Seeing Is Believing: Is Video Modality More Powerful in Spreading Fake News via Online Messaging Apps?

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False rumors on WhatsApp, the world's largest messaging app, have led to mob lynching in India and other countries. Doctored videos sent over the platform have elicited visceral responses among users, resulting in the wrongful death of innocent people. Would the responses have been so strong if the false news were circulated in text or audio? Is video modality the reason for such powerful effects? We explored this question by comparing reactions to three false stories prepared in either text-only, audio-only, or video formats, among rural and urban users in India. Our findings reveal that video is processed more superficially, and therefore users believe in it more readily and share it with others. Aside from advancing our theoretical understanding of modality effects in the context of mobile media, our findings also hold practical implications for design of modality-based flagging of fake news, and literacy campaigns to inoculate users against misinformation.

Lay Summary

False rumors on messaging platforms like WhatsApp are on the rise. These rumors, however, can have deadly effects. For example, a false video led to several murders of suspected child kidnappers in India. Is it because it was in video format? Fake news stories on social media used to be mostly text. Today, they appear in richer formats like pictures, audio, and video. Digital technologies allow us to easily create fake content in all these formats. But, is fake news more believed when it is in a richer format like video? Are people more likely to share it with others? We ran a field experiment in India to find out. The experiment compared reactions to three false stories. We showed different versions of the same story to different participants. In our work, we find that users fall for fake news more when presented in video form. This is because they tend to believe what they see; more than what they hear or read. This study gives us insight into how people consume news on mobile devices. It shows that format affects how people perceive information. This work provides ideas for literacy campaigns to promote awareness of fake news and protect people from falling for it. It informs the design of alerts and warnings to help people detect fake news early and stop its spread.

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The recent spate of mob lynching and murders of suspected child kidnappers in India has been traced to doctored videos circulated on WhatsApp, the popular social messaging application (Goel, Raj, & Ravichandran, 2018). While misinformation has existed ever since the introduction of social media, indeed before the Internet itself, what is different now is the modality of false news. Rumors were mostly text-based in the past, but appear in richer modalities nowadays, with pictures (Resende et al., 2019), audio and video (Funke, 2018), which may be more potent in affecting users and gaining virality online. During the 2020 coronavirus pandemic, a wave of misinformation was disseminated in these formats (Delcker, Wanat, & Scott, 2020), prompting the World Health Organization to declare an "infodemic" (Stubbs, 2020) of "fake news," which we define as "information that is *intentionally* false" (p. 10) and therefore "not factual and unable to be verified" (Molina et al., 2021, p. 191).

While creators of fake news are increasingly expending extra resources to produce audio and video stories, it is not clear if these modalities are more likely to deceive than textual stories. The potential modality effects on psychological processing of fake news can be explained by two theoretical frameworks: the Modality–Agency–Interactivity–Navigability (MAIN) Model (Sundar, 2008) and the Limited Capacity Model (Lang, 2000). Both suggest that textual content will be processed more systematically than video, because video tends to overburden the finite processing capacity of the human brain with its rich stimuli, forcing message receivers to rely on superficial contextual cues that trigger simple rules of thumb, called heuristics, when assessing content. A key heuristic related to modality of presentation is the realism heuristic, or the rule of thumb that "if something seems real, then it is credible" (Sundar, 2008).

We examine this heuristic in the current study by experimentally comparing the relative influence of video, audio, and text modalities on Indian social media users' credibility assessment and sharing intentions of false news stories on WhatsApp, as mediated by perceived realism of story content. In an attempt to disambiguate heuristic versus systematic processing (Chaiken, 1980), we follow the standard psychological procedure of examining the moderating effect of users' involvement with the topic of the news story. Furthermore, considering that much of the WhatsApp-fueled mob lynching occurred in rural parts of India (Rajput et al., 2018), we examine if the modality effects of fake news are more pronounced among rural, compared to urban, users.

Literature review

In the context of visual modalities, such as pictures and video, the realism heuristic translates to "seeing is believing." For example, audio–visual testimonies were rated more favorably by participants than textual testimonies on a website due to the vividness associated with the audio-visual modality (Appiah, 2006). The MAIN model (Sundar, 2008) argues that enriching the mode of presentation, from text to audio to video, results in more realistic approximations of conveyed messages and mediated events, thereby enhancing credibility directly. This means users may forego the normal cognitive filters for evaluating the trustworthiness of the source and veracity of the content. According to the Heuristic-Systematic Model (HSM) of persuasion (Eagly & Chaiken, 1993), this occurs because human beings have an innate preference for heuristic processing that "requires less cognitive effort and

fewer cognitive resources than systematic processing," (p. 327) which is a "comprehensive, analytic orientation to information processing" (p. 326). When processing information heuristically, individuals make judgments based on simple decision rules (e.g., a long message is a strong message; messages by trustworthy sources are credible). While the use of systematic versus heuristic processing depends on many factors (e.g., user's motivation and ability, as well as external factors like time), the information overload situation of the current online media environment makes it difficult to systematically process most messages, with users processing them heuristically, by relying on cognitive heuristics, such as the realism heuristic, when evaluating content (Metzger, Flanagin, & Medders, 2010).

Cognitive overload or depletion is exacerbated when processing video (compared to text) because information comes from many modalities (such as audio, video, and graphics), and contains not only material relevant to the message but also structural aspects such as lighting and animation that are peripheral to the content of the video (Lang, 2000). This means more cognitive resources end up being allocated to encoding, at the cost of other memory subprocesses, such as storage and retrieval. Therefore, a media message presented via a "richer" modality such as video may be encoded more quickly but not processed as systematically as a text-only message (which requires translation of the written word). In fact, Fisher et al. (2019) found a biological basis for modality-biased processing by demonstrating that the greater consumption of cognitive and perceptual resources by video modality is more detrimental for systematic processing compared to leaner modalities like text and audio. This difference in cognitive processing between modalities can, in turn, influence memory as well as perceptions of the content and the news story itself (Lang, 2000). Studies have shown that watching a video news clip (compared to text-based article) decreases depth of processing (Powell et al., 2018). Text format represents a more abstract statement, requiring users to interpret and envision what the author is trying to convey (Molina & Sundar, 2019), and is associated with higher recall of news (Sundar, 2000). In contrast, video modality is more concrete and appeals directly to our visual senses, offering greater sensory description of a mediated event, which requires less interpretation. As Hansen and Wanke (2010) found, concrete statements are more likely to be perceived as true because "it makes the described situation more imaginable" (p. 1585). Imaginability makes the message more believable. This explains why video is associated with greater engagement and higher perceived realism (Yadav et al., 2011).

Belief in misinformation can be influenced by several content characteristics (e.g., message with general assertion vs. one focusing on singular events, Ecker & Ang, 2019; misinformation attributed to a public figure vs. no one, Swire, Berinsky, Lewandowsky, & Ecker, 2017), which could be verified as false upon scrutiny, but the effects of modality are more insidious. Recent technological advancements have made it very easy for video and images to be manipulated in a way that is indistinguishable to the human eye. As Hancock, Naaman, and Levy (2020) point out, the realism heuristic triggered by video modality can be particularly problematic in the case of "deep fakes," which are manipulated or fabricated videos using machine learning designed with a clear intent to deceive. A higher believability of this type of content can be dangerous for users and for society at large (Southwell, Thorson, & Sheble, 2018). Furthermore, in today's media environment, digital manipulation is problematic not only because users might believe in this content, but also because they share this information with their network of friends and family, contributing to its virality. When information is endorsed by others in their network, users tend to perceive it as more credible (Luo, Hancock, & Markowitz, 2020). As Tandoc (2019) explains, fake news audiences are relatively small in number, but they can "exert influence on the opinions and beliefs of other news audiences, backed by social ties or opinion leadership" (p. 4).

This is particularly the case with WhatsApp. Its affordances, specifically its encrypted technology, peer-to-peer communication, and group architecture, make it easy for users to disseminate information by enabling both interpersonal and mass communication simultaneously (Banaji, Bhat, Agarwal, Passsanha, & Pravin, 2019). Research studying the motivations behind the sharing of false information online has found that users do so when they perceive it as credible (Stefanone, Vollmer, & Covert, 2019) with the primary goal of enhancing social cohesion, particularly because of its emotional impact, perceived relevance, and ability to provide warnings or raise awareness to others about potential dangers (Duffy, Tandoc, & Ling, 2020). An understudied question, however, is whether the modality of information presentation makes any difference to their sharing of content. But, given that sharing is based on perceived credibility as discussed above, information presented in video modality will be more likely to be shared with others because the perceived realness of the content, combined with lack of scrutiny, makes it more credible. Based on this rationale, we propose:

H1: False news on WhatsApp will be a) perceived as more credible, and b) more likely to be shared, when presented in video modality, compared to audio or text modalities.
H2: These relationships will be mediated by perceived realism of story content.

Individual differences in information processing

In addition to modality, research suggests that individual differences might also influence users' processing of mediated news information, particularly false news (Scheufele & Krause, 2019). For instance, partisan-congruence of misinformation is found to increase acceptance of fake news (Swire et al., 2017; Ecker & Ang, 2019). In addition, factors such as trust in online information, fear of missing out, and social media fatigue also predict fake news sharing in WhatsApp (Talwar, Dhir, Kaur, Zafar, & Alrasheedy, 2019); as does age, partisanship (Guess, Nagler, & Tucker, 2019), and altruism (Apuke & Omar, 2021). All these factors can be subsumed under two broad psychological traits, motivation and ability, which have long been identified as factors that impact message elaboration and processing (Hallahan, 2000). To study these, we first examine the moderating effects of issue involvement, which has represented motivation (e.g., readiness, willingness, interest, or desire to process a message) in many studies (Hallahan, 2000). Second, considering that the ability to recognize incorrect messages can derive from media literacy and socioeconomic background (Scheufele & Krausea, 2019), we examine the role of location, that is, urban versus rural. We discuss both involvement and location in the sections that follow.

User involvement with the news story

Research investigating heuristic versus systematic processing of news has consistently found that user involvement, or interest in the issue covered in the story, plays an important role in users' depth of information processing (Chaiken, 1980; Metzger et al., 2010). When users are highly involved with the story, they tend to process information more systematically. On the other hand, when users have low involvement with the story, they tend to process it more heuristically, often relying on superficial and peripheral cues that guide their credibility assessment (Metzger et al., 2010). For example, a news story citing experts may be sufficient to impress readers who are not very knowledgeable or involved in the topic of the story. They may apply the "expertise heuristic" ("experts' statements can be trusted") in judging credibility. But, for highly involved users, what matters more are the arguments put forth in the story. When users are sufficiently motivated to process information, issue-relevant

information overrides the influence of peripheral factors like source (Pierro, Mannetti, Kruglanski, & Sleeth-Keppler, 2004).

Applied to the context of the current study, it is likely that users with low levels of involvement in the story will rely more on the realism heuristic when assessing news in video modality (vs. audio or text), compared to users with high levels of involvement. As Lee and Kim (2016) discovered, for high issue-involvement users, adding graphics to the news article increased elaboration. The richer modality evidently "served as a catalyst to induce more active message processing among those with stronger interest in the topic, if not stimulating cognitive activity on its own" (Lee & Kim, 2016, p. 1593). On the other hand, for users with lower motivation and involvement, the inclusion of graphics simply served as a peripheral cue that directly led to a positive evaluation of the story, without effortful consideration of story content. Thus, we posit:

> H3: The effects of video (vs. text and audio) modality of news presentation, and the operation of the realism heuristic, on a) content credibility and b) sharing intentions will be less pronounced as users' level of involvement increases.

Urban versus rural areas

Where users reside can play a role in news perceptions and news sharing behaviors. A vast majority of the WhatsApp-fueled mob lynching in India occurred in rural areas (Rajput et al., 2018). This can be because users in urban and rural areas possess different sociodemographic characteristics that play a role in both news consumption and media preferences. Research reveals, for example, that news subscribers tend to live in urban areas and earn relatively high incomes (The Media Insight Project, 2018). Additionally, while residents from urban locations tend to get their news from a combination of mass media and online platforms, rural residents tend to rely more on traditional sources, such as television, newspaper, and word of mouth (Miller, Purcell, Mitchell, & Rosenstiel, 2012). These differences are particularly relevant in India where individuals in rural areas have less access to education, poorer Internet connection (Asha Bhavan Centre, 2017) and lesser overall economic development (Kumar, 2016), creating a larger knowledge-gap among citizens. Even when information reaches them, their ability to process it is less efficient, compared to individuals of higher socioeconomic status (Pierro et al., 2004). Given that in social media, users not only get information from reliable sources, but also from friends and families, assessing the veracity of information is left to the user. It is possible that WhatsApp users from rural areas in India, with lower socioeconomic status, might be less equipped to engage in such vigilance and lack the education to systematically process information, making them more prone to applying the realism heuristic and believing in false information. Furthermore, the lifestyle in rural India is centered on agriculture, and places greater emphasis on family and close-knit communities (University of Minnesota, 2012), which may in turn contribute to creating greater sharing intentions. Therefore, we hypothesize that users' location (i.e., rural vs. urban) will moderate the modality effects on fake news credibility and sharing.

> H4: The effects of video (vs. text and audio) modality of news presentation on a) content credibility and b) sharing intentions will be more pronounced among users from rural areas compared to users from urban areas.

While we acknowledge that the rural–urban distinction is a crude proxy for a whole host of underlying sociodemographic factors, it has practical utility in the current context. For instance, WhatsApp is tied to locationally distinct mobile phone numbers, which make it far simpler and more effective for WhatsApp and regulatory authorities to track the spread of fake news as well as

selectively introduce measures to curb virality of fake news (e.g., limiting the number of forwards, which WhatsApp has already implemented in some markets).

Method

To test the proposed hypotheses, we conducted a 3 (modality: video vs. audio vs. text) × 2 (location: urban vs. rural) full-factorial between-subjects field experiment in India with three false news stories obtained from Boom Live, Alt News, and Social Media Hoax Slayer, sites specializing in exposing false online viral videos in India. We chose the stories with the help of the Centre for Media Studies (CMS), New Delhi, to ensure that stories were timely and of general societal interest. Another criterion for selection was the availability of original stories in video format, so that we could translate them into the audio and text versions.

The final stories pertained to different topics (health, crime, and politics). Specifically, the health story was a piece about rice being made out of plastic for consumption in India, starting with a man feeding plastic sheets to a machine on a conveyor belt that produces rice grains at the other end. The crime story was about a man posing as a door-to-door clothes salesman but declared by a group of villagers to be a terrorist because when they disrobed him, he had weapons taped to his body, but in reality, he was a lovelorn man evidently planning to harm his ex-girlfriend. Lastly, the political story showed Arvind Kejriwal, an Indian politician, asking for votes in a drunken state, that is, the audio track was slowed down to imply that he was slurring and therefore inebriated. For each story, we prepared three different versions, with the only difference being the modality (video, audio, or text) of information delivery. To accomplish this, we used the professional translation service provided by CMS. For the text and video conditions, the same headline was provided, followed by the story in either text or video. For the audio condition, the headline was narrated (see Figure 1 for sample stimuli). This ensured that the entire story is in one modality, just like in the text condition. We opted to include the textual headline for the video condition because narrating in video would mean adding another source (like an anchorperson), which would have introduced incidental confounds due to perceived credibility of that source. It is also worth noting that this manipulation of the video

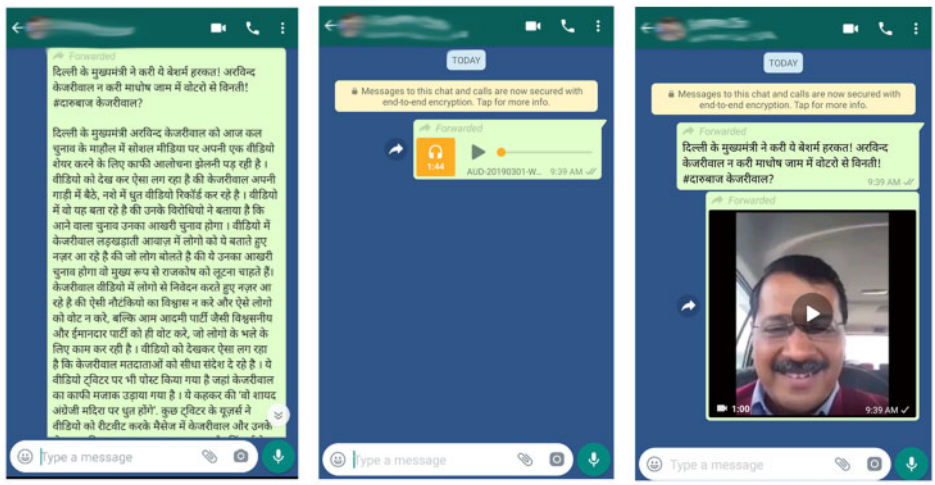

Figure 1 Text (left), audio (middle), and video (right) stimulus for the political story.

condition constitutes a conservative test of the realism heuristic because it includes textual elements that are expected to promote systematic processing.

Study context

For this study, we chose the dissemination of fake news via WhatsApp in India as a context for three reasons. First, as previously mentioned, the social implications of the dissemination of false, compared to real, news are serious (Southwell et al., 2018). Second, WhatsApp is the most popular messaging app in the world with 2 billion users worldwide in 180 countries, India being its largest market (Iqbal, 2020). Finally, the affordances of WhatsApp make it easy for users to share information one-on-one as well as in group chats, but because of encryption, misinformation cannot be seen by those outside the chats and is therefore difficult to detect. This is especially important in collectivist countries like India where communal and familial ties are regarded as more important than civic trust. For example, as Banaji et al. (2019) discovered, one of the main considerations for forwarding a WhatsApp post is the user's tie with the person who sent them the post in the first place. Furthermore, when it comes to the dissemination of false information in particular, an important motivation in India is "the belief that it is a civic duty to use violence or threat against suspicious outsiders" and the need to be seen as the "'first source' for local information" (Banaji et al., 2019, p. 4). All this makes the Indian WhatsApp context an ideal one for studying the factors that prompt users to unwittingly share false information with their networks.

Participants

Participants for this study were recruited from rural and urban areas in and around Delhi and Patna in India ($N = 180$, to allow at least 10 participants for each cell of the manipulated conditions). The sample consisted of 58.3% males and 41.7% females, ages between 18 and 61 years ($M = 31.26$, $SD = 9.93$). Their level of education varied, with 42.2% being college-educated, 40.6% having secondary school education, 14.4% graduate school and medicine, 1.7% primary school, and 1.1% with a professional degree. Income ranged from 8,000 to 400,000 rupees per month ($M = 35{,}490$, $Mdn = 25{,}000$, $SD = 47{,}374$).

Procedure

The study was administered in person by the staff of CMS, who were unaware of the study hypotheses and were trained by the principal investigator before going to the field. Recruitment occurred through a street intercept survey method where four administrators were provided with initial locations and seed addresses in urban and rural areas of two regions (Delhi and Bihar). The administrators then branched out to other addresses and potential participants in public places like parks. After obtaining informed consent, the staff administered a prequestionnaire asking demographic and individual-difference questions. Participants were then shown a WhatsApp message on the researcher's phone with one of the three stories, in one of the three modalities (video, audio, or text), and asked to imagine that they came across this story in one of the WhatsApp groups to which they belong. We opted for this strategy instead of sharing the stimulus directly to participants' phones because we wanted to avoid inadvertently disseminating false news further to users' networks and contributing to its virality. After watching/listening/reading the story, participants answered closed-ended questions containing the measured variables and open-ended questions. Both the story and the questions were in Hindi.

Participation was voluntary, and no remuneration was provided. The data underlying this article will be shared upon reasonable request to the corresponding author.

Measures

Content credibility

Participants were asked to rate the information conveyed through the (false) news based on 4 adjectives (believable, truthful, reliable, dependable; Soh, Reid, & King, 2009), each on a 7-point scale (1 = strongly disagree, 7 = strongly agree). For instance, 1 (vs. 7) for "believable" represents that users strongly disagreed (vs. agreed) with the information delivered by the news to be believable. We averaged the ratings on the four adjectives for computing our credibility measure ($M = 4.13$, $SD = 1.67$, $\alpha = .96$).

Sharing intentions

Users also rated how willing they were to share the news content (1 = not willing, 7 = very willing) with three different groups: family members ($M = 3.87$, $SD = 2.19$), friends ($M = 3.99$, $SD = 2.15$), and others ($M = 3.62$, SD = 2.19). While the subject of sharing is different, due to high correlations (see Table 1 for correlations between measured variables) and reliability ($M = 3.83$, $SD = 2.07$, $\alpha = .94$) among the three sharing behaviors, we have reported both multivariate and univariate analyses in the results section.

Perceived realism of the news (realism heuristic)

From a scale developed by Baños et al. (2000) to measure reality judgment in virtual environments, we modified and created five items to fit the context of this study ($M = 4.16$, $SD = 1.52$, $\alpha = .90$). Example items include "What I saw/listened/read in the news story was similar to reality," "The way the news story was portrayed seemed natural to me, like in the real world," and "There were times during my exposure to the news story when the story environment was the reality for me" (1 = strongly disagree, 7 = strongly agree).

Issue involvement

We assessed issue involvement by asking users to rate the issue presented in the news on five items from Mittal (1995): important, essential, valuable, interesting, and significant ($M = 4.53$, $SD = 1.51$, $\alpha = .89$), each on a 7-point scale (e.g., 1 = not important, 7 = important).

Open-ended responses

After participants responded to the quantitative measures, they were asked three sets of open-ended questions pertaining to their reactions toward the news story they received. Questions included: "Did you find the news article interesting? Why?" "Who are you likely to share this story with? And why?" and "Do you think the content you just viewed/heard is real or fake?[1] Why?" All participants responded to the open-ended questions.

Results

To answer H1 and H4, a series of 3 (modality: video vs. audio vs. text) × 2 (location: urban vs. rural) × 3 (story: crime vs. health vs. politics) full-factorial analyses of variance were run on (a) content credibility and (b) sharing intentions.

Table 1 Intercorrelations Among Measured Variables

Variable name	1	2	2a	2b	2c	3
1. Content credibility						
2. Sharing intentions (2a–c)	.75***					
2a. Sharing with family	.74***	.95***				
2b. Sharing with friends	.71***	.97***	.91***			
2c. Sharing with others	.68***	.93***	.80***	.84***		
3. Perceived realism of the news	.82***	.63***	.61***	.59***	.58***	
4. Issue involvement	.75***	.58***	.59***	.52***	.52***	.69***

***$p < .001$.

For content credibility (H1a), modality showed a significant main effect, $F(2, 162) = 4.09$, $p = .02$, $\eta_p^2 = .05$, in that users perceived the content of the story to be more credible when shown in video format ($M = 4.58$, $SE = .19$), compared to audio ($M = 3.94$, $SE = .19$), or text ($M = 3.87$, $SE = .19$), as predicted. In particular, the LSD pairwise comparison showed significant mean difference between video and the other two modalities—audio ($p = .02$) and text ($p = .01$)—but not with each other ($p = .78$). Data also showed support for H1b in that the main effect of modality was significant for sharing with family ($F(2, 162) = 3.11$, $p = .047$, $\eta_p^2 = .04$), and nearly significant for sharing with friends ($F(2, 162) = 2.82$, $p = .06$, $\eta_p^2 = .03$) and others ($F(2, 162) = 2.86$, $p = .06$, $\eta_p^2 = .03$), although the multivariate results with all three sharing intentions failed to reach significance (Wilks' $L = .96$, $F(6, 320) = 1.14$, $p = .34$, $\eta_p^2 = .02$). Results revealed that users were more likely to share with family when the story was in video ($M = 4.37$, $SE = 2.46$), compared to audio ($M = 3.65$, $SE = 2.46$), or text ($M = 3.58$, $SE = 2.46$), with similar patterns emerging for friends and others as well.

When location effects were tested on (a) content credibility, no significant main effect ($F[1, 162] = .14$, $p = .71$, $\eta_p^2 = .001$) or interaction effect with modality ($F[2, 162] = .40$, $p = .67$, $\eta_p^2 = .005$) emerged, thus lending no support to H4a, but on (b) sharing intentions, we found a significant multivariate main effect (Wilks' $L = .93$, $F[3, 160] = 3.88$, $p = .01$, $\eta_p^2 = .07$), with the univariate tests indicating a different direction for sharing with family ($M_{Rural} = 3.80$, $SE_{Rural} = .20$; $M_{Urban} = 3.93$, $SE_{Urban} = .20$; $F[1, 162] = .217$, $p = .642$, $\eta_p^2 = .001$) compared to friends ($M_{Rural} = 4.06$, $SE_{Rural} = .20$; $M_{Urban} = 3.92$, $SE_{Urban} = .20$; $F[1, 162] = .220$, $p = .640$, $\eta_p^2 = .001$) and others ($M_{Rural} = 3.90$, $SE_{Rural} = .21$; $M_{Urban} = 3.34$, $SE_{Urban} = .21$; $F[1, 162] = 3.45$, $p = .07$, $\eta_p^2 = .02$), although only the last mentioned (i.e., sharing with others) showed marginally significant effects. More directly relevant to H4b, when we examined the interaction between location and modality on sharing intentions, no significant multivariate effect was found (Wilks' $L = .98$, $F[6, 320] = .68$, $p = .67$, $\eta_p^2 = .01$). Therefore, H4b was not supported either.

Aside from modality effects, story appeared to have significant effects on content credibility ($F[2, 162] = 21.24$, $p = .0001$), as well as sharing intentions (Wilks' $L = .77$, $F[6, 320] = 7.42$, $p < .001$, $\eta_p^2 = .12$): sharing with friends ($F[2, 162] = 18.30$, $p = .0001$, $\eta_p^2 = .18$), family ($F[2, 162] = 23.81$, $p = .0001$, $\eta_p^2 = .23$), and others ($F[2, 162] = 12.88$, $p < .001$, $\eta_p^2 = .14$), respectively. Results revealed that participants generally rated the political story lower in credibility compared to the health and crime ones (Figure 2). No other significant two-way or three-way interactions among location, modality, and story types were seen ($ps > .10$)

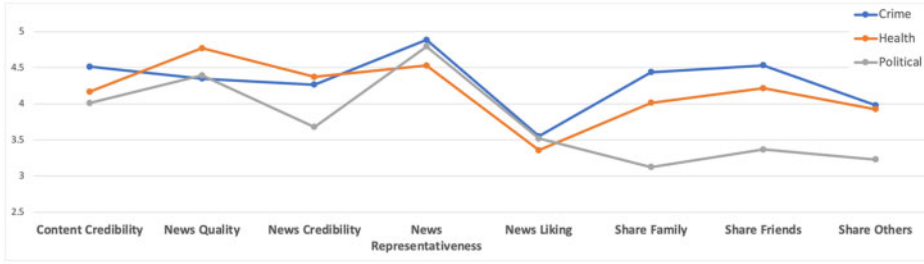

Figure 2 Perceptions of the news content and sharing intentions as a function of story topic.

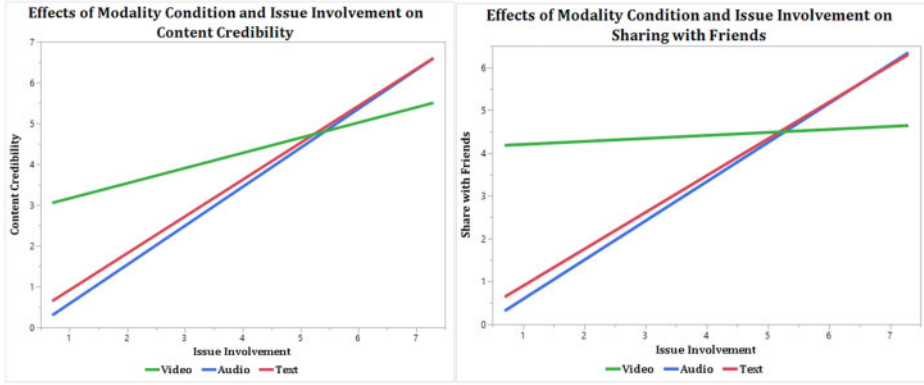

Figure 3 Interaction effects between modality and involvement on content credibility, F (2, 162) = 9.66, $p < .001$, $\eta_p^2 = .11$(left), and sharing behaviors with friends, F (2, 162) = 4.51, $p = .013$, $\eta_p^2 = .05$ (right).

To examine the mediating role of realism heuristic between modality and dependent variables (H2), we used PROCESS macro version 3.1 that allows for multicategorical predictors (https://www.processmacro.org/index.html), with video as the indicator, and ran PROCESS Model 4. Data suggested that the realism heuristic did not by itself explain the significant relationship between modality and (a) content credibility (indirect effect for video vs. audio = −.13, CI = −.60, .34, and for video vs. text = −.43, CI = −.90, .06). Mediation analysis with (b) sharing intentions showed similar nonsignificant effects.

To test H3, we first conducted a series of regression analyses that assessed whether the effects of modality were moderated by participants' level of involvement with the story, and if this interaction varied by topic of the story. Because of the multicollinear relationship between location and issue involvement,[2] we excluded the location variable from this analysis. Effect coding was applied for modality to examine the particular effects of video compared to the grand mean. Results revealed significant interaction effects between modality and involvement on content credibility (b_{video} × involvement = –.42, $p < .001$).

When the significant interaction effects were decomposed, users with low involvement in the issue of the story reported higher credibility perceptions with video modality, relative to text and audio conditions. On the other hand, for users with higher involvement in the issue, text, and audio seemed to induce higher credibility of the content (Figure 3, left).

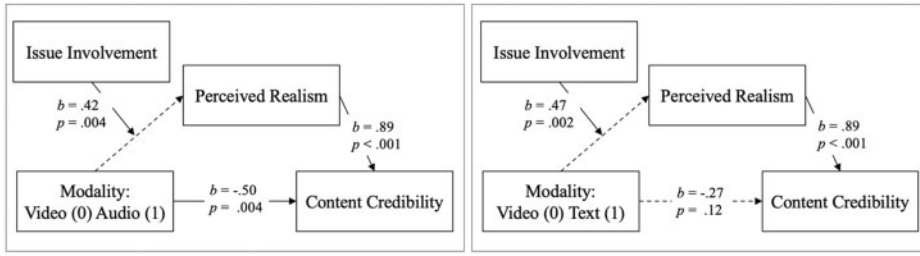

Figure 4 The positive credibility effect of video over audio (left), and over text (right), was mediated by perceived realism for participants with low issue involvement, but not for those with high involvement.

For sharing intentions, similar interaction patterns emerged for all measures—sharing with family ($b_{video} \times$ involvement $= -.38$, $p = .014$), friends ($b_{video} \times$ involvement $= -.49$, $p = .003$), and others ($b_{video} \times$ involvement $= -.56$, $p = .001$)—such that when users had low involvement with the issue of the story, video scored higher than text or audio, whereas for those who were highly involved, text and audio scored higher (see, e.g., Figure 3, right).

Next, we ran a series of moderated mediation analyses (PROCESS Model 7) to explore how involvement moderates (H3) the mediation of the realism heuristic in the relationship between modality and the dependent variables of interest (H2). The indices of moderated mediation (video [0] audio [1], and video [0], text [1]) were significant for content credibility (moderated mediation index for video vs. audio = .38, CI = .10, .68; and for video vs. text = .42 CI = .13, .72) and sharing behaviors (friends, family, and others). As predicted, data reveal (see, e.g., Figure 4) that when issue involvement is low, video modality causes individuals to perceive false news as more credible than audio or text via the operation of the realism heuristic, meaning that they find the video more real than the other two modalities. This effect does not hold true for individuals who are more involved with the issue of the story.

Finally, we conducted a thematic analysis of responses to each of the three open-ended questions using a constant comparative technique, whereby conceptually similar ideas are grouped under one construct (Corbin & Strauss, 2008). Participants' responses confirm our findings regarding modality effects and the operation of the realism heuristic. When asked if they thought the article was real or false, 58% of participants in the video condition stated that they thought the video was real, compared to 48% and 33% in audio and text conditions respectively. Two themes emerged across modality conditions: prior experiences and realism. Prior experiences governed the rationale of participants across modalities (over 70% in each condition). For example, participants stated that they thought the crime story was real because "especially after the terrorist attack on the 14th, these kinds of incidents are on the rise" and "I've heard so many stories related to clothes salesmen such as them, making people smell chloroform and stealing all their belongings upon arriving in their homes." Participants who received the political story believed that the story was real because "every party is after votes in every election season" and another mentioned that during election season "each politician is appealing for votes through their messages." Similarly, for the health story, participants mentioned it is real because "these days it's very easy to deceive and steal from everyone" and "many other items like oil, turmeric, and medicine have been adulterated before." These responses show evidence of a priming effect (Bower, 1981). It is possible that our stimuli activated participants' associative networks, eliciting ideas, and thoughts related to the particulars of that scenario.

Nevertheless, the realism theme was more prominent in the video modality, with more than one-fourth (26%) of participants citing realism as the reason why they believed in the story, compared to 10% in audio and 15% in text conditions. One participant mentioned "it seemed real because it seemed real after watching the video." More specifically, one participant in the crime condition stated that "it seems real since the boy looked like a terrorist." Similarly, a participant in the political story mentioned, "it seemed real after watching Kejriwal." Another participant stated, referring to the health story, that "it seemed real because I saw the plastic rice being made in front of me." These quotes reinforce our findings that seeing an event triggers believability because individuals perceive the event as more real and palpable. Notably, participants in the audio condition also perceived reality based on the presence of the politician's voice: "It was real because Kejriwal himself was speaking." Nevertheless, other participants noted that the story was false because the voice did not seem that of the politician. These competing results might be a result of the different levels of knowledge of participants. It is possible that for those more familiar with the politician, the voice served as a rationale during a more effortful processing of information, whereas for those less familiar, it served as a heuristic cue and indicator of realism.

When coding the reasons behind participants' willingness to share the story with others in their network, two themes emerged across conditions: raising awareness and belief that others would find it interesting. Though not mutually exclusive, more participants stated that they would share the story to raise awareness about a particular issue (more than 60%). To illustrate, one person said that they would share the health story with family elders because "I care for their ailing health and I don't want them to consume something which will affect them." Another participant said that he wanted to share the political story with family and friends "so that they get to know what level he [Kerjiwal] has stooped to ask for votes." Though the prominence of themes did not vary across conditions, it is important to note that 78% of participants in the video condition stated they would share the video with others in their network, compared to 63% in the audio condition and 67% in the text condition. It is worth noting that the stories were perceived equally interesting across modalities, with about 58% in all the three conditions expressing interest in the story. This means that the differences in sharing behavior and realism perception were due to the modality and not a function of participants' interest level in the story.

Discussion

It is clear from our findings that video is causing individuals to perceive fake news as more credible than audio and text, and increases the likelihood of them spreading it. This effect is stronger when users are not deeply involved or interested in the issue of the story. Those who are not very informed about an issue (compared to those who are more involved with the issue) are more easily convinced that a fake story is real when presented in video modality compared to audio or text modality. This perceived realism is positively associated with perceived credibility of the news content, as well as intentions to share the article with other WhatsApp users.

The insidious effect of video in promoting the credibility and spread of fake news is particularly concerning given the rise of "deepfakes" wherein videos are manipulated using machine learning to replace individuals in scenes and superimpose one scene over another (among numerous other possibilities for creating falsehoods and false narratives that cannot be detected by the human eye). The realism heuristic (seeing is believing) demonstrated in this study is the primary mechanism by which video stories have such a powerful psychological effect, not only in promoting user trust in the

veracity of false content but also in motivating the spread of misinformation. The virality of video-based fake news is particularly dangerous in encrypted messaging platforms, such as WhatsApp, which are less open to public scrutiny and corrective action by way of takedowns of offending posts. Furthermore, what makes WhatsApp unique is that it is composed of smaller communities where the dissemination of content is not subject to the influence of newsfeed algorithms and therefore cannot be downranked by the platform (Resende et al., 2019).

The findings have several theoretical implications. First, consistent with research in cognitive media psychology (Lang, 2000; Fisher, Hopp, & Weber, 2019), our results shed light on the differential processing of information presented in different modalities. Furthermore, the moderation effect of involvement and the mediation of perceived realism demonstrate the applicability of dual-process models of persuasion (Chaiken, 1980) and the MAIN model (Sundar, 2008) as frameworks for examining information processing of fake news in particular. Previous studies showing the positive effects of visual stimuli on credibility (e.g., Appiah, 2006) have attributed it to a decrease in systematic processing (Powell et al., 2018). This study adds to the literature by shedding light on the mechanism underlying these effects, specifically the realism heuristic, which can be quite critical in the context of fake news. Furthermore, our open-ended responses reveal that realism mattered even for those informed about the topic of the story, which lends support to the idea that the realism heuristic could also be aiding systematic processing by serving as arguments in decision making, in line with the additivity hypothesis of HSM. Open-ended responses also lend support to confirmation bias (Nickerson, 1998), by demonstrating that news story portrayals that are aligned with one's prior associations (e.g., what a terrorist looks like or what a politician sounds like) are more likely to be believed because they tend to reinforce existing opinions. A clear implication is that richer modalities like audio and video can more easily trigger such associations, thereby facilitating confirmation bias and increasing susceptibility to fake news. Importantly as well and consistent with previous research (e.g., Duffy et al., 2020), users expressed warning others about potential dangers as one of the main reasons for sharing misinformation. The operation of the realism heuristic could strengthen this motivation. This is especially likely in India, a country known for its communal orientation.

Our findings also have significant practical implications, specifically in the realm of design, as social media companies face criticism for the rapid spread of misinformation on their platforms. Important questions include how to promptly and efficiently identify fake news, how to aid users in their decision-making process so that they can identify false news in a timely manner, and how can we build interfaces that will dissuade and counter the dissemination of such information? First, findings of this study suggest modality-based flagging of content as a first line of defense. When WhatsApp and other platforms monitor traffic for fakes during peak seasons (e.g., election time, immediate aftermath of a disaster), sorting them based on modality and prioritizing video fakes for closer scrutiny and further action will likely be a more efficient use of resources. Modality-based flagging can be paired with location-sensitive sorting of incoming reports of potential fakes. Given the large volume of reports, the likelihood of finding fakes among video stories is higher; on the other hand, rural users and those with less knowledge about the topic of a story would be less likely to report fakes in the first place. Therefore, both modality and location of the user would need to be considered when responding to reports.

Industry could also focus on designing just-in-time alerts (e.g., real-time automatic notifications, preprogrammed based on users' location, content modality, media consumption patterns, and other contextual factors) and other interactive interface cues to make users more vigilant of the video content they are consuming. For instance, Geeng, Yee, and Roesner (2020) propose an "Investigate Later" option that would automatically alert users if a social media post that they had filed away earlier was

subsequently debunked by a fact-checking site. In addition, increasing message interactivity, by providing users options to reciprocally communicate with the system, can enhance message elaboration (Oh & Sundar, 2015), and thereby negate the heuristically driven effects of video modality. We also suggest including modality in literacy materials for users as an important element to watch for when receiving and sharing news via WhatsApp. For example, WhatsApp guidelines currently recommend users to check for videos, audios, and photos as they can be edited with the purpose of misleading (WhatsApp, 2020). Current campaigns can be made more effective by informing users that videos engender inherent trust because of our deep-rooted psychological tendency to believe what we see, and can therefore be more pernicious than audio or text stories. Targeting and personalizing alerts and literacy materials to users based on their user profile settings (e.g., location, news topics of interest) can also help identify the most vulnerable and curb the virality of video fake stories, considering that WhatsApp cascades of misinformation are deeper, wider, and have more reach in political (vs. nonpolitical) groups (Caetano et al., 2019). Such design implications resonate with Swire-Thompson and Lazer's (2020) suggestions (in the context of public health misinformation) for expanding literacy programs and public campaigns to enhance critical content evaluation skills across generations, and implementing technological solutions (e.g., browser extensions that flag disreputable websites, real-time information sharing applications in rural communities) to detect false news promptly and equally across locations.

Limitations and future research

Several limitations of this study are worth noting. First, our recruitment procedure following a door-to-door approach might have resulted in selection bias by including only those participants who were available at the moment, leading to concerns of generalizability of our findings. Second, we showed participants the stimulus on the administrator's phone instead of sharing it via participants' own personal device in order to avoid further spreading fake news. The use of the administrator's phone and the presence of the administrator while participants responded to the questions might have resulted in social desirability effects. However, if social desirability led our participants to scrutinize information more, it means that the effect we found for realism heuristic would only be stronger in a more natural, unsupervised setting when users encounter such false stories in the midst of many messages in their feed. In addition, as acknowledged earlier, our rural–urban distinction is driven by practical considerations, but conceptually murky. Our location variable reflects many different sociodemographic factors, such as education and digital literacy. In fact, we found that our urban sample had higher digital literacy, and therefore less likely to find our fake stories to be credible.[3] Urban residents also reported higher education, with generally lower content credibility and sharing.[4] Another limitation of our study is that we only investigated the realism heuristic. Assessing more heuristics would have allowed us to find additional explanations for the results. Yet another limitation pertains to external validity of our findings. It is possible that the effect of video modality on credibility and sharing found in this study is stronger because of the communal nature of Indian WhatsApp users and therefore may not be as pronounced in more individualistic countries. This is an open empirical question.

These limitations are richly suggestive of several areas for future study. First, as noted earlier, other heuristics (e.g., being there) might be operating in parallel with the realism heuristic and are worth investigating. Although we did not set out to formally test the additivity hypothesis of HSM, we found evidence to suggest that some participants might have processed the realism heuristic more

systematically. Future research should investigate this possibility by including measures to distinguish systematic and heuristic processing. It is also important to acknowledge that there are other types of visual modality other than video, such as pictures and memes (bold text over image), that could also trigger the realism heuristic. Future research should investigate if the realism heuristic applies to these and other types of visual messages, as well as other heuristics relevant to each specific visual modality. Moreover, false news and real news might have stylistic characteristics leading to differences in the invocation of the realism heuristic, which merits further investigation. Finally, it is important to replicate our work in other countries and settings to increase the external validity of our findings. In conclusion, the greater realism and the consequent persuasive appeal of video, over text and audio, merit more attention from scholars and designers interested in stemming the flow of misinformation via social media.

Endnotes

1. While on the surface it may seem like this question could have primed participants to articulate the realism heuristic, it is unlikely because the Hindi word for "real" used in this question ("asli") is different from the one used to convey that it was realistic ("vaastavik"). Moreover, answers to the open-ended questions suggest that there are several aspects that made the story seem real, with "seeing is believing" being just one of many.
2. Urban participants reported marginally higher levels of involvement ($M = 4.74$, $SD = 1.51$) compared to rural participants ($M = 4.32$, $SD = 1.50$), $t\ (178) = 1.88$, $p = .06$.
3. As expected, urban residents ($M = 4.54$, $SD = .97$) were significantly higher in digital literacy than rural residents ($M = 3.62$, $SD = 1.61$), $t(178) = 4.66$, $p < .001$. When we replaced location with digital literacy for testing H4, digital literacy showed a marginally significant negative effect on content credibility ($b = -0.17$, $t = -1.89$, $p = .06$), but nonsignificant in predicting the three sharing intentions ($ps > .21$). Also, there were no significant moderating effects of digital literacy with modality or story topic on the dependent variables. Digital literacy was measured based on yes/no answers to five questions (i.e., "Do you know how to: 1) download a file from internet to mobile, 2) send a file saved to your mobile to another device, 3) open an attachment someone sent you via email, 4) open an attachment someone sent you via text, 5) search engine like google?"), and transformed into a scale by adding positive responses (range = 0–5, $M = 4.08$, $SD = 1.40$).
4. The urban sample ($N = 90$; $M = 14.43$, $SD = 1.90$) is higher in education than the rural sample ($N = 90$, $M = 12.11$, $SD = 2\ .77$), $t(178) = 6.56$, $p < .001$. When we replaced location with education for testing H4, we found that higher education is associated with less credibility and sharing in general. Specifically, education was a significant negative predictor of sharing with friends ($b = -0.15$, $t = -2.61$, $p = .001$) and others ($b = -0.20$, $t = -3.28$, $p = .001$), and marginally negative predictor of content credibility ($b = -0.09$, $t = -1.95$, $p = .053$), but had no effect on sharing with family ($b = -0.08$, $t = -1.47$, $p = .14$), No other significant moderating effects of education with modality or story topic appeared on the dependent variables. Education was measured as years spent in school, that is, 1–12 = Actual years in school till high-school/preuniversity, 14 = D.Pharma & B.Ed, 15 = Graduate, 16 = Postgraduate, and 17 = MBBS/MD.

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