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Advancing Visual Health Communication Research to Improve Infodemic Response

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ABSTRACT

During public health crises like the ongoing novel coronavirus pandemic, there is a need to amplify and improve critical health communication messages. This need is due to pandemics producing infodemic conditions, meaning the public information environment is oversaturated with information of questionable accuracy and utility. The strategic use of visuals can be leveraged to improve the quality of health communication during public health crises and lessen the unintended effects of infodemic conditions. In this essay, we review previous visual communication theorizing and research that provide insights for effective and efficient use of graphical (e.g., data visualizations) and illustrative (e.g., photos, illustrations, and content features) visuals. We also discuss and advocate for more systematic research on visual misinformation and visual narratives, as there are significant gaps in the literature about how people interpret, act on, and engage with these visual content types. More systematic research about these areas of visual health communication research will improve public communication during future public health crises.

The novel coronavirus (SARS-CoV-2/COVID-19) resulted in a global pandemic in 2020, as well as what the World Health Organization (WHO) referred to as an infodemic (Zarocostas, 2020). In an infodemic, the information environment is saturated by the information of varying accuracy and utility. The conditions of an infodemic are likely to (1) make information seeking more challenging, (2) make information scanning exert a questionable influence, and (3) make information sharing result in undesirable outcomes (e.g., spread of misinformation). Facing such a challenging information environment, a most pressing concern is having evidence-based communication recommendations to help reach vulnerable population segments, at-risk audiences, and influential information diffusers. Given the prominence of visual stimuli ("visuals") within people's media environments, recommendations specifically for how and when to use visuals to communicate science risk and health information are essential, but few strongly supported recommendations exist. During the current pandemic, visuals used have potentially contributed to confusion (e.g., Tufekci, 2020) and misinformation (e.g., Brennen et al., 2020). In this essay, we provide a brief overview of the evidence supporting the proposition that visuals can assist health communication efforts. Following that brief overview, we summarize recommendations for including different types of visuals in strategic message efforts. More importantly, we identify two areas that researchers should focus on to improve responses to other infectious disease outbreaks in the future.

Past visual health communication research, theory, & recommendations

Past research reviews found a variety of visuals used in messages, including pictures/illustrations (Houts et al., 2006), data visualizations (Ancker et al., 2006), and photographs (Gibson, 2003), can influence outcomes of interest about health-related topics. The outcomes of interest vary greatly but include concepts like attitudes, attention, recall, comprehension, message perceptions, perceptions of risk, risk estimates, physiological responses, and a variety of health behaviors and behavioral intentions/expectations. For many years, researchers used an absence/presence approach to study visual content (King, 2015), though increasingly researchers have focused on studying different visual message features for both static images and dynamic audiovisual content (e.g., Clayton et al., 2017; Lazard & Mackert, 2015). The most prominent visually dominant area of study in health communication over the past few years has been pictorial warning labels on a variety of consumer products (Clarke et al., 2020; Grummon & Hall, 2020; Noar et al., 2016).

There are few visual communication theories that offer unique insights for health communicators. Instead, research on visual health communication uses more general frameworks from communication (e.g., exemplification theory; Zillmann, 2006), psychology (e.g., fuzzy trace theory; Reyna, 2008), education (e.g., dual coding theory; Sadoski & Paivio, 2013), or behavior change (e.g., health belief model; see, e.g., Carpenter, 2010) to develop hypotheses, generate research questions, and select outcomes. Two exceptions come from persuasion/consumer research, specifically visual persuasion theory (Messaris, 1997) and theorizing related to visual metaphors (Phillips & McQuarrie, 2004).

One past review suggested the study of visual health communication could be categorized into two broad areas of visual content (King, 2015): graphical (e.g., data visualizations) and illustrative (e.g., photos, illustrations, and content features). We discuss some of the specific visual recommendations for

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health communicators using those two categorizations of visual message content.[1]

Recommendations for graphical visual content

Past research reviews found that user-preferred features (e.g., visual simplicity and familiarity) often did not result in desired outcomes, certain visual features that highlight certain aspects of risk ratios can inflate perceived risk, and that graphic representations of data did not always outperform text on risk-related outcomes (Ancker et al., 2006). Another review found that information visualizations aimed at health-care workers were understudied and recommendations for optimizing visualization approaches were unclear given the current evidence base (Lor et al., 2019).

Lipkus (2007) provided recommendations about selecting and designing graphical displays of visual information, suggesting that communicators (1) select displays for specific tasks, (2) consider the importance of accurate judgments of risk magnitude, (3) be mindful of information processing heuristics related to height/placement of information, (4) use icon arrays that group cases together, and (5) provide contextual information that explains each graph/display presented to people. There are dozens of studies on the effects of particular data visualizations in particular contexts, as well as novel variations like interactive visualizations (e.g., Oh et al., 2018), though fewer studies on infectious diseases or related topics like vaccines.[2]

The largest single source of recommendations on what visualizations to use when displaying numeric information to people comes from the Visualizing Health project (http://www.vizhealth.org/; see University of Michigan Center for Health Communications Research, n.d.). The website provides a decision wizard for health communicators to specify the goal of the visual communication if numeric information is desired to be remembered in gist or verbatim form (linking to fuzzy trace theorizing), and what data is available for the visualization. After site users answer a few questions, the website PROVIDES a set of examples and recommendations for visualizing health data accompanied by reports that explain the evidence available to support the use of that visualization.

Recommendations for illustrative visual content

Recommendations and evidence guiding the selection of illustrative visual content are far less specific than those for graphical visual content. King et al. (2014) noted recommendations about selecting visuals, specifically, for health messages and information were often vague (e.g., National Cancer Institute, 2007),[3] such as suggesting the inclusion of "culturally appropriate" and "attractive" visuals without providing parameters of what that means or what evidence supports that recommendation. Such recommendations are problematic given the need in health and risk communication to reach diverse audiences regularly that would require diverse visual selection strategies given potential differences in processing, meaning, and effects (see, e.g., Scheltema et al., 2018; Springston & Champion, 2004).

Theorizing on visual exemplars would suggest their use might be helpful at persuading individuals (King, 2016) or overcoming misinformation (Dixon et al., 2015). Other research on visual complexity theory and models of persuasive design (e.g., King et al., 2020) may help communicators make decisions about real-time dashboard design, but ultimately many of these design decisions have not been studied in situations where information consumers are managing pandemic, crisis-oriented information environments. Industry research on social media message sharing has consistently found that messages with visual content are shared more (Hubspot, 2020), but research on what images are shared most on infectious disease topics has been primarily descriptive (e.g., Fung et al., 2017; Guidry et al., 2019; Wu et al., 2018)

Overall recommendations and insights

Currently, there are few evidence-based recommendations that can be made with confidence regarding communicating with visuals about infectious diseases because few studies have investigated visual influence in this particular context. When there have been studies of infectious diseases and visual content (e.g., Guidry et al., 2018; McGlone et al., 2013), there is little evidence of visuals affecting outcomes of interest on infectious disease topics (e.g., Zika and H1N1, respectively).

As noted above, the strongest recommendations for communicating information come from research on health/risk data visualizations. Research on visualizations offers communicators the ability to link communicative purpose/goals with visual content selection. For illustrative visual information – which includes everything from including photographs on social media posts to what images/visuals to use within video content or comics about COVID-19 and much more – extant visual health communication research offers more insights than explicit recommendations. There is a large enough body of research where studies could inform visual content decisions, but how well that visual content will contribute to (positive or any) effects of infectious disease communication is not clear.

Future research considerations for visual health communication research

Research on visuals about COVID-19 has likely been taking place since the beginning of the pandemic by a variety of researchers using a variety of perspectives. Indeed, many of the previously mentioned theoretical frameworks and recommendations were likely tested via rapid response efforts that will undoubtedly offer critical information about how to communicate effectively using visuals specific to infectious disease crises. Our closing point of discussion, though, is to outline two areas of research that we see as highly relevant to COVID-19 but still generally understudied in the visual health communication literature. Engaging in systematic and theoretically innovative research across these two areas would improve the abilities of health communicators to respond during the next infectious disease crisis – or any other public health crisis that could emerge in the near future.

Visual misinformation and recontextualization

Our brains process visual information instinctively and before we have a chance to critically evaluate whether to believe what is shown or omitted (Barry, 1997). This initial visual processing increases our susceptibility to photo manipulation (Lazard et al., 2020) and likely extends to other types of visual misinformation like cheap fakes and deep fakes (i.e., forms of audiovisual misinformation intended to influence message interpretation, see Parris & Donovan, 2019). In addition to photo manipulation and the manipulation of audiovisual information, though, visual information can be presented alongside written or verbal information in a way that is misleading – even though the visual information is not false, just out of context. Out-of-context visuals offer a low-tech path to misinformation that can still be influential (Fazio, 2020). Misinformation, generally considered, is an important area of research in health communication (Krishna & Thompson, 2019) and communication as a field more generally (Southwell et al., 2018).

The public information environment around COVID-19, at this point, seems to feature primarily these out-of-context visuals. Brennen et al. (2020) found 24% of their sample of misinformation included visuals/videos that were described or labeled incorrectly (out-of-context), such as a picture from a grocery store during a hurricane being labeled as taken during the pandemic. Other examples of photographs being used without proper context for COVID-19 coverage include images accompanying stories of new outbreaks. For example, news coverage about spikes in certain areas around the United States often featured pictures of people going to the beach, even though people on beaches were socially distancing from other groups/people and engaging in an outdoor activity following guidelines (see Tufekci, 2020). Additionally, some of the beach photos were taken at angles that made beaches look more crowded.

The work by Brennen et al. (2020) and the observations of Tufekci (2020) suggest that out-of-context visuals are contributing to misinformation during the pandemic. Cheap fakes and deepfakes did not appear at all in the Brennen et al. misinformation sample, though there are examples of photo manipulations that would likely be classified as cheap fakes (e.g., Mikkelson, 2020). Research on visual health communication has only started to tackle issues related to visual misinformation and out-of-context visuals. Much attention is paid to overall framing and content selection in message design and development, but *visual* framing and image selection can be an afterthought.

For research attempting to determine the influence of "visual misinformation," future work should more clearly delineate categories of visual misinformation to determine if the different categories influence processing and outcomes uniquely. Others have articulated dimensions of visual information based on user intent and credibility (Hemsley & Snyder, 2018), but we suggest a more basic set of categories to consider that aims to focus on visual content and composition features: (1) *visual recontextualization* – visuals that offer visual evidence of something but are used falsely or out-of-context, (2) *visual manipulation* – visuals that have been modified in some way to mislead interpretation of the visual information or a larger message unit (including, but not limited to, cheap fakes), and (3) *visual fabrication* – referring to visual content that is wholly false, though likely produced with representations of people or things familiar to an audience, appearing as legitimate information (e.g., deepfakes).

These categories represent misinformation in the basic sense (e.g., resulting in a message that includes incorrect information; Bode & Vraga, 2015) while attempting to focus on visual content or visual composition to identify what is uniquely "visual" about a misinformation message. Future research could attempt to reveal if the visual processing of these different types of visual misinformation, and their contribution to larger message units (e.g., videos, social media posts, news stories), affect people in unique ways – or if any type of visual content contributing to misinformation attempts is processed similarly. Further, given research on misinformation corrections (e.g., Walter & Tukachinsky, 2020), how difficult is correcting misinforming visual content compared to textual/spoken content? Having a stronger evidence base on visual misinformation provides health communicators with clearer strategies to respond during future infectious disease outbreaks. Such research will also assist in helping organizations and public health officials plan for coming concerns related to COVID-19, such as promoting a vaccine when it becomes available.

Graphic medicine and illustrated visual content

There are many examples of artists and creators generating content related to COVID-19 (e.g., https://www.graphicmedicine.org/covid-19-comics/) and comics have been suggested as a useful tool for health communicators (King, 2017). Illustrations achieve "amplification through simplification" by conveying complex ideas with a few lines and colors (McCloud, 1993). For health communicators and graphic medicine artists, illustrations can uniquely and efficiently communicate emotion and context in small spaces, such as a single social media post. Graphic medicine offers an outlet for visual narratives that can be highly customized depictions of all sorts of events, behaviors, and scenarios (Green & Myers, 2010), which can allow for modifying the size or placement of objects and people to emphasize meaning that would be impossible to do with photographs (Mackert et al., 2017). The simplification also allows people to more easily "see themselves" in the images than they might be able to do with photographs (e.g., Lu, 2009).

The COVID-19-related comics collected by the Graphic Medicine site (linked above) include instructional and information message that could be considered strategic health communication due to the attempts to correct misinformation (Taylor & Shwed, 2020) or provide information on proper handwashing technique (Forney, 2020). Other comics take a different focus with their communicative intent, examining health-care provider experiences (e.g., Kellman & Radtke, 2020), patient experiences (e.g., Chatfield, n.d.), or providing visual narratives of people helping out (e.g., Bessie & Parenteau, 2020). Cartoonists and illustrators have provided a variety of examples of how illustrated content and sequential narrative content might be used to communicate relevant information during a pandemic.

The influence of this visual content, though, is understudied. There are exceptions to course (e.g., Leung et al., 2017; Ronan & Czerwiec, 2020), but most work in this area focuses more on the process of creation or interpretive meaning and less on how these comics do or could influence audiences as part of larger public health communication efforts. Additionally, few studies have considered work outside of graphic medicine that theorizes how people process sequential narratives (e.g., Cohn, 2013, 2020) and how that can influence the design and dissemination of graphic medicine for public health communication. Additionally, the adaptability of illustrated content might allow for more useful reconfigurations of content to appeal more to audiences with different systems of knowledge exchange and cultural norms.

Given the ability to increase relevance and allow for considerable customization, graphic medicine, and illustrated content can efficiently convey critical processes and 'how-to' information, with sequential visualizations showing key steps for preventive health behaviors. These depictions can highlight specific features of necessary actions, without visual clutter, including sequential instructions for how to properly wear a mask (or take off a mask or launder a mask; see Shelus et al., under review). How do people respond to instructions if they contradict (visually or in practice) other recommendations that they have received? How can graphic medicine help people manage uncertainty and contradictory information during a public health crisis? Knowing more about how people respond to this type of visual content could improve the responsiveness and quality of public health communicators' initial attempts at outreach during a pandemic or crisis.

Concluding thoughts

In this essay, we provided a brief overview of research on visual health communication, as well as recommendations about visual content selection. We also highlighted two areas of future work that we see as important lines of inquiry for improving infectious disease messaging efforts for future infodemics. The continued prominence of visual content in health communication environments necessitates the need for more research in this area. Our suggestions only scratch the surface of the potential options for innovative and progressive research and theorizing that aims to improve public health communication about a variety of topics, all with the goal of being able to better prepare communicators to respond to the next public health infodemic and improve the quality of communication efforts as the current pandemic continues.

Notes

1. We would add here that studying visuals of any variety *without accompanying written or verbal content* makes little sense for strategic health communication research, theory, and practice. There are few, if any, practical applications of visuals in health communication efforts that would exist without some type of written or verbal content.
2. We refer here to research studies on these topics. There are numerous tools available to visualize data and information relevant to infectious diseases and vaccines, but formal tests (e.g., lab or field experiments) about how people respond to such visualizations about infectious disease information are not prominent in the study of health risk communication.
3. This source provides valuable recommendations for health communication material in general, but the suggestions for visual content, specifically, are vague.

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