Ferrer, R. A., Ubel, P. A., & Fagerlin, A. (2012). Risk perception measures' associations with behavior intentions, affect, and cognition following colon cancer screening messages. *Health Psychology*, *31*(1), 106–113. https://doi.org/10.1037/a0024787

Djafarova, E., & Rushworth, C. (2017). Exploring the credibility of online celebrities' Instagram profiles in influencing the purchase decisions of young female users. *Computers in Human Behavior*, *68*, 1–7. https://doi.org/10.1016/j.chb.2016.11.009

Dollard, J., Doob, L., Miller, N., Mowrer, O., & Sears, R. (1939). *Frustration and aggregation*. Yale University Press. https://doi.org/10.1037/10022-000

Douek, E. (2021, October 10). 1 billion TikTok users understand what congress doesn't. *The Atlantic*. https://www.theatlantic.com/ideas/archive/2021/10/problem-underestimating-tiktok/620354/

Duffy, B. E. (2017). *(Not) getting paid to do what you love: Gender and aspirational labor in the social media economy*. Yale University Press.

Eisend, M. (2009). A meta-analysis of humor in advertising. *Journal of the Academy of Marketing Science*, *37*(2), 191–203. https://doi.org/10.1007/s11747-008-0096-y

Eriksson Krutrök, M. (2021). Algorithmic closeness in mourning: Vernaculars of the hashtag #grief on TikTok. *Social Media + Society*, *7*(3). https://doi.org/10.1177/20563051211042396

Evans, S. K., Pearce, K. E., Vitak, J., & Treem, J. W. (2017). Explicating affordances: A conceptual framework for understanding affordances in communication research. *Journal of Computer-Mediated Communication*, *22*(1), 35–52. https://doi.org/10.1111/jcc4.12180

Fischer, T.-S., Kolo, C., & Mothes, C. (2022). Political influencers on YouTube: Business strategies and content characteristics. *Media and Communication*, *10*(1), 259–271. https://doi.org/10.17645/mac.v10i1.4767

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach*. Psychology Press. https://doi.org/10.4324/9780203838020

Franken, A., Laceulle, O. M., Van Aken, M. A. G., & Ormel, J. (2017). Using response surface analysis to interpret the impact of parent–offspring personality similarity on adolescent externalizing problems. *European Journal of Personality*, *31*(1), 104–117. https://doi.org/10.1002/per.2088

Fung, B., & Sands, G. (2021, December 17). Vague and viral TikTok warning of school violence is not credible but has schools and law enforcement on high alert. *CNN*. https://www.cnn.com/2021/12/17/tech/tiktok-school-threat-december-17/index.html

Goldenberg, A., & Gross, J. J. (2020). Digital emotion contagion. *Trends in Cognitive Sciences*, *24*(4), 316–328. https://doi.org/10.1016/j.tics.2020.01.009

Graham-Rowe, E., Jessop, D. C., & Sparks, P. (2014). Identifying motivations and barriers to minimising household food waste. *Resources, Conservation and Recycling*, *84*, 15–23. https://doi.org/10.1016/j.resconrec.2013.12.005

Haenlein, M., Anadol, E., Farnsworth, T., Hugo, H., Hunichen, J., & Welte, D. (2020). Navigating the new era of influencer marketing: How to be successful on Instagram, TikTok & Co. *California Management Review*, *63*(1), 5–25. https://doi.org/10.1177/0008125620958166

Harmon-Jones, E., Harmon-Jones, C., & Summerell, E. (2017). On the importance of both dimensional and discrete models of emotion. *Behavioral Sciences*, *7*(4), 66. https://doi.org/10.3390/bs7040066

Hautea, S., Parks, P., Takahashi, B., & Zeng, J. (2021). Showing they care (or don't): Affective publics and ambivalent climate activism on TikTok. *Social Media + Society*, *7*(2). https://doi.org/10.1177/20563051211012344

Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. *Communication Methods and Measures*, *1*(1), 77–89. https://doi.org/10.1080/19312450709336664

Heirich, M. (1964). The use of time in the study of social change. *American Sociological Review*, *29*(3), 386–397. https://doi.org/10.2307/2091482

Holtz, D., Carterette, B., Chandar, P., Nazari, Z., Cramer, H., & Aral, S. (2020). The engagement-diversity connection: Evidence from a field experiment on spotify. *Proceedings of the 21st ACM Conference on Economics and Computation*, 75–76. https://doi.org/10.1145/3391403.3399532

Infegy Research Team. (2023, July 28). Harnessing the power of social listening to advocate for customers. *Infegy*. https://www.infegy.com/blog

Jeronimus, B. F., & Laceulle, O. M. (2017). Frustration. In V. Zeigler-Hill & T. K. Shackelford (Eds.), *Encyclopedia of personality and individual*

differences (pp. 1–5). Springer International Publishing. https://doi.org/10.1007/978-3-319-28099-8_815-1

Jiang, X., Su, M.-H., Hwang, J., Lian, R., Brauer, M., Kim, S., & Shah, D. (2021). Polarization over vaccination: Ideological differences in twitter expression about COVID-19 vaccine favorability and specific hesitancy concerns. *Social Media + Society*, *7*(3), 205630512110484. https://doi.org/10.1177/20563051211048413

Kim, E., (ANNA), Duffy, M., & Thorson, E. (2021). Under the influence: Social media influencers' impact on response to corporate reputation advertising. *Journal of Advertising*, *50*(2), 119–138. https://doi.org/10.1080/00913367.2020.1868026

Kim, C., & Yang, S.-U. (2017). Like, comment, and share on Facebook: How each behavior differs from the other. *Public Relations Review*, *43*(2), 441–449. https://doi.org/10.1016/j.pubrev.2017.02.006

Klug, D., Evans, M., & Kaufman, G. (2023). How TikTok served as a platform for young people to share and cope with lived COVID-19 experiences. *MedieKultur: Journal of Media and Communication Research*, *38*(73), 152–170. https://doi.org/10.7146/mk.v38i73.128463

Klug, D., Qin, Y., Evans, M., & Kaufman, G. (2021). Trick and please: A mixed-method study on user assumptions about the TikTok algorithm. *13th ACM Web Science Conference 2021*, 84–92. https://doi.org/10.1145/3447535.3462512

Kozak, M., & Piepho, H.-P. (2018). What's normal anyway? Residual plots are more telling than significance tests when checking ANOVA assumptions. *Journal of Agronomy and Crop Science*, *204*(1), 86–98. https://doi.org/10.1111/jac.12220

Kramer, A. D. I., Guillory, J. E., & Hancock, J. T. (2014). Experimental evidence of massive scale emotional contagion through social networks. *Proceedings of the National Academy of Sciences*, *111*(29), 10779–10779. https://doi.org/10.1073/pnas.1320040111

Krippendorff, K. (2004). *Content analysis: An introduction to its methodology* (2nd ed.). Sage.

Lee, M. T., & Theokary, C. (2021). The superstar social media influencer: Exploiting linguistic style and emotional contagion over content? *Journal of Business Research*, *132*, 860–871. https://doi.org/10.1016/j.jbusres.2020.11.014

Lichtenstein, D., & Nitsch, C. (2023). Content analysis in the research field of satire. In F. Oehmer-Pedrazzi, S. H. Kessler, E. Humprecht, K. Sommer & L. Castro (Eds.), *Standardized content analysis in communication research* (pp. 277–286). Springer.

Little, H. (2022). The use of satire to communicate science in Don't Look Up. *Journal of Science Communication*, *21*(5), 1–6. https://doi.org/10.22323/2.21050306

Lorenz, T. (2022, March 11). The White House is briefing TikTok stars about the war in Ukraine. *The Washington Post*. https://www.washingtonpost.com/technology/2022/03/11/tik-tok-ukraine-white-house/

Macafee, T. (2013). Some of these things are not like the others: Examining motivations and political predispositions among political Facebook activity. *Computers in Human Behavior*, *29*(6), 2766–2775. https://doi.org/10.1016/j.chb.2013.07.019

Matthews, O., Davies, A., Vigo, M., & Harper, S. (2020). Unobtrusive arousal detection on the web using pupillary response. *International Journal of Human-Computer Studies*, *136*, 102361. https://doi.org/10.1016/j.ijhcs.2019.09.003

McCrae, R. R., Costa Jr., P. T., & Martin, T. A. (2005). The NEO–PI–3: A more readable revised NEO Personality Inventory. *Journal of Personality Assessment*, *84*(3), 261–270. https://doi.org/10.1207/s15327752jpa8403_05

Medina Serrano, J. C., Papakyriakopoulos, O., & Hegelich, S. (2020). Dancing to the partisan beat: A first analysis of political communication on TikTok. *12th ACM Conference on Web Science*, 257–266. https://doi.org/10.1145/3394231.3397916

Molder, A. L., Lakind, A., Clemmons, Z. E., & Chen, K. (2022). Framing the global youth climate movement: A qualitative content analysis of Greta Thunberg's moral, hopeful, and motivational framing on Instagram. *The International Journal of Press/Politics*, *27*(3), 668–695. https://doi.org/10.1177/19401612211055691

Molina, M. D., Wang, J., Sundar, S. S., Le, T., & DiRusso, C. (2023). Reading, commenting and sharing of fake news: How online bandwagons and bots dictate user engagement. *Communication Research*, *50*(6), 667–694. https://doi.org/10.1177/00936502211073398

Moyer-Gusé, E., Robinson, M. J., & McKnight, J. (2018). The role of humor in messaging about the MMR vaccine. *Journal of Health Communication*, *23*(6), 514–522. https://doi.org/10.1080/10810730.2018.1473533

Myrick, J. G., & Oliver, M. B. (2015). Laughing and crying: Mixed emotions, compassion, and the effectiveness of a YouTube PSA about skin cancer. *Health Communication*, *30*(8), 820–829. https://doi.org/10.1080/10410236.2013.845729

Nabi, R. L. (2010). The case for emphasizing discrete emotions in communication research. *Communication Monographs*, *77*(2), 153–159. https://doi.org/10.1080/03637751003790444

Nabi, R. L. (2015). Emotional flow in persuasive health messages. *Health Communication*, *30*(2), 114–124. https://doi.org/10.1080/10410236.2014.974129

Nabi, R. L. (2016). Laughing in the face of fear (of disease detection): Using humor to promote cancer self-examination behavior. *Health Communication*, *31*(7), 873–883. https://doi.org/10.1080/10410236.2014.1000479

Nan, X., Iles, I. A., Yang, B., & Ma, Z. (2022). Public health messaging during the COVID-19 pandemic and beyond: Lessons from communication science. *Health Communication*, *37*(1), 1–19. https://doi.org/10.1080/10410236.2021.1994910

Nisbet, M. C., & Kotcher, J. E. (2009). A two-step flow of influence?: Opinion-leader campaigns on climate change. *Science Communication*, *30*(3), 328–354. https://doi.org/10.1177/1075547008328797

Orlowski, J. (2020). *The social dilemma*. Netflix.

Papacharissi, Z. (2015). *Affective publics: Sentiment, technology, and politics*. Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199999736.001.0001

Papacharissi, Z. (2016). Affective publics and structures of storytelling: Sentiment, events and mediality. *Information, Communication & Society*, *19*(3), 307–324. https://doi.org/10.1080/1369118X.2015.1109697

Peng, T., & Zhu, J. J. H. (2023). [Pre-print] Understanding online behaviors through a temporal lens. *ArXiv*. https://arxiv.org/abs/2301.05996

Peretti-Watel, P., Seror, V., Cortaredona, S., Launay, O., Raude, J., Verger, P., Fressard, L., Beck, F., Legleye, S., L'Haridon, O., Léger, D., & Ward, J. K. (2020). A future vaccination campaign against COVID-19 at risk of vaccine hesitancy and politicisation. *The Lancet Infectious Diseases*, *20*(7), 769–770. https://doi.org/10.1016/S1473-3099(20)30426-6

Punton, G., Dodd, A. L., McNeill, A., & Scott, S. (2022). 'You're on the waiting list': An interpretive phenomenological analysis of young adults' experiences of waiting lists within mental health services in the UK. *PLOS ONE*, *17*(3), e0265542. https://doi.org/10.1371/journal.pone.0265542

Puri, N., Coomes, E. A., Haghbayan, H., & Gunaratne, K. (2020). Social media and vaccine hesitancy: New updates for the era of COVID-19 and globalized infectious diseases. *Human Vaccines & Immunotherapeutics*, *16*(11), 2586–2593. https://doi.org/10.1080/21645515.2020.1780846

Putnam, S. P., Ellis, S. K., & Rothbart, M. K. (2001). The structure of temperament from infancy through adolescence. In A. Eliasz & A. Engleneiter (Eds.), *Advances in research on temperament* (pp. 165–182). Pabst Scientist Publicer.

Raab, K., Wagner, R., & Salem, M. (2020). "Feeling the waste": Evidence from consumers' living in Gaza Strip camps. *Journal of Consumer Marketing*, *37*(7), 921–931. https://doi.org/10.1108/JCM-04-2019-3171

Ratcliff, C. L., Fleerackers, A., Wicke, R., Harvill, B., King, A. J., & Jensen, J. D. (2023). Framing COVID-19 preprint research as uncertain: A mixed-method study of public reactions. *Health Communication*, 1–14. https://doi.org/10.1080/10410236.2023.2164954

Rathje, S., van Bavel, J. J., & van der Linden, S. (2021). Out-group animosity drives engagement on social media. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(26), 1–9. https://doi.org/10.1073/pnas.2024292118

Ridout, T. N., & Searles, K. (2011). It's my campaign I'll cry if I want to: How and when campaigns use emotional appeals. *Political Psychology*, *32*(3), 439–458. https://doi.org/10.1111/j.1467-9221.2010.00819.x

Rubin, A. M., & Step, M. M. (2000). Impact of motivation, attraction, and parasocial interaction on talk radio listening. *Journal of Broadcasting & Electronic Media*, *44*(4), 635–654. https://doi.org/10.1207/s15506878jobem4404_7

Sallam, M., Dababseh, D., Yaseen, A., Al-Haidar, A., Taim, D., Eid, H., Ababneh, N. A., Bakri, F. G., Mahafzah, A., & Osório, F. L. (2020). COVID-19 misinformation: Mere harmless delusions or much more? A knowledge and attitude cross-sectional study among the general public residing in Jordan. *PLOS ONE*, *15*(12), e0243264. https://doi.org/10.1371/journal.pone.0243264

Schouten, A. P., Janssen, L., & Verspaget, M. (2021). Celebrity vs. Influencer endorsements in advertising: The role of identification, credibility, and product-endorser fit. In S. Yoon, Y. K. Choi & C. R. Taylor (Eds.), *Leveraged marketing communications: The importance of studying the transfer of object-to-brand associations* (pp. 208–231). Routledge.

Shah, D. V. (2016). Conversation is the soul of democracy: Expression effects, communication mediation, and digital media. *Communication and the Public*, *1*(1), 12–18. https://doi.org/10.1177/2057047316628310

Shah, D. V., Culver, K. B., Hanna, A., Macafee, T., & Yang, J. (2015). Computational approaches to online political expression: Rediscovering a "science of the social. In S. Coleman & D. Freelon (Eds.), *Handbook of digital politics* (pp. 281–305). Edward Elgar.

Shao, W., & Hao, F. (2021). Understanding American public support for COVID-19 risk mitigation: The role of political orientation, socio-demographic characteristics, personal concern, and experience, the United States, 2020. *International Journal of Public Health*, *66*. https://doi.org/10.3389/ijph.2021.1604037

Shen, L. J. (2017). Putting the fear back again (and within individuals): Revisiting the role of fear in persuasion. *Health Communication*, *32*(11), 1331–1341. https://doi.org/10.1080/10410236.2016.1220043

Shen, L. J., & Bigsby, E. (2012). The effects of message features: Content, structure, and style. In J. P. Dillard & L. J. Shen (Eds.), *The SAGE handbook of persuasion: Developments in theory and practice* (2nd ed., pp. 20–35). Sage. https://doi.org/10.4135/9781452218410.n2

Shen, F., Sheer, V. C., & Li, R. (2015). Impact of narratives on persuasion in health communication: A meta-analysis. *Journal of Advertising*, *44*(2), 105–113. https://doi.org/10.1080/00913367.2015.1018467

Sun, Y., & Lu, F. (2023). How misinformation and rebuttals in online comments affect people's intention to receive COVID-19 vaccines: The roles of psychological reactance and misperceptions. *Journalism & Mass Communication Quarterly*, *100*(1), 145–171. https://doi.org/10.1177/10776990221084606

Swartz, J., Wasko, J., Marvin, C., Logan, R. K., & Coleman, B. (2019). Philosophy of technology: Who is in the saddle? *Journalism & Mass Communication Quarterly*, *96*(2), 351–366. https://doi.org/10.1177/1077699019841380

Teng, S., Khong, K. W., Chong, A. Y. L., & Lin, B. (2017). Persuasive electronic word-of-mouth messages in social media. *Journal of Computer Information Systems*, *57*(1), 76–88. https://doi.org/10.1080/08874417.2016.1181501

TikTok. (2021, March 25). TikTok creator fund: Your questions answered. *TikTok*. [Press release]. https://newsroom.tiktok.com/en-gb/tiktok-creator-fund-your-questions-answered

Van Poucke, M. (2023). COVID-19 vaccine hesitancy and shaming on TikTok: A multimodal appraisal analysis. *Multimodality & Society*, *3*(2), 97–129. https://doi.org/10.1177/26349795231153955

Yang, F. E., Shah, D. V., Tahk, A., Vjorn, O., Dietz, S., Pe-Romashko, K., Bailey, E., Gicquelais, R. E., Hwang, J., Gustafson, D. H., & Westergaard, R. (2023). mHealth and social mediation: Mobile support among stigmatized people living with HIV and substance use disorder. *New Media & Society*, *25*(4), 702–731. https://doi.org/10.1177/14614448231158653

Zhang, X. A., & Cozma, R. (2022). Risk sharing on Twitter: Social amplification and attenuation of risk in the early stages of the COVID-19 pandemic. *Computers in Human Behavior*, *126*, 106983. https://doi.org/10.1016/j.chb.2021.106983

Zhao, X., Roditis, M. L., & Alexander, T. N. (2019). Fear and humor appeals in "The Real Cost" campaign: Evidence of potential effectiveness in message pretesting. *American Journal of Preventive Medicine*, *56*(2), S31–S39. https://doi.org/10.1016/j.amepre.2018.07.033

Zhong, Y., Liu, W., Lee, T.-Y., Zhao, H., & Ji, J. (2021). Risk perception, knowledge, information sources and emotional states among COVID-19 patients in Wuhan, China. *Nursing Outlook*, *69*(1), 13–21. https://doi.org/10.1016/j.outlook.2020.08.005

Zhou, S., Barnes, L., McCormick, H., & Blazquez Cano, M. (2021). Social media influencers' narrative strategies to create eWOM: A theoretical contribution. *International Journal of Information Management*, *59*. https://doi.org/10.1016/j.ijinfomgt.2020.102293

Appendix

Table A1. Levene's test to check the homogeneity of variances for ANOVA test.

	Levene's statistic	*df*	*p*
Likes	.73	2	.485
Shares	1.13	2	.325
Comments	2.33	2	.100

Table A2. Means, standard deviations, and one-way analyses of variance in likes, shares, and comments after excluding outliers.

	Personal vaccine experience		Fictitious drama		Instructional information sharing				
Measure	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	η^2	*p*
Likes	247.82	331.70	171.63	287.13	396.91	508.96	1.27	.01	.284
Shares	13.39	16.55	8.97	13.66	14.41	21.09	1.08	.01	.342
Comments	28.11	32.80	22.20	29.72	22.23	26.73	2.00	.02	.138

Note. ANOVA model was applied to the log format of the three engagement indicators.

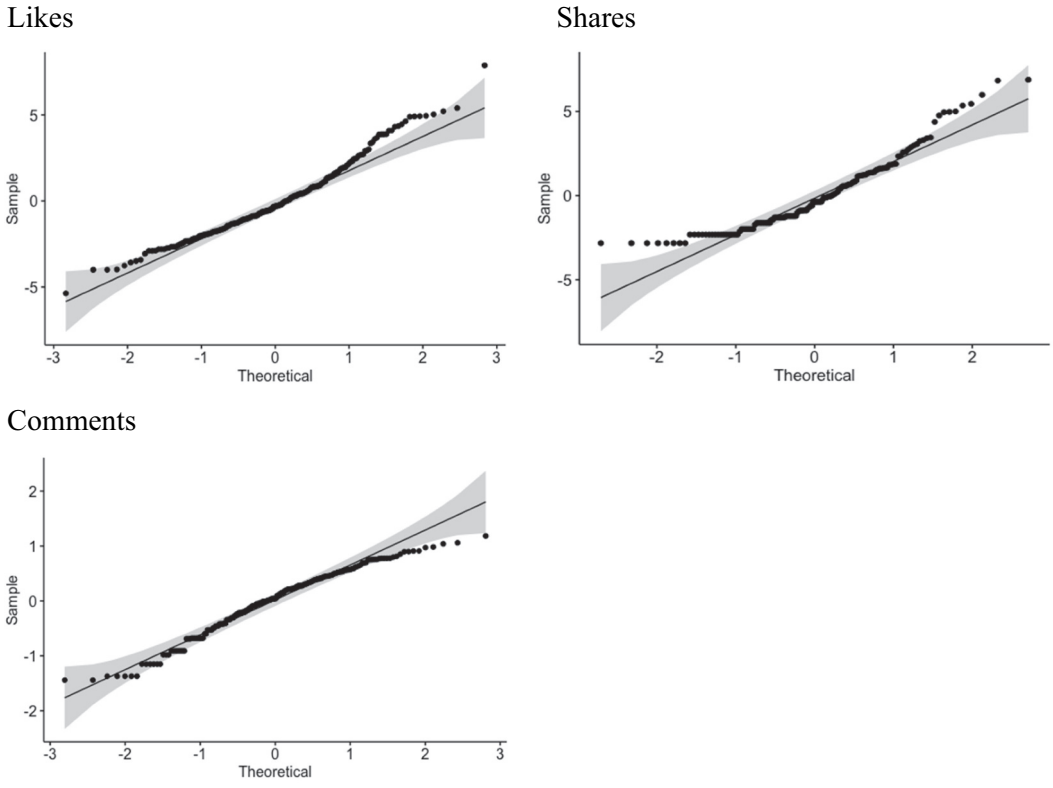

Figure A1. Residual plot for normality and outlier assumption test.