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ARTICLE

Augmented Landscapes of Empathy: Community Voices in Augmented Reality Campaigns

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Abstract

In contrast with virtual reality which often aims to isolate a user from their surroundings in order to transport them to a distant place, augmented reality (AR) was uniquely designed to (re)contextualize local landscapes and to provide expanded human experiences in situ. This critical reflection adopts a "research through design" process to examine AR's technological and affective capabilities in the context of three community co-created AR campaigns. We discuss how AR can become both a conceptual and practical tool for creating conditions of self-identification and, potentially, empathy between audience and content. Further, we explore how people and place become a critical part of AR's infrastructure through the practice of empathic feedback loops.

Keywords

augmented reality; community research; empathy; research through design

1. Introduction

Extended reality (XR) technologies comprising virtual, augmented, and mixed reality tools, have become colloquial terms and a habitual media practice for many people. Yet, while these technologies have recently catapulted into the spotlight following the Covid-19 pandemic and a string of highly publicized industry developments, critical academic research has moved at a more tempered pace. In addition, while XR is useful as an umbrella term to refer to a relatively new category of embodied and interactive spatial media experiences, its three key components have significantly different affordances and require individual

attention. Subsequently, this article tackles one of these components, augmented reality (AR), and its relationship to one of the most popular and problematic keywords attached to XR media use: the ability to evoke "empathy."

We argue that in contrast to virtual reality (VR) which often aims to isolate a user from their surroundings in order to transport them to a distant place, AR was uniquely designed to (re)contextualize local landscapes and to provide expanded human experiences in situ. Thus, taking this central function of AR as our departure point, we ask: How can we rethink the mediation of affect and empathy in more productive and ethical ways? Furthermore, what can this process teach us about the medium of AR? To explore these questions, we engage with critique about the framing of empathy in XR media experiences and examine how AR can become both a conceptual and practical tool for creating more just conditions for self-identification and, potentially, empathy between audience and content.

Our critical reflection is grounded in the lived experiences of three innovative pilot campaigns that use AR to promote pediatric vaccinations within the Black community of a major US city. Specific attention is paid to the experiences of Black mothers and caregivers, a population often marginalized in discussions about XR and technology more broadly (Nakamura, 2013). Using a "research through design" process (B. Gaver & Bowers, 2012) we map out key junctures throughout our community co-created campaigns to illustrate the potential for empathetic connections across digital and physical sites. Thus, we interrogate the practice of empathy in the specific context of AR and glean insights about the means through which AR media, as a unique visibility management device, shapes the creation of meaning. We propose that when strategically placed and critically approached within community landscapes, AR can create empathic feedback loops. This is in sharp contrast to many digital applications that overlook community contexts and provide decontextualized, vague user feedback. Our research contributes to ongoing debates about how XR and specifically AR media can ethically evoke empathy (Davis, 2023; Nakamura, 2020) and to a more thorough understanding of AR as a medium.

1.1. AR and Its Contents

Most people access AR media, like games or various filters and apps to enhance one's physical context, directly from their smartphone. As such, AR is by far the more widespread set of technologies from the XR spectrum, with some reports estimating that in 2024 there are close to 2 billion active user devices (Alsop, 2024a) in contrast with 24 million VR headsets worldwide (Alsop, 2024b). The modern history of AR is often traced back to the early 1960s, when computer scientist Ivan Sutherland developed the "Sword of Damocles," a head-mounted display that would allow a person to see computer-generated graphics overlaid on top of their physical surroundings. However, while the technological experience behind AR has significantly evolved today—it is no longer necessary to wear a head-mounted display that is so heavy it needs to be suspended from the ceiling—the concept of AR largely remains tethered to the "overlay" of the virtual on top of the real (Bower et al., 2014).

As several scholars have pointed out, this description misses much of the socio-technical nuance inherent to how AR functions (Healey, 2021; Heemsbergen, 2023), and it forecloses possibilities for understanding active users' reception practices (Livingstone & Das, 2013). This description also obscures the analytical opportunity to fruitfully connect AR media experiences to the broader "spatial turn" happening across the

social sciences (Warf & Arias, 2009). In turn, there have been some efforts to advance our understanding of AR by shifting the focus toward its socio-technical functions and exploring its relationships with the environment. For instance, Alha et al. (2023) advocate for the re-framing of AR not as a single technology, but as a cultural practice that augments our space via a plurality of technologies. Heemsbergen (2023) focuses on AR's interactions with the local context and argues that AR media could be "described as relations between computing-data and environment made perceptibly real." Through this shift, Heemsbergen critiques the now standard description of AR as the layering of virtual content on top of a real, physical setting, and instead asks us to move beyond thinking in layers and toward mediations between those layers. In fact, Heemsbergen provocatively problematizes the hierarchical atomic–electronic divide:

> The physical world and reality are not interchangeable concepts; differences between reality and our perception of it range from biological to sociological mediations. Are glyphs virtuality or reality when carved into rock? Layered on paper with graphite? Shone through liquid crystal? How do any of these media make reality? (Heemsbergen, 2023)

In other words, Heemsbergen urges us to consider how meaning is created via the mediation of the environment and the subsequent interaction between the content and the user.

There have been efforts to advance our understanding of AR by critically examining its ideological work, too. For example, Healey (2021) emphasizes the need to prioritize social and ethical definitions of augmentation over technical ones and encourages us to think about what is being mediated and amplified socially, politically, and ideologically through AR. This is particularly important when we consider augmentation as a practice that is not simply "additive but transformative" (Healey, 2021, p. 104). Subsequently, scholars have argued that AR is better aligned with civic-style media than VR due to the possibility for "a more complex and genuine experience between location and media content" (Friesem, 2021, p. 39). In short, AR dynamically channels and expands rather than substitutes our visually perceived contexts and creates opportunities for localized experiences. Through our work, we offer some critical reflections that further extend the notion of AR as a cultural practice, embedded and enacted within local spaces, by specifically focusing on community as a collective actor in the sense-making process. We also interrogate how the community co-creation and use of AR may lead to conditions of self-identification and empathy.

1.2. Locating Empathy in XR Media

Empathy has emerged as a key term in the vocabulary of XR technologies. It has raised much hope for the pro-social uses of XR amongst some communities and, simultaneously, garnered much criticism amongst others for the ways it has been instrumentalized to further entrench social inequalities. For a history of the modern attachment and subsequent detachment of empathy to XR media in the US, including the marginalized roles and imaginaries emanating from female creators, see Messeri (2024). For the purposes of this article, we will highlight the fundamental quality of embodiment, which is present across the XR spectrum (meaning it is exhibited, albeit in different ways, across augmented, mixed, and virtual reality media), as a precursor to creating a sense of empathy. In the context of XR, we understand embodiment as the mutually constitutive relationship between one's physical environment, body, motion, and virtual media components. Indeed, the synergy between these elements is necessary for the very consumption of XR media content and for meaning-making processes to occur. However, we argue that embodiment is

experienced differently, and, furthermore, that there are productive differences in its operationalization between VR and AR media.

It is also worth noting a series of highly publicized XR products as another reason why empathy has emerged as an XR keyword. These include Milk's (2015) TED talk, where he described VR as the ultimate "empathy machine"—a soundbite that itself has generated significant reaction amongst academia and industry—and a strong corporate push to market "good" uses of XR. In a capitalist society underpinned by various strands of techno-solutionism, it seems like a natural extension that more advanced technologies solve our more advanced problems. It is here that we contend AR media could, through careful design, invert some of this problematic logic. Before we delve into how, it is worth also examining what we mean by empathy and disentangling the problematics of current XR-empathy operationalizations.

In this article, we understand empathy as the ability to connect, logically and emotionally, to the perspective of another (Cuff et al., 2016). This is different from sympathy, which can exacerbate distance between self and Other by creating a remote awareness of another's plight (Wispé, 1986). Empathy is often separated into various dimensions (Batson, 2009) including cognitive (knowing another's internal state), aesthetic (projecting what another is feeling), and affective or empathic distress (physiologically feeling what another is feeling). It has been described as an evolutionary response to babies and children (de Waal, 2005), which is noteworthy given our context of pediatric health messaging. Empathy has also been separated into "types" (Batson, 2009): reactions that aim to perceive the state of another (like cognitive empathy), and those that respond to it (like affective empathy or empathic distress). Additionally, research makes the case that, sometimes, actions we take after witnessing others' distress are ultimately aimed at relieving our own discomfort due to experiencing affective empathy or empathic distress (Eisenberg & Eggum, 2009). This, too, is notable in the context of our work, which aims to create conditions for self-identification between user, actor, and health message and we return to this thought in the conclusion.

We are aware that empathy, in its current framing, is a relatively new construct. See, for example, Davis (2023, particularly pp. 1–14) for a poignant discussion about the modern evolution of empathy and its ties to coloniality and XR; specifically, how empathy can be read as a colonial tactic to rid guilt on behalf of the end user while continuing to place the Other in a subjugated position. We are similarly aware that attempts to define empathy have a longstanding and ongoing history in psychology. Therefore, our work is less concerned with finding the correct definition, and more engaged with discovering the connections between XR and the multifaceted components of empathy. Specifically, through a detailed "research through design" process we aim to recognize and dismantle the operationalization of various facets of empathy in XR media so that we may propose alternate and, hopefully, more just means for re-assembling them together again.

The idea of inducing or experiencing empathy through XR media broadly refers to the possibility of a user embodying another being and perspective by being technologically positioned in their place. The logic goes that this (dis)placement translates into a shared feeling and understanding. While some research does exist to support the notion of a shared feeling between self and virtual avatar through, for example, the Proteus effect (Yee et al., 2009), the notion of a shared understanding is trickier: "In suggesting that VR provides access to others' embodied experiences, it devalues the very bodies (and their situated knowledges) that are the subjects of empathy experiences" (Messeri, 2024, p. 107); furthermore, there is a "sharp edge between the intersectional politics of embodied knowledge and their co-optation" (Messeri, 2024, p. 107).

Subsequently, the construct of empathy through XR has received some well-grounded critique in its expansion into empathy culture, or what Davis (2023) describes as "the culture of workshops, self-help books, TED talks, and lesson plans to make everyone more empathetic without doing the work of modelling goodness, humanness, compassion, or caring" (p. 1). In empathy culture, argues Davis, "change and action stop being necessary…because the feeling and sense of understanding are action enough" (p. 2).

Indeed, the role of pre-structured feeling or affect has been studied extensively across diverse contexts, from education (López-Faican & Jaen, 2023) to protest movements (Jasper, 2008). In the context of communication and media studies, research often examines how affect is mediated and mobilized for specific ends (S. Ahmed, 2004; Papacharissi, 2015). Of particular interest to us is the growing body of work that critiques how affect is rallied—or at least the logic through which it is intended to be rallied—via XR media to create a sense of connection with the Other. This research often engages with the framing and operationalization of empathy through XR media and examines how such media products contribute to the problematic notion of empathy culture (Nakamura, 2020). We take these critiques as our starting point to explore what alternatives are possible. However, prior to discussing alternative ways of thinking about empathy and affect, it is worth examining in some more depth the troubling logics of affect as it translates into empathy when evoked through some XR media.

It is worth inserting here that a quick Google Scholar search in early 2024 reveals that there are almost four times as many publications on "VR and empathy" compared to "AR and empathy," even though AR is the more widely used medium. As such, there is a need to better understand the colorful dimensions of AR experiences not only in terms of their prescribed affordances by designers, but also in their realized uses by various groups of people. In turn, we analyze the logics of empathy in VR, the medium that has received primary analytical attention, and think about ways that AR media may be structured to evoke empathic responses in more ethical ways.

For empathy to occur in a VR environment, one often must virtually enter the space of and/or embody an Other through an avatar. Yet, for the original Other to become embodiable, they must be hollowed out and objectified, both practically and conceptually, so they can be mediated (Irom, 2018). A similar logic applies to the Other's spatial context. As such, "there is a risk of erasing this other such that the machine to make us more human comes at the expense of another's dehumanization" (Messeri, 2024, p. 106).

Although often with good intent, the ethics behind such media-making practices cause concern and they are often accompanied by a sleuth of others. For instance, the Other that is being embodied is typically in significantly worse-off socio-economic circumstances. It is very rare to come across an XR empathy media experience in which the user embodies and empathizes with a socially and financially better-off person (Davis, 2023; Messeri, 2024), which means that politics of privilege come into play. Further, the embodied Other is often in a far-removed social, geographical, and sometimes temporal context whereby the end goal of many VR experiences is for the user to feel affected, an emotion, toward their circumstance—not necessarily to take action. Notably, this burden of feeling is often placed on an individual user level.

Subsequently, these notions are underpinned by the Californian ideology (Barbrook & Cameron, 1996) and "the ontology that technology…as a labor-saving device…is capable of simplifying complexity" (Rouse, 2021, p. 4)—even at this intricate socio-cultural and historical level. By framing empathy as an involuntary response,

its fix can also become quick, involuntary, and outsourced to technology—that is, outside of the direct scope of responsibility of human work. Yet, Rouse (2021) also argues that there is "an interesting middle space, a third possibility, between human dialogue and media simulation....This blended space may provide the most fertile ground for experimentation in the work of socially engaged immersive design moving forward" (p. 14). To be sure, we are not arguing that all XR empathy experiences are inherently problematic, but we do think that AR, as a medium, has unique characteristics that allow for a different operationalization of empathy and that need to be carefully parsed out and strategically designed for. So, we take the above problematic and well-critiqued assumptions inherent to much "empathetic" VR content as our starting point for thinking about the types of empathic conditions we wish to create in our work and to see in future AR media developments.

Specifically, we propose:

1. To design AR campaigns that are co-created with the community they are intended for. In addition, we use humor and positive framing.
2. To minimize distance between the user and Other by making content as relevant and relatable as possible. This is in sharp contrast to isolating users from their surrounding context in order to transport them to distant, de-contextualized places. In turn, the surroundings and local context become a part of the content and meaning-making process underpinning AR and help foster critical reflection of one's current place and positioning. As Messeri (2024) argues, "tech is always local, but some locations come to matter more than others" (p. 30); in our case, we want our user's location to be of primacy in their AR-mediated experience.
3. To foster active recognition of the self within the mediated space. Furthermore, to encourage users to consider taking action as opposed to remaining at the level of imagining what another is feeling and empathizing with their condition. In the context of our campaigns, this means vaccination against Covid-19 or influenza, and since both are highly infectious diseases, vaccination becomes an act of helping others, too.
4. To appeal at the level of family and community—not isolated individuals—and to do so in several ways, including through the design and dissemination of the campaigns.

Each of these points will be discussed in more detail through the annotated portfolio as part of a "research through design" approach. Next, we outline our three innovative and community co-created health campaigns, as well as our analytical process of annotated portfolios.

2. Methodology

This article analyzes three iterative and community co-created AR campaigns that aim to inform and influence parents and guardians to vaccinate their child(ren) against influenza (flu) and Covid-19 (initial vaccinations and booster series). The goal of all three campaigns was to use AR technology in what is a novel approach to increase pediatric Covid-19 and flu vaccination in majority-Black communities in West Philadelphia—populations that were disproportionately impacted by the pandemic and experienced inequitable access to the Covid-19 vaccine. To do this, we co-created AR posters and postcards with community members that were displayed around West Philadelphia. We created multiple AR posters/postcards per campaign, which we placed in different areas and tested separately to compare responses. See the Supplementary File for a timetable detailing key phases of our community co-created work.

When users scanned a QR code with their phone, the poster/postcard would come to life with an actor(s) delivering a short message about the importance of pediatric vaccination for either Covid-19 or the flu. More specifically, the video content would be emplaced over the poster as though it was a large video-screen in the user's environment. After the video, users were able to see a map, based on their location, of the closest vaccination clinics. Those accessing the influenza posters/postcards were also able to see a bank of facts about the virus, an informational video about common questions, and an interactive game. Visually drawing inspiration from the well-known Pokémon AR game, our game included an animated cartoon of the flu virus that would symbolically float around the user's environment, and one could beat it by correctly answering flu questions. To access this content, readers can scan the QR codes in Figures 1 and 2.

The community was actively involved throughout the various stages of the campaign development and deployment; a process we discuss in more detail under the "People" section of our annotated portfolio (Section 3.1). Across the three campaigns, our team collected surveys (150), focus groups (10), and anonymous, automated data about user engagement with the AR content every time the QR code was scanned. Since it is not the goal of this article to go into an analysis of our data, we next lay out how we will approach the reflection on our campaign creation process.

The concept of "research through design" is an attempt to engage systematically and reflexively with the process of creating media, technology, or other artifacts (W. Gaver, 2012; Zimmerman & Forlizzi, 2014). This approach values the co-creation of knowledge through practice and in synergy with theory, without necessarily prioritizing the latter. Key to research through design is reflexivity, iterative work, and the making explicit of implicit or tacit practices embedded in the work of designers and researchers.

Annotated portfolios are one practical means for conducting research through design (Harley, 2023), while at the same time structuring an artifact's analysis. Annotated portfolios may serve as a valuable and systematic "alternative to more formalized theory in conceptual development and practical guidance for design" (B. Gaver & Bowers, 2012, p. 44). Indeed, they are particularly useful in more formative stages of projects, where design is a key part of the research deliverable. While community-based interventions to encourage vaccinations, including for Covid-19, have been documented in several rapid reviews (Dada et al., 2022; Demeke et al., 2023), to the best of our knowledge no campaign or systematic research exist for studying the community co-creation of AR health messaging. In turn, the design process was an important aspect—the central aspect— of our work not only because it was the purview of several of our team members, but also because we wanted to tread this new ground creatively, critically, and ethically.

An annotated portfolio approach to analyzing design choices requires systematic notes and reflections across connected projects. We apply this approach by considering the people, functionality, aesthetics, practicalities, and socio-political concerns across a synthesis of our three campaigns (B. Gaver & Bowers, 2012) in conjunction with the concept of technological affordances (Gibson, 1977). We supplement our team's debriefs and project workflow analyses with some reflections from our focus groups, surveys, and back-end data. This approach to research is political, in that it uncovers the decision-making process informing design, thus responding to the oft-met critique of black-boxed technological design (Rosenberg, 1994). Our application of the annotated portfolio as part of the "research through design" process examines our team's thinking in structuring the campaigns and provides suggestions for future research and design possibilities. Since our goal is to be descriptive, critical, and self-reflexive, we do not seek to evaluate the

efficacy of our campaigns, but rather to better understand the medium of AR in relation to the fraught concept of empathy in XR media.

3. Annotated Portfolio

Figure 1 shows an example of one of our posters for the Influenza AR campaign, which was first supplemented by postcards (like the one shown in Figure 2) and then altogether substituted by them.

Figure 1. First influenza AR campaign, poster.

Figure 2. Second influenza AR campaign, postcard.

3.1. People

Our academic team, community members, and survey and focus group respondents were the indispensable backbone to our AR campaigns. We purposefully built an intersectional academic team, which comprised people with different backgrounds and skill sets: from students to technology and photography experts and scholars in anthropology, media and communication, health and nursing, and vaccine and community work. We also designed the project to involve community engagement in research (CEnR) from the outset. We adopt the definition of CEnR as a "core element of any research effort involving communities," which "requires academic members to become part of the community and community members to become part of the research team, [thereby] creating a unique working and learning environment before, during, and after the research" (S. M. Ahmed & Palermo, 2010, pp. 1383–1385). CEnR encompasses a range of models including community-based participatory research, community action research, and participatory action research. The level of community engagement can vary in intensity along a continuum from light-touch outreach to shared leadership between community and research partners (Wallerstein et al., 2020). CEnR operates on the principles of "power sharing, maintenance of equity, and flexibility in pursuing goals, methods, and time frames to fit the priorities, needs, and capacities within the cultural context of communities" (S. M. Ahmed & Palermo, 2010, p. 1385).

We involved community members throughout the five stages of the campaign development process (see the Supplementary File for a detailed timetable of our work):

1. We analyzed community interviews conducted from our team members' ongoing, separate research about pediatric vaccinations, formed an adult community advisory board, and consulted with a youth group about vaccination.
2. The research from Step 1 formed the foundation for our video scripts for the AR campaigns, which were initially drafted by students studying communication and were then edited by the larger study team.
3. The edited scripts were workshopped with the community advisory board comprising local parents and guardians, to ensure that the content and context of the posters were well suited for the target community.
4. The scripts were presented to local actors from our target demographic who played a key role in refining the messaging throughout the filming process.
5. The completed AR posters/postcards were tested with community members in focus groups and at community events via short interviews and surveys. Community members received incentives for participation.

To be inclusive of our community participants, our project was open to malleability in content and timing. We scheduled community meetings around times and places that were convenient for the advisory members and sometimes moved focus groups online so mothers who did not have childcare could participate from home. This resulted in logistical challenges for our study team and, at times, a lack of consistency in our staffing, which was felt in the quantity and quality of the feedback we were receiving. It became clear that we needed to channel the community atmosphere internally that we wished to tap into externally. The concept was also evoked in several other ways. For example, parents, guardians, and youth frequently spoke not only about their responses to the AR materials but also about how they imagined their extended family members, of various ages, would respond to the materials. The imagined presence of family and community mediated users' AR experiences and sense-making, thus becoming a part of AR's infrastructure. Subsequently, we designed our second campaign (influenza) to have multiple actors of different ages and to include elements that could appeal to various age groups (the game being targeted at younger audiences, whereas the fact bank and informational video were geared toward older adults). In short, we strategically shifted our focus from one-to-one appeals to evoking multiple generations via an extended family and community unit.

3.2. Functionality

To explore our campaigns' functionalities, we draw from Gibson's (1977) notion of affordances to examine how the technical capabilities of AR can create conditions for empathetic engagement and affective responses. The affordances described below can be divided into two types: technical affordances, which are the capacities of the system, and perceived affordances, which are the actions users believe they can take and the emotional responses they might experience.

The main technical affordances of AR include web functionality, tracking, registration, interaction, and display. *Web functionality* meant that our application ran completely from the web on WebXR standards, requiring no user downloads. Furthermore, it meant that we could update it on the fly by using backend-hosted servers from Glitch (https://glitch.com). This ease of access lowered barriers to engagement,

allowing for a more immediate connection with the content. *Tracking*, the ability to monitor the user's position and orientation in real-time, enabled accurate placement of virtual content within the user's environment. This capability, combined with *registration* (the alignment of virtual content with real-world objects), created an integration between the virtual and real (Azuma, 1997) that could evoke a sense of presence and immediacy. We leveraged these affordances in our Pokémon-inspired game, where an animated cartoon flu virus floats on the screen around the user's environment. *Interaction*, the ability to manipulate virtual content using various input methods such as touch and gesture, offered users a sense of agency within the AR experience. Furthermore, the gamification of health information aimed to deepen users' engagement and emotional investment in the content. *Display*, the visual presentation of virtual content alongside the physical environment, allowed us to create a hybrid space where interaction would take place between user and content. The content was designed to contain familiar app and gameplay elements and modes of interaction to create a comfortable and engaging interface that could help users easily navigate the information presented.

Perceived affordances are shaped by users' past experiences and socio-cultural backgrounds (Norman, 1999). In our case, while community members were familiar with QR codes, they had never seen a poster or postcard "come to life" or played an AR game in this context. This element of surprise and novelty became a generative aspect of our campaigns. Users often expressed delight at seeing the poster animate and the flu virus float around their environment. This created a personal and emotionally engaging experience that often encouraged our participants to pay attention to vaccination messaging they might otherwise not be inclined to hear. One parent shared that when you feel like someone *like* you is talking *to* you, it is harder to tune out than regular text or video.

The interplay between technical and perceived affordances in our AR campaigns, particularly in video content and the Pokémon-inspired game, created opportunities for what we might call "empathetic moments"—instances where the technology's capabilities aligned with users' perceptions to create conditions conducive to emotional engagement and, potentially, empathetic responses to the health messaging. By making the invisible visible through the floating flu virus, and by allowing users to actively engage with health information through gameplay, we aimed to create a more visceral and emotionally resonant understanding of the importance of flu vaccination.

This approach to functionality demonstrates how AR can be leveraged not just as a technological tool, but as a medium for creating affective experiences that have the potential to foster connection and understanding around important health—or other—issues. However, despite the potential of AR's affordances to create engaging and empathetic experiences, it is important to acknowledge their limitations. The effectiveness of tracking and registration can be compromised by environmental factors such as lighting conditions or complex physical spaces, potentially disrupting the seamless integration of virtual and real elements. Although we used WebXR standards compliant with A-Frame, we did find that newer/older phones and Android/Apple phones behaved differently, which sometimes resulted in varying issues for users (e.g., loading times, frame rates, etc.). Moreover, the novelty of AR interactions may wear off over time, potentially diminishing their emotional appeal and ability to foster empathetic engagement in long-term or repeated-use scenarios.

3.3. Aesthetics

We placed heavy emphasis on authentic representation in our videos: Our actors were all accomplished professionals who were also local to the Philadelphia area and many of them were parents and guardians themselves. This approach aligns with the Centers for Disease Control and Prevention's (2021) recommendation for disseminating information about vaccines via trusted messengers. In short, families are more willing to accept vaccine information if "you look like me…or if it's coming from someone that is from here" (Summers et al., 2023, p. 5). For us, this step was key in creating conditions for self-identification and empathy. Indeed, many of our focus group respondents perceived and appreciated the likeness of the characters.

Following community feedback, we also opted for less formal-looking campaigns, although some of our team members thought we could have gone further in that direction. For example, we adopted more informal language and opted for less text on subsequent versions of our posters (and even less on our postcards). We also encouraged our actors to improvise parts of the scripts, which made the videos significantly more relatable and entertaining, and included elements like our actors breaking the fourth wall by addressing the user directly through the screen through "Hey, you!" Figures 3 and 4 are examples of how

MISSING HOLIDAY DINNER
INT. BEDROOM – DAY
Actors: Mom (20-40's wearing pajamas, looking very ill), Junior (8-10, wearing pajamas, looking very ill) Dad (off camera)
Props:

- Bed
- Blankets
- Pillows
- Tissues
- Thermometer
- Ice pack
- Broom stick
- Bucket
- Rice crackers
-

Scene: Mom and Junior are both sitting up in bed. Mom has her arm around his shoulder, he's laying up against her looking miserable. The bed is covered with tissue boxes and used tissues.
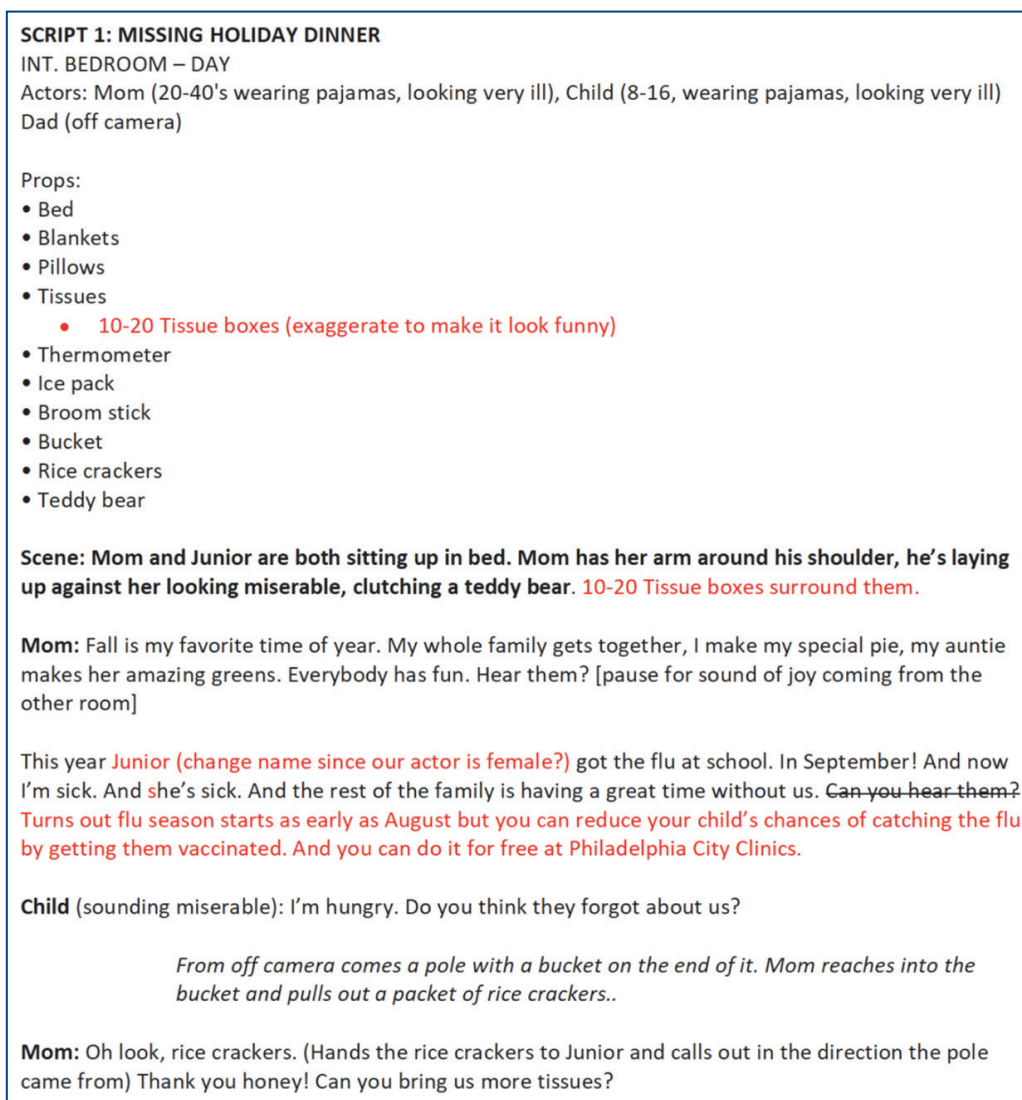**Mom:** Fall is my favorite time of year. My whole family gets together, I make my special pie, my auntie makes her amazing greens. Everybody has fun. Hear them? This year Junior got the flu at school. In September! And now I'm sick. And he's sick. And the rest of the family is having a great time without us. Can you hear them? I didn't know flu season started so early. And I didn't realize that getting vaccinated reduces your chances of catching the flu by XYZ, or that you can get vaccinated for free at Philadelphia City Clinics if you don't have insurance.
Junior: I'm hungry. Do you think they forgot about us?
From off camera comes a pole with a bucket on the end of it. Mom reaches into the bucket and pulls out a packet of rice crackers..
Mom: Oh look, rice crackers. (Hands the rice crackers to Junior and calls out in the direction the pole came from) Thank you honey! Can you bring us more tissues?

Figure 3. Original script for *Missing Holiday Dinner*, August 10, 2023.

SCRIPT 1: MISSING HOLIDAY DINNER
INT. BEDROOM – DAY
Actors: Mom (20-40's wearing pajamas, looking very ill), Child (8-16, wearing pajamas, looking very ill)
Dad (off camera)

Props:
• Bed
• Blankets
• Pillows
• Tissues
    • 10-20 Tissue boxes (exaggerate to make it look funny)
• Thermometer
• Ice pack
• Broom stick
• Bucket
• Rice crackers
• Teddy bear

Scene: Mom and Junior are both sitting up in bed. Mom has her arm around his shoulder, he's laying up against her looking miserable, clutching a teddy bear. 10-20 Tissue boxes surround them.

Mom: Fall is my favorite time of year. My whole family gets together, I make my special pie, my auntie makes her amazing greens. Everybody has fun. Hear them? [pause for sound of joy coming from the other room]

This year Junior (change name since our actor is female?) got the flu at school. In September! And now I'm sick. And she's sick. And the rest of the family is having a great time without us. ~~Can you hear them?~~ Turns out flu season starts as early as August but you can reduce your child's chances of catching the flu by getting them vaccinated. And you can do it for free at Philadelphia City Clinics.

Child (sounding miserable): I'm hungry. Do you think they forgot about us?

From off camera comes a pole with a bucket on the end of it. Mom reaches into the bucket and pulls out a packet of rice crackers..

Mom: Oh look, rice crackers. (Hands the rice crackers to Junior and calls out in the direction the pole came from) Thank you honey! Can you bring us more tissues?

Figure 4. Final version of the script for *Missing Holiday Dinner*, August 24, 2023.

our first influenza script evolved, and readers can see the final version, with additional actor improvisation, by scanning the QR code in Figure 1. Based on feedback, one notable difference between the first and final script versions was our positive and empowering reframing of the parent's engagement with the virus; the parent went from not knowing much about influenza in the first version of the script to delivering an informed yet casual message about the vaccination in the latter versions.

In addition, we opted for humor and a lighthearted aesthetic throughout our scripts in contrast to the more often encountered "serious" style of community health messaging. Research shows that humor is well-perceived in youth and pediatric vaccination messaging, especially amongst populations that are hesitant toward the messaging and messenger (Moyer-Gusé et al., 2018; Yoon et al., 2023). The videos were also all filmed in Philadelphia within close proximity to their target audience, though the majority were filmed indoors due to better control over lighting and sound (see Figure 5). Unfortunately, through focus groups, it became clear that these authentic locative features were not always readily apparent; although, when they were, they did make a significant positive difference in the perception of the content. In the

Figure 5. Photograph of AR filming.

future, we would benefit from further integrating local, recognizable outdoor landscapes within our AR work and, per parent suggestions, including local soundscapes or music.

In several of the videos, our actors play the role of a doctor or nurse without uniform, and this, too, raised some credibility concerns over whether these were real medical professionals. (Notably, the videos where parents addressed viewers seemed to be better received than when "professionals" delivered the same message.) We also initially chose Zappar (https://www.zappar.com) to host and display our AR content, which required numerous clicks on behalf of the user to grant access to various features. In subsequent campaigns, we developed and coded a no-download HTML5 WebXR solution hosted on Glitch, which allowed for one-click content access through the QR code. Although the Glitch server proved to be a reliable and free web host, the name "glitch.com" appeared in the browser address bar on participants' phones and, given the name, raised some questions about the reliability of the link.

Indeed, our audiences seemed sensitive to the authenticity of the digital content, prompting us to think about how we might address the broader topic of content verification that is currently prevailing across the media sector. Further, as the above paragraphs demonstrate, we faced the constant tension of the balancing act of creating an authentic, community co-created campaign that was simultaneously perceived as authoritative and trustworthy given the gravity of the medical context.

3.4. Practicalities

While posters/postcards "coming to life" through the scanning of a QR code was a new technological experience for most, it took place on a familiar device, their phone. We received feedback from community members wishing to have the flexibility to take the AR experience with them and see it during their own free time (as well as to easily share it with others), so we were able to pivot from a poster-only first campaign to a postcard-supplemented and then postcard-only second and third campaigns. To make the content accessible, we also created closed captions for all videos.

Despite testing on a variety of phones and operating systems, the self-administered AR experiences did not always work for everyone. This prompted our team to wonder what information we could still offer those who were not able to access any of the AR features. This is partially why our posters/postcards have some text; although, as previously noted, this decreased with time. Lastly, this series of campaigns was created as an ongoing proof of concept; however, the sustainability of such projects is important and includes addressing issues of content hosting and archiving.

3.5. Socio-Political Concerns

Vaccination messaging, specifically around Covid-19 and the optional influenza vaccine, is itself a politically fraught topic. Many of the community members we spoke with, across various age groups, shared historically rooted concerns over these vaccinations. As noted earlier, while almost everyone we showed our materials to stated they enjoyed interacting with the AR, as expected, not everyone was convinced by the vaccination messaging (see Figure 6 of community showcase event soliciting feedback and celebrating work).
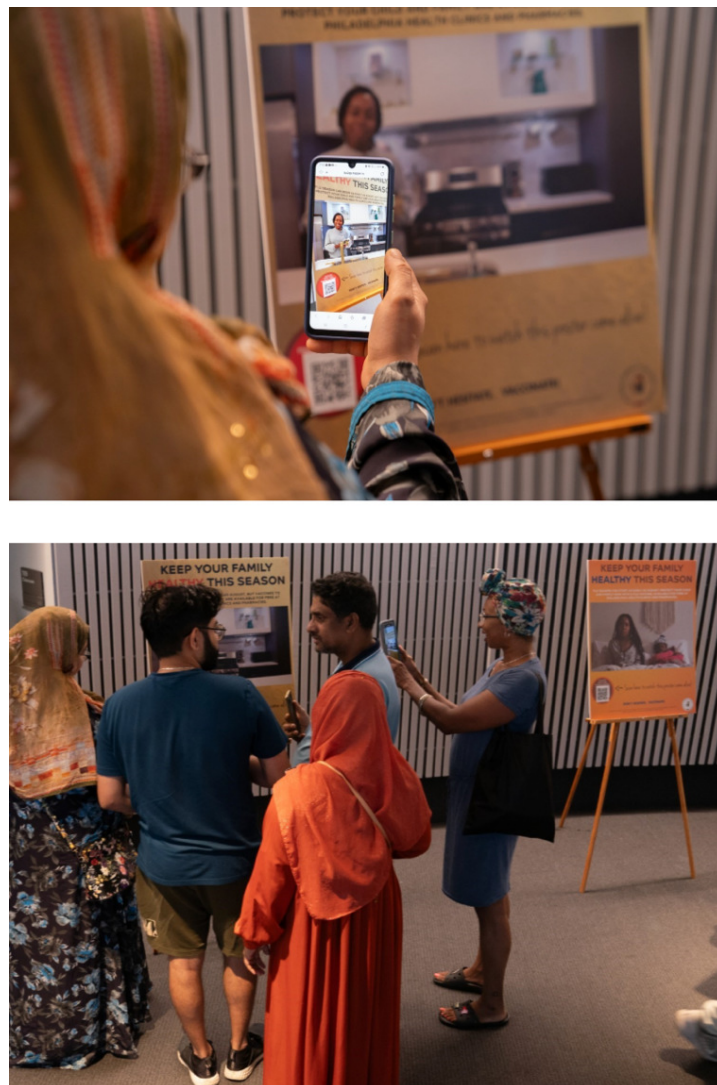
Figure 6. Photographs from the community showcase event.

We also received some community feedback about a lack of a recognizable logo. This was a decision our team came to because there exist historical tensions between the University, which is based in West Philadelphia, and the neighboring communities. In turn, we thought using the University logo could lead to negative associations with the campaigns and we decided to use a more neutral emblem. The downside of this choice was that the logo was largely unrecognizable and perceived as less credible by our participants.

Lastly, our very reflections on this series of campaigns are a conscious attempt to open the oft-called black box of technology and the decision-making that goes into its creation. Furthermore, as mothers of color are underrepresented in research in general (Sealy-Jefferson, 2022), this encouraged us to utilize flexible methodologies for engagement with the hope that our research is one step toward greater inclusivity—a point we shared in our interactions with community members and one that was well received.

4. Conclusion

This piece adopted a "research through design" approach to examine the process of co-creating three AR campaigns with community members. By critically reflecting upon our campaign designs, we interrogate how the making and consumption of AR becomes a cultural practice, embedded within local spaces and actors. Specifically, we pose that community was an integral part of the socio-technical infrastructure of our AR campaigns as it structured our design choices and mediated users' experiences. When seen as such, a community focus can lead to different types of operationalizations of empathy.

Deep localization allowed us to minimize the distance between the user and the AR Other, and it helped to foster critical reflection of one's current place and positioning in relation to the health messaging. We did not want users just to imagine what the actors in the video were feeling regarding vaccination. To return to Batson's (2009) types of empathy, that would mean remaining at a perceptive level. Rather, we wanted users to see themselves within the scenarios and to move toward a state of responsive empathy and action. In this sense, we were also appealing to the theory that, often, action based on empathy aims to assuage discomfort felt by the empathizer, with positive effects for the one being empathized with as a secondary benefit. Indeed, in our context, action on behalf of the user (considering or getting their child vaccinated) benefits the community too. Therefore, we view self-identification through deep localization and the multifaceted concept of empathy in productive interplay.

Furthermore, the annotation of our AR campaigns presents a pushback against the idea that empathy should be "understood as an almost involuntary emotional response" (Rouse, 2021, p. 5) that does not require any work. Instead, through a slower process centered on dialogue, meaningful community relations, and co-design, we reveal that empathic responses require analytical work on behalf of audiences, who often use the lens of community and authenticity to evaluate their responses and can be aided or hindered through certain design choices that impact these two dimensions. Early findings indicate that the more credible, community-oriented, and relatable the AR content, the more likely users were to feel a connection with it and to be able to critically place themselves within the scenario. Thus, in synergy with AR technology, affect through humor and emotional familial appeals have the potential to be channeled into an ongoing, collaborative process of reflection anchored in community knowledge and spaces. We see an opportunity for future research to explore this emerging affective economy (S. Ahmed, 2004; Messeri, 2024); that is, the dynamics between the multiple forces resulting in the cumulative product of "affect" and self-identification/empathy.

The recurring theme of community was present throughout the iterative stages of our AR work: from our campaign's process of localized, community co-development, to the subsequent functionality updates enabled by flexible A-frame WebXR technologies, and our users' references to community in their sense-making practices of the AR content. Thus, we synthesize the overarching function of community into what we call empathic feedback loops. In contrast to many XR applications that overlook community contexts and provide decontextualized, vague user feedback to the designers and users, we sought to contextualize our community feedback as much as possible.

Can the design of this AR campaign translate to other contexts and to XR content more broadly? While there are context-specific challenges and issues associated with scale, we argue the design of our campaign can be replicated as long as some key conditions are met. It is important for users to be able to recognize their own lived realities and cultural contexts reflected in the AR content *and* for it to be embedded within their social fabrics. This allows for more personal, ethical, and potentially empathic connections to the content and occurs best when potential users are involved in the design. Through this work, our team saw firsthand the intricate level of physical, contextual cues that underpin meaning-making processes in the medium of AR. Subsequently, we see potential to extend our work through mixed reality applications, which currently present a prominent avenue of industry development. Additionally, it would be insightful to test whether the ideas we developed for AR can be successfully incorporated back into VR to alleviate some of the critiques that inspired this piece.

Conflict of Interests

The authors declare no conflict of interests.

Supplementary Material

Supplementary material for this article is available online in the format provided by the authors (unedited).

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