Media Modalities and the Spread of Fake News: Diagnosticity and Involvement Effects

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Abstract: The proliferation of fake news about climate change presents a significant challenge to global efforts to address this urgent environmental issue. While fake news was previously predominantly text-based, it has evolved in recent years to incorporate more dynamic multimedia formats like pictures, audio, and video, with the potential to significantly influence users and amplify its spread online. This study investigates how different presentation modalities (text-only, image with text, and video with text) influence the believability and dissemination of fake news about climate change. An online experiment was conducted with 456 participants randomly assigned to view fake news posts in one of the three formats. The study examined the effects of these presentation formats on perceived accuracy and sharing intentions, as well as the mediating role of content diagnosticity and the moderating role of personal involvement. The experimental outcomes reveal the following: 1) Video with text significantly enhances perceived accuracy compared to text-only format, while image with text shows no significant difference; (2) The effect of presentation format on perceived accuracy is mediated by perceived diagnosticity; (3) Personal involvement moderates these relationships, with highly involved individuals being less influenced by presentation format; (4) Perceived accuracy positively correlates with sharing intentions across all formats. The study contributes to our understanding of fake news dissemination by integrating the MAIN model, cognitive theory of multimedia learning, and elaboration likelihood model. It highlights the role of the "realism heuristic" in processing fake news content and reveals how perceived diagnosticity influences accuracy judgments. These findings provide valuable insights for researchers, practitioners, and policymakers working to develop effective strategies for combating fake news and promoting media literacy in the context of climate change communication. They suggest that media literacy programs should focus on enhancing critical evaluation skills, particularly for video content. Additionally, increasing personal involvement in climate change issues may lead to a more critical evaluation of information across different modalities.

Keywords: Fake News, Climate Change, Presentation Modalities, Perceived Diagnosticity, Personal Involvement, Social Media

1. Introduction

The proliferation of fake news about climate change poses significant challenges to global efforts to address this urgent environmental issue (Lewandowsky 2021). The rise of online platforms has further amplified the dissemination of climate change misinformation, reaching broad audiences and fostering public confusion and skepticism (Treen et al. 2020). This evolution is further exacerbated by the transition of misinformation from traditional text-based formats to dynamic multimedia such as images and videos, which significantly enhance its potential to mislead and influence public opinion (Peng et al. 2023; Sundar et al. 2021). While existing research has focused predominantly on text-based misinformation, less attention has been paid to the impact of multimedia formats. Lee and Shin (2022) argue that this creates a critical gap, as visuals are often perceived as more realistic and credible, increasing their influence. Vaccari and Chadwick (2020) and Wang et al (2021) further suggest that the sensory richness of multimedia formats, such as videos, amplifies their persuasive power. This study seeks to address this gap by comparing how three modalities - text-only, image with text, and video with text -affect the perceived accuracy and sharing intentions of climate change-related fake news.

To guide this investigation, this study employs the Modality–Agency–Interactivity–Navigability (MAIN) model, which explains how digital content features influence user perceptions and engagement. Sundar (2008) contends that modality, or the sensory presentation of information, significantly shapes user responses. Multimedia formats combining visuals and audio, such as videos, are perceived as more credible due to their realism and emotional engagement.

This study introduces perceived diagnosticity as a mediating factor, reflecting the extent to which users find information helpful for understanding an issue. Jiang and Benbasat (2007) note that diagnosticity influences trust and acceptance of information. It has been shown that in contexts like website interfaces, multimedia content can enhance perceived diagnosticity, making information appear more credible and useful (Jiang and

Benbasat 2007). In addition, this study suggests that personal involvement, or the relevance and interest individuals place on a topic, moderates these effects. Sundar et al. (2021) highlight that individuals who are more personally involved with a topic engage in systematic processing, while those with lower involvement are more likely to rely on heuristics. This reliance on heuristics often leads to greater susceptibility to video-based fake news compared to text or audio formats.

In summary, this study examines the interplay of presentation modalities, perceived diagnosticity, and personal involvement to enhance understanding of fake news dynamics and inform strategies to mitigate the spread of climate change misinformation.

2. Literature Review

Understanding how different presentation modalities influence belief formation and sharing behavior regarding fake news requires a comprehensive analysis of cognitive processing. This study draws on theoretical frameworks, including the MAIN model (Sundar 2008), the cognitive theory of multimedia learning (Mayer 2009), and dual coding theory (Paivio 1991), to examine these dynamics, particularly in the context of climate change misinformation.

2.1 Media Modality Impact on Cognitive Processing and Credibility

The MAIN model (Sundar 2008) provides a theoretical foundation for exploring how media modalities influence cognitive processing and credibility perceptions. According to this model, different formats - text, audio, images, and video - affect how individuals process information. Text-based formats require abstraction and active interpretation, which fosters deeper and more reflective cognitive engagement (Molina and Sundar 2019). Conversely, videos with vivid sensory details are easier to process but tend to encourage heuristic, surface-level cognitive processing due to reduced cognitive effort (Sundar et al. 2021).

The realism heuristic, a core component of the MAIN model, posits that multimedia formats, particularly video and audio, enhance perceived credibility by creating immediacy and vividness akin to real-life experiences (Sundar et al. 2021). This “seeing is believing” phenomenon can bypass critical evaluation mechanisms, leading individuals to judge multimedia-based content as more credible (Sundar et al. 2021). Generative AI has further complicated this dynamic by producing highly realistic visual and audio content. Studies reveal that AI-generated imagery and text evoke trust due to their authentic replication of visual cues, increasing susceptibility to misinformation (Chen and Shu 2024; Ferrara 2024).

2.2 Diagnosticity in Multimedia Credibility Evaluation

Diagnosticity, defined as the perceived utility of information for understanding an issue, is critical for evaluating credibility (Jiang and Benbasat 2004). The cognitive theory of multimedia learning (Mayer 2003) and dual coding theory (Paivio 1991) emphasize the importance of sensory integration in enhancing comprehension and information retention. Multimedia formats that leverage both visual and auditory channels can reduce cognitive load, thereby fostering deeper learning.

Empirical evidence supports these theoretical claims. Multimedia combinations, such as text paired with images or audio, enhance perceived diagnosticity and simplify content evaluation (Moreno and Mayer 2002). Lim et al. (2000) highlight that verbal and nonverbal cues complement rather than compete for cognitive resources, thereby enhancing perceived diagnosticity by providing multiple pathways for evaluation. Shin et al. (2024) observed that diagnosticity fosters trust, increasing engagement with potentially misleading information. This research extends these insights by examining the interplay between media modality and diagnosticity to understand their combined impact on fake news believability.

2.3 Personal Involvement and Cognitive Processing

Personal involvement, or the extent to which an individual finds a topic relevant, critically affects how information is processed. According to the elaboration likelihood model (Petty and Cacioppo 1986), highly involved individuals engage in systematic processing, scrutinizing content critically. In contrast, those with low involvement rely on superficial cues such as graphics (Metzger et al. 2010). Research by Lee and Kim (2016) demonstrates that multimedia features, such as images or videos, enhance message elaboration among highly involved individuals, prompting deeper cognitive engagement. Conversely, individuals with lower involvement often judge content based on surface features, finding video formats more persuasive due to their realism and

immediacy. Demuyakor and Opata (2022) show that users with limited knowledge are particularly susceptible to video-based misinformation. The vividness and perceived realism of such content make it compelling and more likely to be shared. These findings highlight the role of presentation modalities in shaping user engagement and susceptibility to fake news, especially among less informed audiences.

3. The Research Model and Hypotheses Development

3.1 Impact of Presentation Modality on Fake News Accuracy and Sharing

The MAIN model (Sundar 2008) posits that multimedia formats, particularly video, enhance perceived credibility by engaging multiple cognitive pathways. Studies confirm that video-based fake news is perceived as more credible and widely shared than text-only formats (Sundar et al. 2021). Lee and Shin (2022) found that video-based deepfake content increased source vividness and engagement intentions compared to text or image-based formats. Building on these insights, we propose:

H1: Perceived accuracy of fake news will be higher in (a) video with text or (b) image-based with text modalities compared to text-only formats.

H2: Sharing intentions will be higher for fake news presented in (a) video with text or (b) image-based with text modalities compared to text-only formats.

H3: Perceived accuracy will be positively related to sharing intentions.

H4: The relationship between presentation format and sharing intentions will be mediated by perceived accuracy.

3.2 Mediating Role of Diagnosticity

Multimedia formats enhance clarity and richness, increasing diagnosticity (Lim et al. 2000; Yin and Zhang 2020). Higher diagnosticity promotes content credibility and influences belief formation (Yin and Zhang 2020). Thus, we hypothesize:

H5: Perceived diagnosticity will be higher for fake news presented in (a) video with text or (b) image-based with text modalities compared to text-only formats.

H6: Perceived diagnosticity will be positively related to perceived accuracy.

H7: The relationship between presentation format and perceived accuracy will be mediated by perceived diagnosticity. Specifically, the effects of (a) video with text or (b) image-based with text modalities compared to a text-only format on perceived accuracy of fake news will be mediated by perceived diagnosticity.

3.3 Moderating Effect of User Involvement

We hypothesize that the impact of presentation format on perceived accuracy, mediated by diagnosticity, varies with user involvement. According to the elaboration likelihood model (Petty and Cacioppo 1986), highly involved users critically evaluate content based on its quality, reducing the influence of sensory cues (Lee and Kim 2016). In contrast, low-involvement users rely on sensory appeal, such as video realism, to judge credibility (Demuyakor and Opata 2022). Thus, for low-involvement users, presentation format significantly shapes accuracy perceptions.

H8: The indirect effects of presentation format on perceived accuracy through diagnosticity will diminish as user involvement increases.

4. Methodology

This study examined how different presentation modalities of fake news about climate change affected perceived accuracy and sharing intentions. Participants were shown identical content in three formats: (1) Text-only: A post with only textual information, serving as a baseline. (2) Narrated video with text: A one-minute video with narrated climate data and text overlays. (3) Image with text: A static image (e.g., a graph) paired with the same text.

4.1 Procedure

The study was conducted online on a mobile-compatible platform to simulate typical social media use. After providing informed consent, participants completed demographic questions (age, gender, education level) and rated their involvement with climate change. They were then randomly assigned to one of three conditions. Participants viewed the assigned fake news post and subsequently evaluated its perceived accuracy, sharing intentions, and diagnosticity. A debriefing followed, informing participants that the content was fictional and intentionally misleading to ensure ethical transparency.

4.2 Measurements

Scales were adapted to the study context and translated into Hebrew using the backward translation method.

Perceived accuracy: Measured using a 6-point Likert scale ranging from "definitely false" (1) to "definitely true" (6), adapted from Martel et al. (2020).

Sharing intention: Measured on a 7-point Likert scale, from "very unlikely" (1) to "very likely" (7), to assess the likelihood of sharing the post.

Perceived diagnosticity: Assessed using a modified version of the scale by Jiang and Benbasat (2004, 2007). Items included statements such as “The post provided valuable information on the climate change crisis,” rated on a 7-point Likert scale (Cronbach’s alpha = .94).

Personal involvement: Measured using an adapted version of the revised Personal Involvement Inventory (Zaichkowsky 1994), as modified by Nekmat (2020). Participants rated five items on a 7-point semantic differential scale (e.g., “Irrelevant–Relevant”; Cronbach’s alpha = .97).

4.3 Participants

Participants were recruited via iPanel, a national online panel provider, with sampling stratified to reflect Israeli census demographics. The sample included 456 participants aged 18–70 (M = 41.25, SD = 15.29), with 239 females (52.4%) and 217 males (47.6%). Comparisons of background variables across conditions showed no significant differences ($p > .05$).

4.4 Statistical Analysis

Data analysis was performed using IBM SPSS Statistics 29, with alpha set at .05 (two-tailed). One-way ANOVAs and χ^2 tests assessed group differences in demographic and background variables. Hypotheses *H1*, *H2*, and *H5* were tested using ANOVAs or Welch’s F-tests with post-hoc tests (Tukey’s HSD or Games-Howell). Zero-order correlations tested H3 and H6, examining relationships between perceived accuracy, sharing intention, and diagnosticity. Mediation (*H4*, *H7*) and moderated mediation (*H8*) were analyzed using the PROCESS macro for SPSS (Hayes 2022). Indirect effects were determined using 5,000 bootstrap samples, with significance indicated by confidence intervals excluding zero (Shrout and Bolger 2002). Interactions were probed using simple slopes analysis (Aiken and West 1991). Predictor variables were mean-centered, and variance inflation factors (VIF) were examined to ensure no multicollinearity (VIF < 10; Hair et al. 2014).

5. Results

Table 1 presents the comparison of study variables across different presentation formats. Results revealed that perceived accuracy scores were higher when presented in video with text compared to text-only, supporting *H1a*. However, there were no significant differences in perceived accuracy between image-based with text and text-only, which did not support *H1b*. Contrary to *H2a* and *H2b*, no significant differences were found in the inclination to share scores across the groups ($p > .05$). Aligned with *H3,* perceived accuracy was positively related to inclination to share.

Table 1: Means and standard deviations of the study variables by presentation format

	Presentation Format							
	Text-only (*n* = 151)		**Video with text (*n* = 151)**		**Image with text (*n* = 154)**			
Variable	***M***	***SD***	***M***	***SD***	***M***	***SD***	***F***	**η² / ω²**
Perceived accuracy	2.64_a	1.33	3.06_b	1.43	2.79_{ab}	1.42	3.47*	.02
Inclination to share	1.58	1.42	1.92	1.70	1.68	1.46	1.79	.004
Perceived diagnosticity	2.39_a	1.49	3.20_b	1.83	2.79_{ab}	1.62	8.88***	.03

Note. Means with different subscript letters differ significantly from each other at the .05 level.

*$p < .05$. ***$p < .001$.

Regarding the mediation hypothesis (*H4*), the relationship between presentation format and perceived accuracy was significant, as was the relationship between perceived accuracy and inclination to share. However, the direct effect of presentation format on inclination to share was not significant (p > .05). Bootstrapping the indirect effect revealed significant results (*B* = 0.17, *SE* = 0.08, 95% CI: 0.04, 0.35), supporting *H4*. Perceived accuracy was higher when information presented in video with text as opposed to text-only, and higher perceived accuracy predicted a greater inclination to share. Perceived accuracy did not differ between image-based with text and text-only.

Differences in perceived diagnosticity scores indicated higher scores when presented in video with text compared to text-only format, but not when presented in image-based with text compared to text-only, indicating support for *H5a* but not for *H5b*. In line with *H6,* perceived diagnosticity was positively related to perceived accuracy. Mediation analysis for *H7* revealed significant relationships between presentation format and perceived diagnosticity, and between perceived diagnosticity and perceived accuracy. However, the direct effect of presentation format on perceived accuracy was not significant (*p* > .05). Bootstrapping the indirect effect yielded significant results (*B* = 0.44, *SE* = 0.11, 95% CI: 0.23, 0.65), supporting *H7a*. Perceived diagnosticity was higher for video with text compared to text-only format, and higher perceived diagnosticity predicted higher perceived accuracy. Since perceived diagnosticity scores did not differ between image-based with text and text-only, *H7b* was not tested.

Table 2 presents results of moderated-mediation analysis (*H8*). The relationship between presentation format and perceived diagnosticity was moderated by personal involvement. Simple slopes analysis showed that perceived diagnosticity scores were higher for video with text relative to text-only at low and moderate levels of involvement, but not at high levels. Additionally, the relationship between perceived diagnosticity and perceived accuracy was significant and positive. However, the direct effect of presentation format on perceived accuracy was not significant (*p* > .05). Conditional indirect effects analysis indicated significant results at low and moderate levels of involvement, but not at high levels. At low and moderate levels, perceived diagnosticity was higher for video with text compared to text-only format, predicting higher perceived accuracy. The index of moderated mediation was significant, supporting *H8a*. Since *H7b* was not tested, its moderation (*H8b*) was also not examined.

Table 2: Results for the moderated mediation analysis

Predictors	Mediating variable model: Perceived diagnosticity *B*	*SE B*	*t*	Outcome variable model: Perceived accuracy *B*	*SE B*	*t*
Presentation format[a]	0.79	0.19	4.19***	-0.02	0.12	-0.15
Involvement	-0.01	0.07	-0.20	—	—	—
Presentation format[a] × Involvement	-0.25	0.10	-2.39*	—	—	—
Perceived diagnosticity	—	—	—	0.54	0.04	14.92***
	Overall R^2 = .10			Overall R^2 = .44		
	Overall $F(3, 298) = 10.43$, $p < .001$			Overall $F(2, 299) = 117.35$ $p < .001$		

Conditional direct and indirect effects of presentation format on perceived accuracy

Involvement	Direct effect	*SE B*	*t*	Indirect effect	Boot *SE B*	95% Bootstrap CI
Low (-*SD*)	1.25	0.27	4.65***	0.67	0.15	0.38 to 0.98
Moderate (*Mean*)	0.79	0.19	4.19***	0.43	0.11	0.23 to 0.63
High (+*SD*)	0.34	0.27	1.27	0.18	0.16	-0.13 to 0.49

Index of moderated mediation

	Index	Boot *SE*	95% Bootstrap CI
Involvement	-0.13	0.06	-0.26 to -0.01

Note. $N = 302$. Involvement is mean-centered. CI = Confidence Interval.

[a]0 = Text-only, 1 = Video with text.

*$p < .05$ ***$p < .001$

6. Discussion

6.1 Theoretical Implications

This study makes several important contributions to the literature and theory surrounding digital media and fake news. First, it builds on Sundar's MAIN model (2008) by demonstrating that video formats enhance the perceived credibility of fake news, reinforcing the "realism heuristic." This finding underscores the greater influence that multimedia formats, especially video, have on shaping perceptions of fake news compared to traditional text-based formats. It provides a deeper understanding of how media modality interacts with cognitive processes to influence beliefs about news, particularly in the context of misinformation.

While previous research has explored the role of **diagnosticity** in multimedia content (e.g., Jiang and Benbasat 2007), this study significantly **extends** these frameworks by **explicitly linking diagnosticity** to **fake news acceptance**. This integration adds a critical layer to existing theoretical models, such as **cognitive multimedia learning** (Mayer, 2009) and **dual coding theory** (Paivio, 1986), by revealing how **multimedia formats** enhance the perceived **usefulness** of information. By positioning perceived diagnosticity as a key **mediator** in the relationship between presentation format and perceptions of fake news, the study offers a novel perspective on how **multimedia content** influences the evaluation and acceptance of fake news.

Finally, the study extends the ELM (Petty and Cacioppo 1986) by exploring personal involvement as a moderating factor in the processing of multimedia content. Our findings suggest that highly involved individuals tend to engage in more systematic processing and rely less on heuristic cues such as modality or vividness. This finding highlights the need for refinement in the model to account for how personal relevance, especially in the context of modern digital media, influences processing.

Overall, this study advances theoretical understanding in the fields of digital media and misinformation by examining the dynamic interplay between media formats, cognitive processes, and personal involvement. It highlights the cognitive mechanisms that influence the acceptance of fake news and underscores the importance of individual differences in how multimedia content is processed.

6.2 Managerial Implications

To combat the spread of fake news, **media literacy programs** should focus on educating individuals about the persuasive power of multimedia formats, particularly **videos** (Chen and Shu 2024). These programs should teach people how **presentation formats** can shape their perceptions and lead to biased judgments about the accuracy of information. By fostering **emotional engagement** with important issues like **climate change**, such programs can encourage **systematic evaluation** of content, reducing individuals' reliance on superficial cues such as visual vividness (Petty and Cacioppo, 1986). Social media platforms should also develop and implement **algorithms**

that can detect and flag misleading multimedia content, particularly **deepfakes** and other forms of manipulated media. Furthermore, collaboration with **policymakers** is essential to establish standardized protocols for verifying **multimedia misinformation** (Aïmeur et al. 2023). These efforts will help mitigate the spread of **fake news** and promote more accurate information dissemination in the digital space.

6.3 Future Research and Limitations

This study's scope was limited to short-term effects and specific presentation modalities. Future research should explore the long-term impact of repeated exposure to fake news and investigate AI-generated misinformation across diverse genres. Examining emotional responses to fake news presentation formats (Toder Alon and Tahar 2024) and advancing techniques to detect and counteract deepfakes are important areas for further inquiry.

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