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From Fork Hands to Microchips: An Analysis of Trending #CovidVaccine Content on TikTok

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TikTok has grown in popularity and has become a platform where users engage with information about COVID-19 in diverse and playful ways. As of July 2021, TikTok videos posted with the hashtag #CovidVaccine collectively received more than 1.4B views, making it the most prominent COVID-related hashtag on TikTok. This study investigates the discourse about COVID-19 vaccination on TikTok by analyzing 100 top TikTok videos that used the hashtag #CovidVaccine. The findings show an overwhelming number of the trending videos were created by citizens who did not identify themselves as professionals or experts, with a low contribution from mega-influencers compared with other influencer types. Content was largely positive in tone toward COVID-19 vaccines, with neutral videos less prominent, offering an agnostic tone about the vaccines. This study highlights some of the challenges and opportunities facing health communicators who seek to better understand TikTok and its audiences and find creative ways to communicate vaccine advocacy on such a pathos-centric, ambiguous platform.

Keywords: TikTok, COVID-19, vaccine, trending hashtags, public health communication

On Sunday, July 25, 2021, at 7:00 p.m., during the peak of the COVID-19 outbreak in New South Wales, the state's Chief Health Officer, Dr. Kerry Chant, gave Australia's first ever TikTok LIVE address. Facing a concerning day of COVID-19 cases as well as two deaths, the session was a live Q&A where Dr. Chant responded to questions from "collaborators," TikTok influencers defined as "a diverse group of creators from different backgrounds and perspectives" (Thomas, 2021, para. 5). This event offered a pertinent example of how COVID-19 public health communicators are attempting to harness this new and playful digital space (Southerton, 2021) for engaging with younger audiences about COVID.

Social media is incredibly popular for people to receive information about their community and local and international issues. A recent study of university students in the United Kingdom and Turkey found that

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nearly half of the sample spent at least 75% of their time on social media. It further found that all students interviewed consumed 90% of their news from online sources (Yanardağoğlu, 2021). Pandemic times have shifted toward insularity, with interpersonal connections occurring online rather than in person.

Our Web search for the social media accounts connected to key government public health agencies globally found that the most-used platforms were Facebook, Instagram, and Twitter, with press conferences livestreamed on Facebook. Comparatively fewer agencies appear to have an active presence on TikTok. As of July 2021, the World Health Organization (WHO) was the main public health organization actively using TikTok. Although the United Kingdom's NHS has a TikTok account, the account was last used in April 2021 and has only eight posted videos.

Given the increasing popularity and prominence of TikTok, we wanted to explore the top 100 trending videos using #CovidVaccine, amid the global public health crisis. In what ways were COVID-19 vaccines and vaccination being characterized on TikTok, and what affordances were employed to do this? What was the theme and style of this widely shared content, and what was the level of user engagement? What was the overall tone in these videos about COVID-19 vaccines and vaccination, and what sort of rhetoric was featured in these posts? We also wanted to map the influencer status of the content creators in these trending videos, and whether the creator indicated any professional affiliations. By better understanding the features of posts with high engagement under this hashtag, we can identify potential opportunities and risks for communicating health information on TikTok.

Background

Owned by Beijing-based company, ByteDance, TikTok was launched in 2017 and has received a steady incline in popularity. In 2020, it was the most downloaded app; by December 2020, it had been downloaded 6 billion times since its inception (De Leyn, De Wolf, Vanden Abeele, & De Marez, 2021). TikTok is popular among those under 30 with statistics showing that some users are as young as six (Auxier & Anderson, 2021; De Leyn et al., 2021). According to Wang (2020), short-form videos can be substantial in content. Influencers can persuade viewers in less than 15 seconds and generate views, likes, comments, and shares of their videos. A para-social bond can develop between followers and social media influencers (Wang, 2020). This is what makes TikTok appealing in the context of health communication more broadly, and for encouraging uptake of COVID-19 vaccination, specifically.

The definition of social media influencers varies between scholars and practitioners, popular media, and audiences (Ruiz-Gomez, 2019). Their "fame" is achieved in a very distinct way from traditional media forms: there are no gatekeepers, users provide the content as well as the audience (Ruiz-Gomez, 2019), and the economic capital value of the influencer is determined by the user's social capital (Zulli, 2018), which is accumulated by attracting followers and "likes." In social media influence, the capacity to attract an audience's attention is paramount (Abidin, 2014). Useful to this discussion is an understanding of the different categories of influencers (Ruiz-Gomez, 2019), which include the following: micro-influencers (with a following of up to 99k); macro-influencers (with a following of 100k to 1 million at an "advanced" level); and mega-influencers (with more than 1 million followers). Separate from these influencer definitions that were used in this study, TikTok also has a verification process. The blue tick is applied by TikTok when a

notable user wants to show other users that theirs is the authentic account. This process assists users in making informed decisions about who they follow. Many high-profile accounts seek this badge, but TikTok highlights that it does not imply endorsement (TikTok, n.d-b).

TikTok speaks the language of relatability to its networked publics, rather than the aspirational sentiment of "picture perfect" Instagram (Abidin, 2020). Those who reach influencer status rely on "performances of relatability," such as personal stories, as a crucial feature of the TikTok attention economy (Abidin, 2020, p. 83). Through her ethnographic work on the platform, Abidin (2020) points out that during COVID, "content genres and relational styles" mattered more than body image for influencers (p. 84). TikTok influencers work to ensure they are noticed, engage in "visibility labour" (Abidin, 2016, p. 86) wherein they strive to please the platform to drive their visibility, work the algorithm, and ultimately grow in popularity (Abidin, 2020). Southerton (2021) acknowledges that content creators are not just expressing their own psychological state or sentiments but are simultaneously providing "an offering toward a collective affective state a viewer of the TikTok may feel, which is constantly shifting within the many broader communities on the platform" (p. 3252). She points toward a "shifting collective emotional tone" via memes, and references to "current events and trends on the platform" (Southerton, 2021, p. 3252). A key avenue for generating a collective emotional tone is storytelling. Algorithms, viral meme templates, influencer status, and social media optimization (SMO) techniques including hashtags and the use of popular music, each contribute to visibility labor and highlight the complex landscape facing researchers of this platform.

In February 2021, social media and online communication sites, including TikTok, Facebook, and Twitter, began combating misinformation and disinformation related to COVID-19. They signed an industry code that saw the sites collectively remove thousands of posts that were found to be spreading disinformation. TikTok took a particular focus on medical misinformation. The site further added a COVID-19 label to any video that was related in some way to the pandemic. The label points users to verified health sources (TikTok, n.d-a). However, a recent study by NewsGuard, in which nine children—ranging in age from 9 to 17—were asked to create TikTok accounts to measure the time it took for their accounts to be fed COVID-19 misinformation, found that 88% of the sample were fed misinformation within 35 minutes and 66% of those were specific to COVID-19 vaccines (Cadier, Goldin, Labbe, Padovese, & Stahlhofen, 2021). TikTok runs on a recommendation system that uses algorithms to deliver videos that would be most interesting to users based on past interactions and views. However, in the Cadier et al. (2021) study, misinformation was delivered regardless of whether the participant was engaging actively or minimally with the platform. It is a platform that encourages content engagement rather than engagement with individuals (Zulli & Zulli, 2020). In the TikTok space, quantifiable performance based on the user's posts has surpassed ideations of a persona or "brand" characteristic of YouTube and Instagram (Abidin, 2020). Engagements with individual posts and generating views, likes, comments, and shares are crucial driving forces for users on this platform, to be cataloged by the platform's For You Page (Abidin, 2020). For those seeking celebrity status, users negotiate the vagaries of virality by being attuned to what is "going viral" to ensure their visibility on the app (Abidin, 2020, p. 79). Users can like, share, and comment on videos, which contribute to the way the platform's algorithms recommend videos (TikTok, 2020). This algorithmic approach creates an "anesthetic" effect (Fang, Wang, & Hao, 2019) where the users delve into continuous viewing based on curiosity and interest (Vázquez-Herrero, Negreira-Rey, & López-García, 2020). Therefore, to be noticed, content creators must post videos that

capture the attention of the collective audience. Although the TikTok algorithm is complex, SMO techniques such as hashtags are important in ensuring content is identified by the algorithm (Krutrök, 2021). Notably, the key function of SMO is to gain maximum visibility on the platform.

Going back to our research questions articulated earlier, the use of persuasive rhetoric is relevant to the attention economy of TikTok. As Aristotle argued, convincing others of the veracity of messages relies on reason (logos), character of the speaker or source (ethos), and emotion (pathos), combined with the use of rhythm, harmony, and dynamism (Stockwell, 2005). For instance, ethos considers the perception of qualification and validity in delivering the message (English, Sweetser, & Ancu, 2011), while logos appeals to an audience's reasoned logic. The use of pathos offers a specific emotional appeal, ranging from tragedy to humor. Audience attitudes to humor have shifted over time. The findings of a 2011 audience-reception study among university students indicated that humor decreased perceptions of credibility, suggesting the persuasive impact of YouTube clips using humor was lost (English et al., 2011). However, humor has since become a fundamental approach to social media with the rise of memetic humor (Sebba-Elran, 2021). Social media is used to negotiate arduous topics through ironic humor and, in the process, release some of the social tension associated with the topic (Gal, 2019). Ironic humor can be ambiguous because the "said" message is often different from the "meant" message and relies upon the audience's interpretation to be in line with the proposed interpretation (Day, 2008; Gal, 2019). There are many contributors to how the audiences interpret messages because the interpretation occurs in the space between what is "said" and what is "meant."

There are communicative challenges for public health messaging on a platform like TikTok. A study of top posts about the human papillomavirus (HPV) vaccine found that although most posts were pro-vaccine, the anti-vaccine posts had the highest number of interactions (Boatman, Eason, Conn, & Kennedy-Rea, 2021). False or "fake" news typically reaches more online audiences than fact-checked news (Vosoughi, Roy, & Aral, 2018). Despite this ongoing potential to perpetuate health misinformation and disinformation about COVID-19 on an enormous scale, TikTok also offers valuable opportunities for communicating health messages in a public health crisis. Phenomenally popular, particularly with those aged under 30 (Auxier & Anderson, 2021), the platform's potential for engaging with pandemic-attuned audiences has not yet been fully realized (Li, Guan, Hammond, & Berrey, 2021; Mheidly & Fares, 2020). At the same time, public health agencies (Basch, Hillyer, & Jaime, 2020) and health professionals have been using TikTok to disseminate COVID-19 information (Southerton, 2021), drawing on their credibility and expertise to share knowledge about the risks of SARS-CoV-2 and the benefits of protection from COVID-19 disease through vaccines. In the spirit of crowdsourcing, which has been successful in countries like China (Ding, 2021), expert and nonexpert citizens alike are taking action to play some sort of role in vaccine-positive messaging, capitalizing on the very performative, memetic, and relatable nature of the platform.

Materials and Methods

Data Gathering

Using the discover feature, we searched TikTok for the highest trending hashtag related to COVID-19 vaccinations. The discover feature is a function that allows users to discover trending videos based on hashtags, music, or creators. It can also be used as a search tool. Adapting the approach taken by Basch and colleagues

(2020), on the collection date (July 4, 2021), which coincided with the spread of the Delta variant, the highest trending hashtag was #CovidVaccine with 1.4B views. Although the algorithms of TikTok are complex, a user seeking information on the COVID-19 vaccine would be shown videos that use this hashtag. The top 100 trending videos on that date were collected for analysis. The videos were algorithmically ordered on the discover feature as the top 100 videos and were collected in the presented order to ensure we replicated how users would see the videos if the same search was conducted or if a user clicked on the trending hashtag. First, we collected the number of likes, comments, shares, and views to map and quantify user engagement (Li et al., 2021). We then collected the metadata of each video, including the following: the date of the post; the language of the video (videos in languages other than English were translated into English for coding); the country of origin (where known); whether the video was created by a citizen or a professional (the content creator's profile page was used to determine this information); and the hashtags used. Of the top 100 videos collected, two were unrelated to COVID-19 vaccines or vaccination in general. A further two became unavailable: one was made private by the content creator, and the second was removed along with the entire account. This is not uncommon because of the ever-evolving nature of social media and highlights the challenges for social media researchers (Villegas, 2016). To maintain the sample size, the original saved search as it appeared on July 4, 2021, was revisited to collect the next four videos.

Coding and Intercoder Reliability

A codebook (https://figshare.com/articles/online_resource/TikTok_analysis_Codebook/19688259) was prepared to record and define the coding categories that emerged from the data. Initially, specific themes were identified in the data set, and these were then built upon in a pilot coding and for the final intercoder reliability coding. Any new thematic codes that emerged during the final coding process were discussed and agreed upon before being added to the codebook. Content was coded based on its style (e.g., skit, animation, monologue, rant) and theme (e.g., mocked anti-vaccination logic, personal commentary, information sharing). We also coded for rhetorical approaches used in the video (logos, ethos, and pathos). Several coding categories allowed more than one code to be applied to a video. Finally, we coded for the emotional tone of the post toward vaccines or vaccination (positive, negative, neutral, or mixed), which draws attention to specific word choices and other features, such as textual, visual, and audio, that work to create a particular impression about the COVID-19 vaccines. For example, a video of a creator wearing a one-sleeved shirt who receives a compliment on her unusual outfit, and responds with: "Oh, thank you! I wanted to make sure it was easier for the nurse to give me the vaccine" (Fiamme, 2021) was coded as positive. In contrast, a video coded as negative involved the content creator pretending to have a series of small "fits" or tics (i.e., seizures or involuntary spasms) after receiving the vaccine (Powell, 2020).

For testing intercoder reliability, both authors co-coded 10 videos from the sample selected to include an appropriate breadth and diversity of video types that could be determined based on the manifest coding categories that the first coder had created. The intercoder reliability score from this pilot coding study was .68 (Cohen's kappa), showing a moderate to substantial level of agreement (Hallgren, 2012; Landis & Koch, 1977). The authors then revised and discussed any areas of discrepancy in coding, adjusting coding categories that may have been ambiguous or that may have been able to be

merged within another code. For the final intercoder reliability study, another 20 samples were selected, again based on diversity in terms of video type (based on theme and style of content), content creator, influencer status (using Ruiz-Gomez, 2019, definitions), and topic, which each author blindly coded. The intercoder agreement was substantial (K = .79), and the remainder of the videos (70) were coded by the two coders (35 each).

Ethics

The study was approved by the Griffith University Human Research Ethics Committee (2021/720). This process determined TikTok to be a public platform where creators want their content discoverable. The TikTok Terms of Use also highlight that content may be used and replicated by others. The Terms of Use, the visibility labor of each creator, and the significant number of views for each video in the data set were each considered, and it was determined that the research could be conducted without contact being made with the content creators. We have chosen to show screengrabs and video links to give readers a better sense of how the content appears on the platform.

Results

We identified 100 posts from 98 unique creators (i.e., when the same content creator appeared more than once in the data set, we did not count them twice) in our sample. The majority (n = 67) of creators in this sample belonged to citizens, which were accounts where the creators did not state any discernible professional status. Ten creators identified themselves as entertainers. Eight of the creators indicated they were health practitioners (six doctors and two nurses), a term we limited to include practitioners who would come into direct contact with COVID-19 patients, and three content creators were scientists. The remaining accounts (n = 10) indicated some form of professional status, (e.g., phlebotomist, lawyer, doula, author, police officer, fitness expert). Further to this breakdown, nine videos came from seven verified accounts.

Ninety-one percent of all posts originated from the United States, with only four posts from the United Kingdom, three from Europe, and one from the Philippines. Ninety-four percent of all posts were in English, three in Spanish, and one in Italian, Filipino, and French.

While most videos were from some form of TikTok influencer, non-influencers were substantially more prominent in this study than mega-influencers (Figure 1). This study showed very little difference between macro-influencers (n = 32) and micro-influencers (n = 31). Notably, mega-influencers were present only in content that was positive about vaccines.

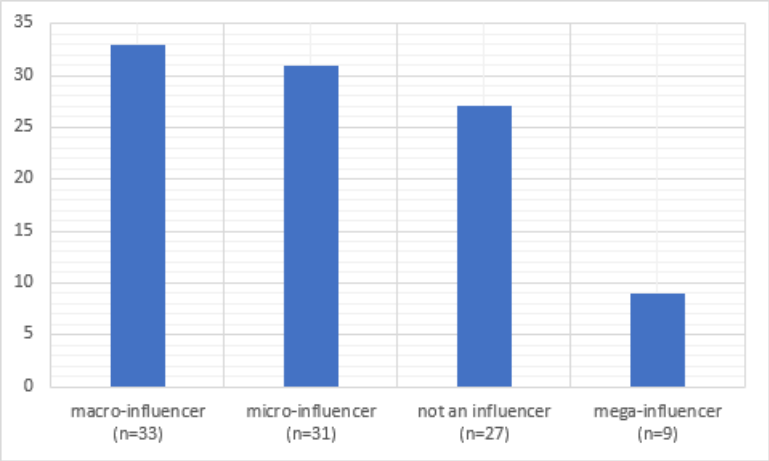

Figure 1. Proportion of different types of influencers.

The tone of the videos had a strong tendency to be positive toward COVID-19 vaccines or vaccination (*n* = 59; Figure 2). Thirty videos were categorized as neutral in tone, while a few videos were either negative (*n* = 6) or mixed (*n* = 5) in tone.

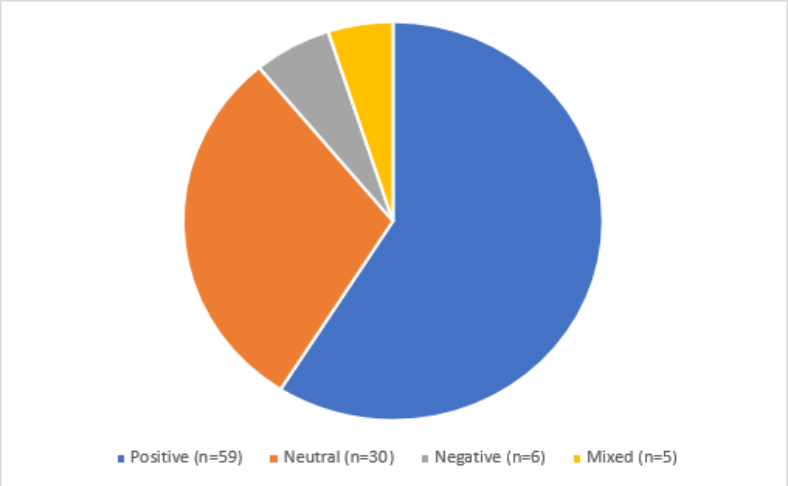

Figure 2. Proportion of TikToks by tone.

For measuring the style of post, the highest proportion of videos (*n* = 44) were based on a personal experience of the content creator, tracking their experience of receiving the vaccine or their intention to receive the vaccine (Figure 3). Posts, where the creator offered a monologue, were one of the more frequent content styles (*n* = 32), followed by comedic skits (*n* = 26). Information sharing (*n* = 17) and scientific information sharing (*n* = 13) were less common, as were rants (*n* = 7), emotive videos (*n* = 5), and animations (*n* = 3). There was only one post each for videos coded as pranks, music videos, and roleplay.

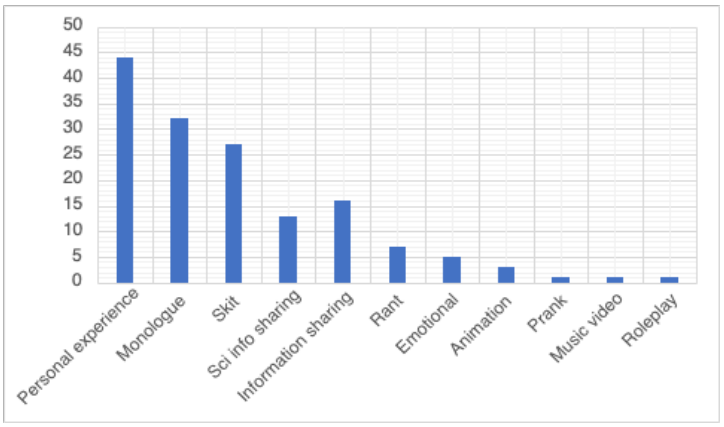

Figure 3. Frequency by style of post.

Similarly, with the coding for the theme (Figure 4), the highest proportion of videos (*n* = 38) included personal commentary in which the creator based the narrative on their own experiences, observations, or opinions. The next highest number was social commentary (*n* = 33). The video was based on the content creator's observations of other people, organizations, communities, or social issues more broadly, relevant to vaccines or vaccination. Posts, where the creator mocked anti-vaccine logic, were also quite prominent (*n* = 28), followed by videos that normalized the vaccine experience (*n* = 26). Twenty-four videos were coded as advocating for the vaccine, while 22 videos were found to have content that could fuel anti-vaccine messages. Fewer videos provided links that supported public health messages (*n* = 14) or provided biomedical commentary about the vaccine (*n* = 12). Eight videos focused on the freedoms that the vaccine could bring; the same number of videos provided political commentary. Addressing fears related to the vaccine were less common (*n* = 7), and three videos were found to have no purpose other than seeking likes. Sixty-five percent of the videos used an element of humor, while only 27% linked to official messages.

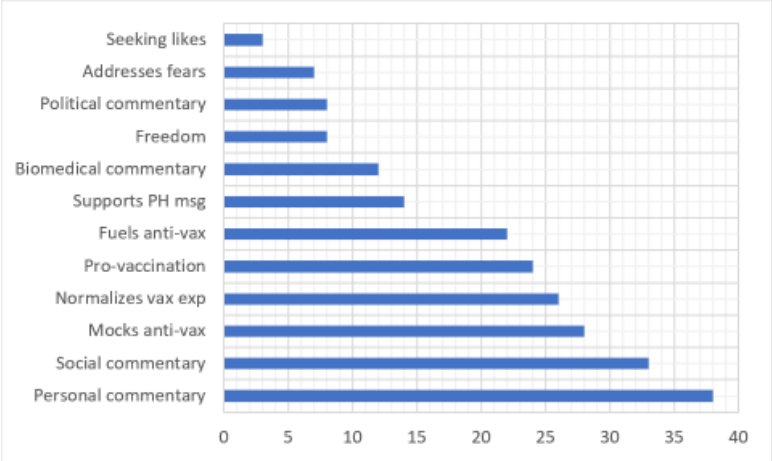

Figure 4. Frequency by theme of post.

We also coded for rhetorical communication approaches. Again, more than one code could be applied to the video. Not all the videos used persuasive rhetoric. Some were "neutral" based on personal experience/storytelling and appeared to be seeking likes. Of the 100 collected videos, 93 used pathos; this included videos that used humor and emotive rhetorical techniques. Fifty-five videos used some form of logos, while only 22 videos carried elements of ethos.

Discussion

Cumulatively, the collected videos were viewed more than 340 million times with individual videos receiving a minimum of 12,000 views and a maximum of 23 million views. There was a low number of mega-influencers represented in the data, which is consistent with other studies (Abidin, 2020; Southerton, 2021). However, the viewership shows the reach that TikTok can have. The predominance of videos that recounted content creators' personal experiences delivered via commentary and monologue coheres with Abidin's (2020) observations of the "communicative intimacies" that exist between influencers and followers (p. 83). Fundamental to establishing such intimacies are performances that are perceived as both relatable (Abidin, 2020) and authentic; intrinsic properties of the TikTok platform. Influencers may work to cultivate an aura of authenticity, even striving for an appearance of amateurism, given its importance on the platform (Abidin, 2016). Contrived authenticity is not new with the arrival of TikTok; it has been a long-held technique across many genres, such as documentary, reality television, blogs, social media platforms, and feature films. Although influencers dominated all content in our study, non-influencers still accounted for a reasonable proportion of content (Figure 1). This group may have less focus or need to manufacture their authenticity in their posts. Importantly, "ordinary citizens," which were the accounts that did not indicate any discernible professional status, comprised most of the content in this analysis. Videos by health practitioners and scientists combined were the most common professional category. Notably, only positive content toward vaccines or vaccination could be attributed to these professional groups. It is also worth noting that at the time of collection, many countries could not yet access the vaccine, yet audiences from these countries were viewing social media videos of TikTok content creators being vaccinated and, in some cases, creators who were challenging the vaccine's validity or even mocking the vaccine. Such conflicting messages may contribute to confusion and exacerbate uncertainty for many viewers who may have subsequently questioned the vaccine's safety or effectiveness. However, this can be determined only via audience-reception analysis and highlights a limitation of this research.

Performativity and personalized presence and narratives are highly valued on TikTok. The platform is renowned for users' applications of dance and lip-syncing; however, the presence of these techniques was minimal in our data set. Instead, humor and music played starring roles in the top-ranking videos with positive tones about vaccines or vaccination. Different types of emotional tones across the content offer insights into the most frequent framings of vaccines in terms of a video's position on vaccines being represented as positive, negative, neutral, or mixed, which we cross-tabulated with other coded variables.

Vaccine-Negative Content: Rants, Skits, and Polysemy (n = 6)

The minimal number of videos with vaccine-negative content or mixed tones about vaccines (Figure 2) is unsurprising, given that TikTok and other social media providers like Twitter and Facebook have

moderated COVID-related content that is deemed mis- or disinformation about COVID-19 or the vaccines since February 2021 (TikTok, n.d-a). Of the six negative videos, two were classified as "rants," which were uncommon in the overall sample (rants referred to videos delivered in a distinctly antagonistic or angry way). Two were skits, one that portrayed a character challenging why vaccinated people expect unvaccinated people to wear masks, and the other video was humorous, making fun of possible side effects from COVID, with the content creator speaking to a friend as she pretends to experience a series of small "fits" or tics. This video (Figure 5) received 721,000 likes and had been viewed more than 5.1 million times. Although the comments in each video were not analyzed in this study, it is worth noting that the comments in response to this post ranged from chastising this creator for ableist content that mocked people with tics (or Tourette's Syndrome), to being inappropriate by joking about a vaccine that was "dangerous." Other comments suggested the video had prompted some sort of vaccine hesitancy or anxiety for them (or could prompt this in other viewers), while others commended the creator for her humorous post. Indeed, this video—by a macro-influencer and, at the time of writing, a mega-influencer with more than one million followers—exemplifies the highly polysemic nature of the TikTok playground, the vast reach of videos that offer a negative slant on vaccination and their scope for interpretation, and further highlights the challenges facing those considering TikTok for vaccination advocacy.

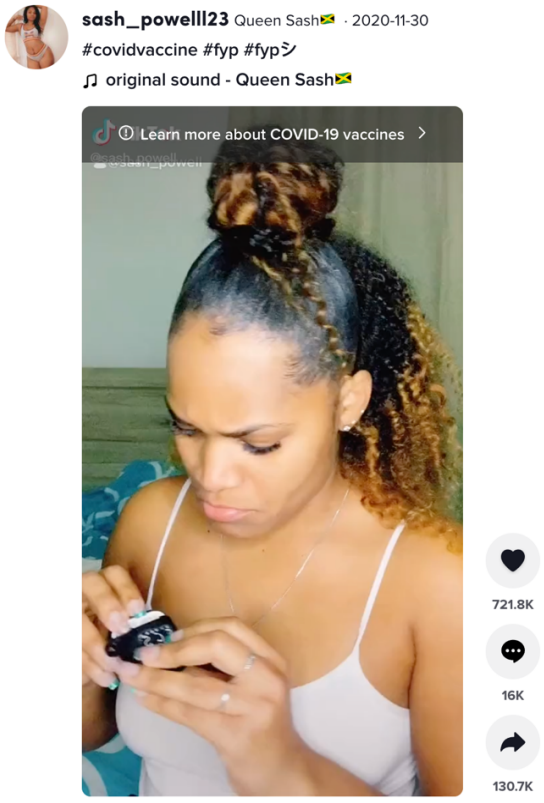

Figure 5. Video by @sash_powelll23 (Powell, 2020).

Another negative video featured a monologue by a micro-influencer recounting adverse effects from the Johnson & Johnson (Janssen) vaccine, including memory loss, mobility issues, and temporary loss of speech. Receiving 169.7k likes and 1.4 million views at the time of data gathering, this was the only video from the sample that referred directly to adverse effects, apart from the humorous video described above and those that mocked anti-vaccination positioning. Only two of these negative videos used humor; all drew on a different form of pathos, offering an emotively charged framing, while three applied a form of reasoned logic, and two drew on the credibility of the creator or information source. One of the negative posts using ethos was set in a veterinary clinic with uniformed staff, using a veterinary microchip reader to imply a person's vaccinated arm contained a microchip. This video (Figure 6) had 1.7 million likes, 32.7k comments, and 29.6 million views. The myth of COVID-19 vaccines carrying some sort of "microchip" delivered intradermally during vaccination has gained traction as part of the increasing repertoire of conspiracy theories circulating on social media (Rosenbaum, 2021), and is addressed in several myth-busting and humor videos in our sample. Although there may be a potential playfulness and even irony at work in this video, the content nevertheless provides "ammunition" for spreading microchip conspiracy ideas and leaves an overarching negative impression of whether vaccines can be trusted—not at the level of health impacts, but at the politicized levels of surveillance and manipulation by government, "Big Pharma," or even Bill Gates himself (Rosenbaum, 2021).

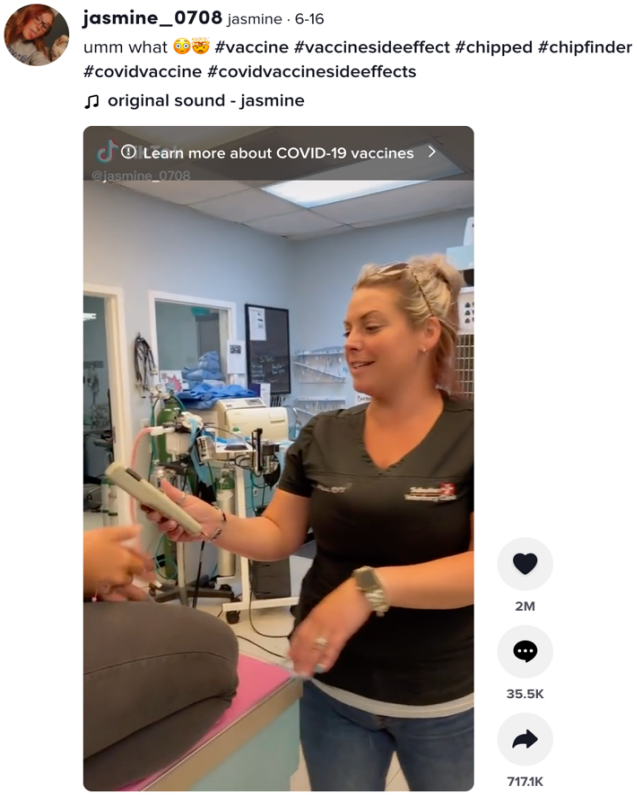

Figure 6. Video by @jasmine_0708 (Nata, 2021).

Vaccine-Positive Content as the Dominant Tone (n = 59)

Content that was positive toward vaccines or vaccination dominated the 100 TikTok posts. Most positive vaccine content using the #CovidVaccine hashtag was created by citizens rather than users who defined themselves as members of a profession. Notably, all content from health professionals and scientists was positive toward vaccination. Micro-influencers also dominated here, followed by an equal proportion of macro-influencers and non-influencers. Mega-influencers were minimal in the sample, but all their videos were coded as positive.

Positive content about vaccination was largely characterized by personal experience and monologues, as well as the sharing of scientific or more general information. This is consistent with Abidin's (2020) findings and a strong feature of sociality in networked communities. Skits, emotive videos, and rants were less common in positive videos. Positive videos were also characterized by an emotional appeal to the viewer, with humor playing a vital role. The specific role of humor, integral to the language and logic of TikTok, is discussed further on. Videos using reasoning or logos as part of their message also comprised a substantial portion of positive videos. In contrast, invoking the credibility or ethos of the content creator or message source was infrequent. The use of some form of music, a central feature in the architecture of TikTok (Southerton, 2021; Vázquez-Herrero et al., 2020), was only present in 45% of all videos. Music featured more prominently in neutral (16/30 videos) and positive (26/59 videos) videos, rather than those that were negative (2/6 videos) or mixed (1/5 videos). Content creators of positive videos tended to offer personal commentary above all other codes in this category. Positive videos also tended to normalize the vaccine by recounting a story of the user, relative, or friend receiving or just having received the vaccine. Consistent with this framing, positive content creators often made clear a pro-vaccination positioning overall. Influencers at all levels, as well as non-influencers, all contributed to positive videos, with the smallest number being mega-influencers. Notably, mega-influencers (the highest level of influencer) contributed only to creating positive content toward vaccines.

One positive video was also coded as having the potential to fuel anti-vaccination beliefs or hesitancy. This featured a young content creator who filmed herself dancing, showing "before Pfizer" and "after Pfizer" images that implied that her breasts had grown after being vaccinated (Figure 7). Although this upbeat post carried a positive comment (Figure 7) and used the classic affordances of TikTok, such as music, humor, and dance, the very visual implication of a vaccine being conveyed as having the capacity to transform a young woman's body in such a way may provide fuel for anti-vaccination groups and the promulgation of hesitancy.

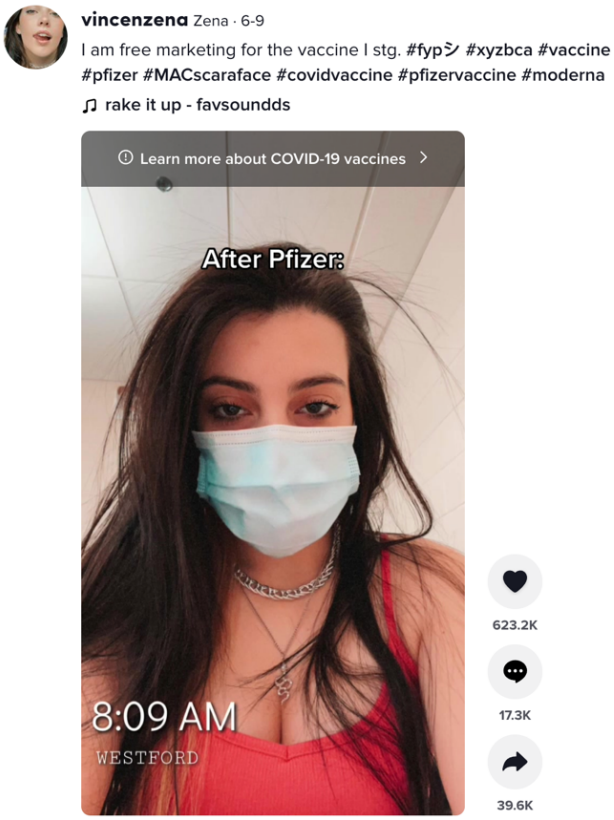

Figure 7. Video by @vincenzena (Zena, 2021).

Several videos stood out as salient examples of communicating science about vaccines. One was created by an actor who plays the part of a white-coated doctor-scientist. Set in a clinical environment, the actor as "scientist" gives a narrative account of how the mRNA vaccines work to help the body's cells recognize the SARS-CoV-2 spike protein and respond accordingly. He does this using the comedy and drama of "fork hands" as props, which help viewers to visualize how the vaccines assist the body to remember and fight against the novel coronavirus when it infects someone. This video (Figure 8) received 2.3 million likes and 146.6k shares at the time of data gathering and is now famous as one of the "fork hands" COVID-19 videos by this creator that went viral across several social media platforms (News18, 2021). Other videos invoked ethos by defining the creator's professional status as either scientists or healthcare workers (scientists, n = 4; health professionals, n = 8; doula, n = 1; phlebotomist, n = 1). Scientists and health professionals were mainly present in videos that carried a positive tone toward COVID-19 vaccines (12/13 videos) with one doctor appearing in a neutrally toned video. Ethos and logos were powerful rhetorical features in all these videos, which warrant further investigation.

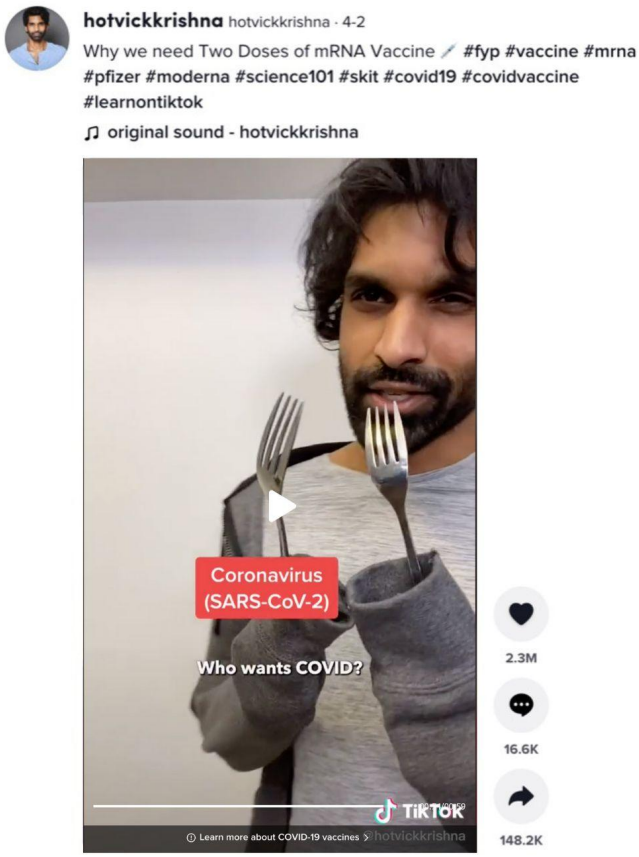

Figure 8. Video by @hotvickkrishna (Krishna, 2021).

Although less common in the data set, videos by scientists and health professionals shed light on the communication possibilities offered by TikTok for health communicators. Three of the 12 videos came from two mega-influencers, both of which have verified accounts, and five of the videos came from four macro-influencers, one of which has a verified account. An example is mega-influencer and verified account @seethemedlife, who identifies on his profile as an emergency room resident doctor, and at the time of data collection had more than 1.7 million followers. His account discusses the medical practice and provides videos of mock medical procedures to offer insights into how doctors might handle certain medical issues. Although the comments were not specifically measured in this study, it is worth noting that despite the positive tone expressed toward vaccines in these videos, the comments on both videos in the sample are mixed, with many expressing distrust of the vaccine. The first video (Figure 9) was viewed more than 1.4 million times, and the second video (Figure 9) was viewed 1.9 million times. Both videos also addressed common fears related to the vaccine, but only one provided links to official public health messages. This indicates a gap in the trending data that public health communicators could fill through partnering with TikTok content creators to strengthen the impact of such content.

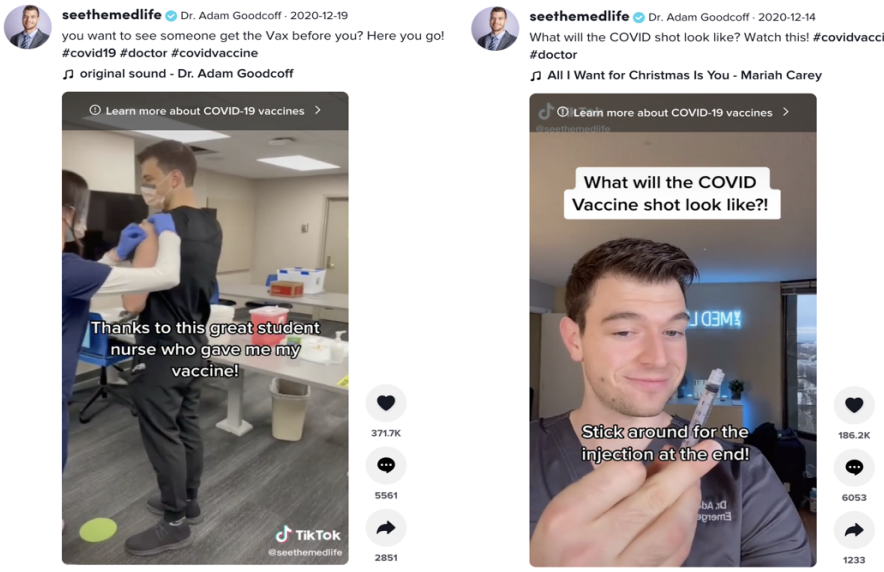

Figure 9. Videos by @seethemedlife (Goodcoff, 2020a, 2020b).

The second account that appeared twice in our data set is macro-influencer and verified account, @dr.noc, who identifies as a "PhD scientist." Further research into his handle shows that he has a PhD in immunology and pharmaceutical science. Both of this creator's videos provide social commentary and mock anti-vaccination logic with one being a "green screen" style video where the creator ridicules comments from Fox News's Tucker Carlson by directly addressing Carlson's vaccine criticism, highlighting that all vaccines have a delayed response. This creator's other video (McSweeny, 2021) debunks the much-circulated conspiracy theory about the body becoming magnetic after receiving the vaccine (because of embedding a microchip into the body) by demonstrating the ease with which a magnet can stick to skin that is simply moist. Both videos aim to offer scientific facts to refute misinformation, and they generated mostly positive engagement. The first video was viewed 1.2 million times, and the second 1.3 million times. Only one of his videos provided links to official messages, further suggesting the potential for public health communicators to strategically partner with content creators like @dr.noc (McSweeny, 2021) to deliver scientific information. His simple, concise, earnest, and humorous delivery of scientific information engages his audiences and may offer benefits for boosting science literacy among viewers. The role science communication can play on TikTok has been discussed by Zeng, Schafer, and Allgaier (2021), who make the salient point that science communicators can properly engage with young audiences by better understanding what Burgess (2006) calls their "vernacular creativity" (p. 201).

TikTok's moderation of negative or blatantly anti-vaccination content likely explains the prominence of positive videos from the #CovidVaccine top 100 posts. However, it is interesting to see the role played by neutral videos in the sample, which often carried the potential for fueling anti-vaccination sentiment or vaccine hesitancy.

Vaccine-Neutral Content as Complex, Humorous, and Agnostic (n = 26)

We were interested to observe that a substantial proportion of all videos carried a neutral tone toward vaccines or vaccination (Figure 2). Most of these posts used some form of humor. They were dominated by skits and monologues, tended to offer social commentary and to fuel or mock anti-vaccination sentiment, and sometimes both. Personal commentary was also a feature of neutral videos. A smaller proportion offered political commentary, normalized the vaccine experience, or sought likes (the latter being uncommon across the whole data set). Neutral videos were dominated by macro-influencers, with a similar proportion of micro- and non-influencers. As with all emotional tone types, citizens rather than professionals dominated this content.

Unlike positive videos, none of the neutral videos offered vaccine advocacy positioning; neither did they appear to support public health messaging. This potentially positions them as somewhat "agnostic" about vaccines, as they are not clearly articulating a position either way. Social commentary from neutral content ranged from topics like fat-shaming by health professionals; an economic explanation of how Krispy Kreme can afford to give everyone who gets vaccinated a free donut; incredulity that "grown-ups" can believe that vaccines cause human bodies to become magnetic; and how vaccinated patients do not properly answer health practitioners' questions. Indeed, such diverse and diffuse ranges of expression are very much a trait of TikTok (Herrman, 2020), highlighting the complexities facing governments or public health groups advocating vaccination on the platform. In this sense, such videos merely offer the (mostly citizen) users' personal, relatable, and "authentic" perspectives that may either be directly related to COVID-19 vaccination issues or may even be quite peripheral. The prevalence of social commentary offers a more documentary communicative form within the overall ephemerality of TikTok, which as Schellewald (2021) argues, enables the thematizing of everyday life and the embedding of content that is, ultimately, relatable.

The Rarer Case of Mixed Emotional Tone in #CovidVaccine Videos (n = 5)

Only a few videos expressed a mixed tone toward COVID-19 vaccines or vaccination. All used humor, and all creators were identified as citizens rather than professionals. Skits dominated as the most common style of video in this category. One of these videos depicted the needle-phobic content creator receiving the vaccine, supported by family but interacting with a very irritable nurse who had an aggressive manner, demanding the patient "stop hyperventilating." This offered a blending of rhetoric that carried some humor, with the overarching story being a shared account of an unpleasant encounter with a nurse. While the TikTok creator and her family wanted her to be vaccinated, which was the underlying premise of the video, this depiction of such a negative experience with an unsympathetic nurse could exacerbate many peoples' concerns about the vaccine experience, as well as instill anxieties about interacting with medical professionals more broadly. This was an authentic personal account by someone who may have wished to use the video to share their unfortunate experience and possibly alert other health professionals to the negative impact of a harsh bedside manner during the vaccination process, particularly for needle-phobic patients. Yet the very negative video portrayal of a COVID-19 vaccination in action could contribute to hesitancy or avoidance. This is prevalent in the comments on this video, with many users discussing their fears of needles and concerns about medical professionals.

Identifying Humor as the Common Thread (n = 65)

The matter of humor is significant in this study, as it is across the platform more broadly. The performance of humor played an integral role across these 100 top #CovidVaccine videos and is an important technique used by TikTok content creators. Humor was also prominent across neutral and positive categories for tone. Humorous skits and commentary offered extreme and unrealistic scenarios in our sample and provided satirical perspectives toward the vaccine resistant. For example, one skit (Figure 10) featured the content creator playing multiple roles in a futuristic scenario—five years after the vaccine. The multiple characters greet one another knowingly in a postvaccine world—one of whom bears a third eye on his forehead ("Astra-Zeneca"); the other who received "Moderna" has a tail. They console each other that at least they do not carry the deficiencies of someone given the Pfizer vaccine, and then race into their homes when a monster-like "J&J" (Johnson & Johnson) hurtles up the street toward them. Another video (Figure 11) depicts a young man who has just been vaccinated and claims to "dispel" the widely circulating myth that the vaccine makes recipients "magnetic"—only to abruptly lurch across the room onto his refrigerator via an implied magnetic source. Seventeen videos were coded as both fueling anti-vaccination beliefs and humorous; nine were also coded as mocking anti-vaccine logic.

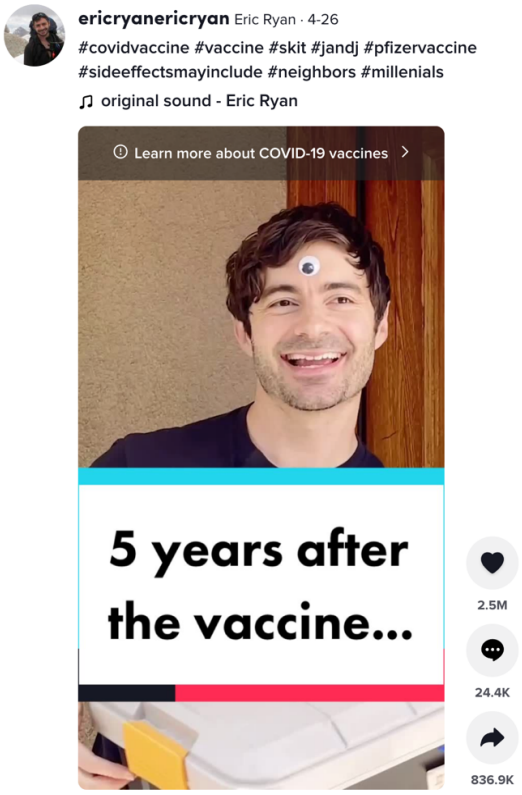

Figure 10. Video by @ericryanericryan (Ryan, 2021).

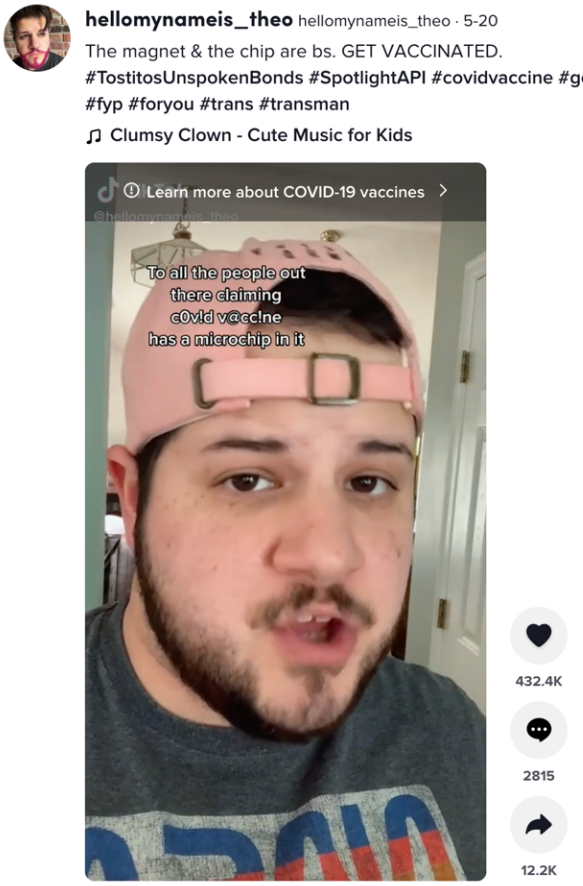

Figure 11. Video by @hellomynameis_theo (Alexander, 2021).

The ambiguousness of humor is apparent here (Day, 2008; Gal, 2019), as we found that while videos like this tended toward satirizing vaccine anxieties, they could also work to stir and exacerbate them. The use of ironic humor or satire when discussing serious issues relies on the interpretation of the audience that, as discussed earlier, can be lost between what is uttered and what is implied, and also carries intercultural communication implications for interpretation that relate to a range of factors including age, gender, and ethnicity. While several studies have explored satire's role in political news consumption (Kolluri, 2016; Lee, 2014), the focus is on people over 20. Given that the TikTok audience can be as young as 10, this area must be further explored. TikTok is an open playground; the speed with which videos can be uploaded and the use of humor means videos can spread before being detected by moderators. Of course, there are ways to disguise negative content within humor or evade moderators' scrutiny. Ultimately, it is an important reminder that out of 65 videos coded as using humor in our sample, only seven were created by health professionals. While these content creators may be well intentioned or feel they are supporting public health messages about vaccination through some form of strategic messaging, they are not experienced health communicators. This supports earlier discussion about possibilities for public health organizations to

communicate on TikTok through some of these influencers or by strategically harnessing the use of humor in TikTok videos, yet this must be delicately balanced with understanding the multiple interpretations that may be generated across vast and diverse audiences. As Southerton (2021) noted from her research of health professionals and health content on TikTok, to understand how health communicators can capitalize on this platform requires not just insight into its unique affordances on offer, but also an appreciation of the "microcelebrity strategies" used by influencers, such as "mobilizing intimacy, relatability, and playfulness, alongside medical authority" (p. 3261).

Limitations

There are several limitations that we acknowledge. We did not systematically measure user comments, but quantifying this would offer further insight into how audiences respond to the content. We also point out that research into audience reception may help investigate some of the tensions we discuss, for example, between content that may mock or fuel anti-vaccination messages and their perceptions of humorous content, which is for another study. There is also an absence of official health organizations using #CovidVaccine, or at least such content is not getting high circulation—unlike the micro- and macro-influencers and even non-influencers. It is a new platform for health and science communicators that has not yet been fully realized or capitalized upon. Therefore, the sample that focused on citizen engagement with a hashtag did not capture the level with which these strategic communicators are attempting to use TikTok, which is for another study. There is a further limitation to analyzing videos based on hashtags. The TikTok algorithm relies on SMO, including hashtags, the use of popular music, and trending memes to structure content on the For You Page. This research has collected data using only one of those optimization tools and may be limited in representing the algorithmic presentation of content for users. This includes disinformation and misinformation videos that may circulate "under the radar" on the platform, rather than in the top trending videos.

Conclusion

TikTok has added yet another layer of complexity to COVID-19 communication and information consumption, where users engage in visibility labor on a platform that cultivates and demands performativity, interactivity, relatability, authenticity, and entertainment from its content creators. This is indeed a challenge for health communicators who need to work to understand younger audiences and find creative ways to communicate vaccine advocacy on such a pathos-centric, storytelling platform. From our sample of the top 100 ranking #CovidVaccine videos, we found largely positive videos about vaccines, where micro-influencers were prominent and content tended to use personal commentary, normalize vaccination, and employ pathos and humor in its delivery. Although blatantly negative and even mixed tone videos were infrequent, we found the content coded as neutral provided something of an "agnostic" space toward COVID-19 vaccines, a playful and ambiguous space dominated by macro-influencers, social commentary, and comedy.

While TikTok provides links to guide its users to official pandemic public health information, we do not know what content individual users encounter in their day-to-day browsing. Notably, the lack of COVID-19 vaccine advocacy content in the trending data, certainly in terms of visibility and prominence on the algorithm, means that much of the COVID-19 vaccine information that audiences will encounter on TikTok

comes from unofficial sources. We wonder whether this suggests a lack of presence of COVID-19 vaccine advocacy content creators, or whether such content simply does not gain sufficient engagement to trend. Systematic longitudinal research, investigating the nuances and complexities of public health advocacy and audience engagement and reception on TikTok, is needed to design and improve communication approaches for future health crises.

There is a distinct language that health communicators must use, and a certain type of visibility labor, to gain the attention of TikTok audiences and encourage their engagement with public health messaging. While not all content is going to be of the "fork hands" virality and caliber (noting the "fork hands" creator was an actor, not a scientist) a critical question is whether health communicators can afford not to have a presence on this platform. The playfulness and "vernacular creativity" (Burgess, 2006; Zeng et al., 2021) required for success on TikTok may not be deemed appropriate for some public health organizations, but the prominence of relevant scientists and health professionals in this sample suggests there is potential for collaboration, particularly with verified accounts, given the aim of verification is to confirm authenticity. The polysemous nature of neutral videos and the use of humor add complexity when delivering serious health messages. There is also the added quandary of the TikTok algorithm that, despite the supposed moderation of videos about COVID-19, nevertheless offered a substantial array of misinforming and disinforming content for those scrolling COVID-19 vaccine videos, as demonstrated in the study by Cadier and colleagues (2021). Health communicators need to be well-versed in the logic and language of TikTok to gain visibility and influence on the platform when advocating public health responses. Although this research focuses on COVID-19 vaccine discourse on TikTok, our findings have broader relevance for how health and science communicators must adapt to the TikTok culture and logic as they navigate and negotiate communicative approaches that engage and persuade their audiences on the platform.

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