



"Acting Out" Queer Identity: The Embodied Visibility in Social Virtual Reality

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This paper focuses on *embodied visibility* emerging in social Virtual Reality (VR) as a new lens to explore how queer users build and experience visibility in nuanced ways. Drawing on 29 queer social VR users' experiences across various countries and cultures, we identify three main strategies for building and experiencing embodied visibility in social VR, limitations of each strategy, and impacts of such visibility on queer users' identity practices online and offline. We broaden current studies on queer visibility online and expand the traditional lens of selective visibility by highlighting how *embodiment* both supports and challenges the multidimensional online presentations of queer identity. We also propose potential design considerations to further support diverse queer users' visibility in social VR and inform future directions for creating inclusive online social experiences.

CCS Concepts: • **Human-centered computing** → **Empirical studies in collaborative and social computing**.

Additional Key Words and Phrases: queer identity, online visibility, selective visibility, embodiment, social virtual reality

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1 INTRODUCTION

The Human Rights Campaign describes "queer" as "a term people often use to express a spectrum of identities and orientations that are counter to the mainstream" [9]. In this sense, being *queer* entails an anti-normative stance toward sexuality and/or gender identities, such as not identifying as exclusively straight and/or having non-binary or gender-expansive identities [9]. These individuals have witnessed the continuous disappearances of safe offline spaces for queerness and an increase of such spaces in online communities [15, 66]. For them, online social spaces have been an integral part of queer social lives [76] and the leading platforms for them to learn about their gender identity and sexual identity and connect with similar others, increasing their *visibility* online.

In particular, the emerging social Virtual Reality (VR) spaces have attracted increasing queer users, as demonstrated by regularly scheduled queer-focused meetups and community events on popular social VR platforms (e.g., AltspaceVR and Meta Horizon) (Figure 1 and 2). In these popular 3D virtual spaces, multiple users can engage with one another using VR head-mounted displays [24, 55]. Compared to other traditional online social spaces, social VR changes how people communicate,

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connect, and socialize with each other in an immersive and embodied manner via 360-degree virtual content, voice communication, and full-body tracked avatars (i.e., avatar's movements correspond to one's physical body movements), rather than merely looking at a computer screen (Figure 1).



Fig. 1. Social VR users talking to each other [59] Fig. 2. AltspaceVR users in a queer event

To our knowledge, how the intersection of queer visibility online and the immersive and embodied experiences in social VR may support and/or challenge novel identity practices has received little research attention in the HCI and CSCW community. We believe that an in-depth empirical investigation of such an intersection is critical for explicating the complex social dynamics and new phenomena surrounding queer visibility mediated, supported, and facilitated by novel technology. Therefore, in this paper, we focus on *embodied visibility* emerging in social VR as a new lens to explore how queer users build and experience visibility in nuanced online social spaces. Grounded in previous literature on conceptualizing embodiment in VR [40, 49], queer theory and queer research in HCI [3, 16, 39, 45, 71, 72], and queer visibility online [4, 7, 11, 19, 20], we define embodied visibility as *queer users' conscious choices on presenting and/or disclosing non-hetero or non-cisnormative identity expressions to others through a sense of embodiment about wearing and acting upon one's virtual body, rather than merely viewing an on-screen visual representation*.

Drawing on 29 users' experiences of building and expressing their queer identity in social VR across various countries and cultures, we explore the following research questions:

RQ1: *What strategies do queer users use to build and experience embodied visibility in social VR, and what are the limitations of these strategies?*

RQ2: *How does embodied visibility in social VR affect queer users' identity practices?*

We contribute to existing HCI and CSCW knowledge on queer online presentation and visibility in three ways. First, our research broadens current studies on queer visibility online by focusing on new phenomena, strategies, and limitations of building and experiencing visibility in social VR, a unique and novel emerging online social space that has not been thoroughly studied for queer online social experiences. Second, we highlight the importance of taking *embodiment* into account when analyzing queer users' online presentation and visibility, which may go beyond the traditional lens of *selective visibility*. Through embodiment, we point out the multidimensional online presentation of queer identity, which involves the control over both virtual body and physical body, the nuanced body ownership, and the complicated sociocultural and economic power dynamics. Third, we propose five potential design considerations for further supporting diverse queer users' visibility in social VR, which may inform future directions for creating inclusive online social experiences.

2 RELATED WORKS

Our focus on queer users' experiences of visibility in social VR spaces is grounded in three inter-linked strands of research in CSCW and HCI: Queer Theory and HCI; self-presentation online and

queer visibility; and theories of embodiment and the embodied visibility in social VR. We believe that our focus especially sheds light on new identity practices/experiences and challenges queer online users may face in emerging novel online social spaces.

2.1 Queer Theory and HCI

The evolving understanding of *queer* continues to highlight its critique of identity [73], its focus on identity without an essence [34], and its goal to problematize "apparently structural and foundational relationships with critical intent" [45]. Therefore, to frame, discuss, and understand queerness, a body of work known as *Queer Theory* has emerged, which goes beyond the more traditional lesbian and gay studies [39].

Among them, Jagose describes *queer* as an umbrella term for a coalition of culturally marginal sexual self-identifications and points out its focus on mismatches between sex, gender, and desire, including topics such as cross-dressing, hermaphroditism, gender ambiguity, and gender-corrective surgery [39]. Others emphasize the critical lens of Queer Theory. For example, Smith explains the key of *queer* as a radical questioning of social and cultural norms and notions of gender, reproductive sexuality, and the family [71]. Halperin understands *queer* as a positionality rather than an identity, as anyone who feels marginalized due to their sexual practices can become *queer* [34]. And Sullivan considers *queer* an identity category that does not aim at consolidating or even stabilizing itself [73]. According to Sullivan, *queer* is a critique of identity-focused movements or identity politics "by understanding that even the formation of its own coalitional and negotiated constituencies may well result in exclusionary and reifying effects far in excess of those intended" [73].

As digital technologies continue to define and facilitate nuanced identity practices and self-presentation online, Queer Theory has inspired Queer HCI as an important research agenda. The 2019 and 2020 CHI SIGs define Queer HCI as "research in HCI by, for, or substantially shaped by the queer community itself and/or queering methods and theory, regardless of application subdomain" [16, 72]. In this sense, Queer HCI involves at least three key strands of research: (1) examining technical problems from queer users' perspectives and how they may be impacted by such technologies and systems [16]; (2) using *queering* as a design method to analyze, challenge, and *troubling* design against a toxic status quo – e.g., "as a form of resistance to dominant messages about who we are supposed to be" [36, 45, 72]; and (3) supporting queer researchers and their perspectives as well as supporting allies in doing queer research sensitively and appropriately [16]. Aligning with (1), in this paper we focus on queer online presence and experiences. With (2) in mind, we hope to help innovate existing social VR design for queer visibility. Continuing the similar line of research as (3), we endeavor to further support queer researchers, allies, and queer topics through this research (see also our Positionality Statement).

2.2 Self-Presentation, Visibility, & Queer Online

Grounded in our review of Queer Theory in the previous section, in this paper we understand queer users as *individuals with an anti-normative stance toward their sexuality and/or gender identities*. In queer research, a queer individual's *visibility* refers to *out-ness*, which is the level of disclosure of their queer identity to friends, family, and the public [23]. Hennessy also defines *queer visibility* as a simple display to promote discourse or complex social conditions [37]. In the offline world, *queer visibility* prepares the ground for gay civil rights protection and promotes affirmative images of queer individuals [37]. An example is the pivotal 1970s gay and lesbian movement [23]. In the online world, *visibility* is essential for understanding queer users' practices and challenges of presenting and disclosing their gender identity and sexual identity in technology-mediated ways

that surpass geographical constraints [10, 54, 68, 75]. It should also be noted that a growing concern regarding queer visibility is that specific queer subcultures may show varying degrees of visibility. One example is *homonormativity* where gay white men are considered more privileged than others in the queer community [18]. A similar example is the concept of *homonationalism*, which highlights gay-friendly public relations but does not necessarily focus on other queer populations such as transgender individuals [63]. In addition, *cisnormativity* normalizes cisgendering but is less supportive of transgender individuals [22, 79]. In this sense, some queer populations, especially those with intersectional identities (e.g., transgender people of color) may face more challenges about visibility than the others (e.g., white gay men).

In HCI and CSCW, a body of research has used the notion of *visibility* in different contexts, such as the degree of queer identity disclosure online (i.e., out, open, semi-open, not out) [11] and the various narrative of technology-mediated "coming out" stories [29]. For example, the lens of *visibility* has become important to investigate queer parents' online disclosures [7], queer users' visibility on social media [11], and transgender and gender non-conforming SNS users' struggles when disclosing significant identity changes online [32, 33]. In these studies, *queer visibility* mainly refers to such users' control over the disclosures of sexual orientation or gender identity to the outgroup [7, 11]. It indicates the broader socio-political significance of disclosing sexual orientation or gender identity – such disclosure may lead to political advancement and public advocacy toward greater acceptance of non-normative identity (e.g., being queer) [7, 75].

In particular, these studies have highlighted *selective visibility* as regard to queer users' online presence and social experiences [7, 11, 21, 45, 52]. This focus seems to root in the well-established *selective self-presentation/performance* theory, which is based on Goffman's metaphor of *theatrical performance* [28]. According to Goffman, self-identity is constructed in a collective and interactive process within different social settings. In this sense, gender representation and sexual representation online are largely performed and audience-oriented: it is important for performers (i.e., users who endeavor to present themselves online) to identify audiences (i.e., other online users who perceive and interpret performers' digital representations) so as to adjust their performance (i.e., how performers present and practice their gender and sexuality online). This perspective thus highlights how gender and sexuality are portrayed and experienced as a combination of conscious personal choices and specific technological features of online social spaces. It sheds light on several identity practices and issues with regard to presenting gender and/or sexuality in these spaces, such as the authenticity and multiplicity of digital identities [13, 17, 62] and identity construction based on "the imagined audience" [46, 47].

With these understandings, prior studies have explored queer users' nuanced presentation of identity and selective visibility in various online social spaces. On social networking sites, queer users can make decisions about their self-presentation in multiple ways across different platforms [14]. Transgender users have also been using social media to curate items such as clothes and accessories for their aspired selves [31] and embed customized gender in social media profiles to better affirm their queer identity [5]. In online gaming, queer players are able to customize, experiment, and selectively present their gender identity and sexual identity through the avatar they choose in-game [27, 38, 64, 65, 80]. For them, avatars may well become a type of "identity tourism" where they selectively and actively perform "versions of themselves as raced and gendered beings" in both textual and visual forms [58]. Other emerging online social spaces continue to facilitate queer users' practices to portray, enact, and experience their online identities in novel ways. Examples include the so-called "throwaway accounts" on Reddit [43]; the creative use of Tumblr's tagging and blog formatting for LGBTQ bloggers' identity construction [60]; Instagram for visualizing queer identity and life transitions [19, 20]; live streaming and video sharing platforms' (e.g., Twitch and Tik Tok) support for high-fidelity and multidimensional physical presence through

real time video, audio, and text, which may both support queer identity work and violate such identities [25, 69]; and how location-based mobile dating apps for LGBTQ users produce sexuality and the "desiring user" [4, 35].

In summary, with *selective visibility*, queer users can manipulate and adjust the level of their visibility across different platforms and choose what aspects of their identity they decide to show to specific groups of online audiences through multimedia forms and multimodal channels (e.g., synchronous or asynchronous video, audio, text, and image and interactive experiences through on-screen 2D or 3D virtual avatars) [7, 11, 25, 45, 52, 69]. In this sense, *selective visibility* often benefits queer users' online presence and social experiences by protecting their privacy, defining their gender identity and sexual identity, and mitigating their social pressure through adjusting their self-presentation online with respect to specific social norms. As social technologies evolve towards more natural and immersive interaction, there is a growing interest in HCI and CSCW to explore how novel social spaces that have not been extensively studied may both support and challenge queer users' identity work and online visibility. Such knowledge can help better understand new and more nuanced presentation of queer identity and how such identity is mediated, constructed, and affected by novel technology. To contribute towards this growing research agenda, we introduce social VR, immersive and embodied social spaces that attract a growing number of queer users.

2.3 Embodiment and the Embodied Visibility in Social VR

Social VR refers to 3D virtual social spaces where multiple users can interact with one another through VR head-mounted displays and engage in 360 degree immersive content [24, 55]. In particular, social VR's uniqueness lies in its focus on the sense of *embodiment* and the resulting immersive experiences due to the predominant use of real time voice chat, full-body tracked avatars (i.e., avatar's movements correspond to one's physical body movements), and more customized avatar design.

The notion of *embodiment* has been defined in various ways across different contexts and disciplines. For example, Lloyd focuses on knowledge obtained through one's physical bodies and personal experiences as a form of embodiment [48]. Kitzie discusses identity performance on 2D social networking sites such as "catfishing" (e.g., setting up a false personal profile on a social networking site for fraudulent or deceptive purposes) as an example of common embodied practices [41, 42]. In VR literature, embodiment centers around the key question regarding how we can experience a virtual body representation as our own body within a virtual environment [70]. This definition thus highlights the sense and awareness of one's virtual body, which is described as the ensemble of sensations that arise in conjunction with being inside, having, and controlling a body in VR [40]. Kiltner et al. further explains *embodiment* through three dimensions: sense of self-location, sense of agency, and sense of body ownership [40]. Specifically, sense of self-location refers to one's spatial experience of being inside a body; sense of agency refers to the subjective experience of action, control, intention, motor selection and the conscious experience of will through the body; the sense of body ownership refers to one's self-attribution of a body and how such a body becomes the source of the experienced sensations [40].

Using the above mentioned conceptualization of *embodiment*, we highlight how social VR provides a unique sense of *embodiment* in terms of self-location, agency, and body ownership compared to other conventional online social spaces. First, due to the use of full-body tracked avatars in social VR, one's physical body, rather than keyboard, mouse, or joystick, is the sole interface between the user and their digital presentation [26]. This interface allows users to explore the virtual environment in a more intuitive and immersive way, which creates a strong sense of self-location and awareness of co-presence. The level of joint involvement and user connectedness is

also enhanced due to the broad spectrum of verbal (e.g., voice) and non-verbal (e.g., body language) communication modalities in social VR, which heightens one's agency of the virtual body [51]. In addition, social VR significantly enhances one's sense of being physically immersed in the virtual environment since avatar behavior in social VR corresponds to the body motions in the offline world. This correspondence may lead to a higher awareness of body ownership and more physical and transformative interactive experiences: social VR users actually "put on" their avatars in VR and are embodying the avatar's skin, clothes, and equipment [50]. They are not merely "viewing" their activities on screen as in any other types of conventional online social spaces (e.g., social networking sites, live streaming, online gaming or traditional virtual worlds). Their bodies are also not merely transported to the VR space. Instead, they engage in the virtual space both with their physical body and bringing in their offline history, background, and sociocultural experiences [56].

Such experiences seem to indicate a more intimate and stronger bond between users (physical body) and their avatars (virtual body), which is especially valuable for queer users. For example, prior research has found that social VR provides transgender users with an immersive and embodied way to explore, express, and experiment with their gender identities [24, 26]. Some popular social VR platforms, such as AltspaceVR and Facebook Horizon, also feature regularly scheduled queer-focused meetups in VR. Despite the increasing popularity of social VR among queer users, this small body of prior studies only involved limited samples of queer social VR users – e.g., in [24, 26], only four out of 30 participants were self-identified as queer (e.g., transgender women). How queer users may present their identity and build visibility through embodied experiences in social VR is still understudied. For these users, in contrast to building their *visibility* through a flat-screen visual display and traditional media formats (e.g., text, video, image, and audio) as in conventional online social spaces, social VR seems to offer a new form of visibility – the *embodied visibility*.

Based on previous literature on conceptualizing embodiment in VR [40, 49], queer theory and queer research in HCI [3, 16, 39, 45, 71, 72], and queer visibility online [4, 7, 11, 19, 20], we define embodied visibility as *queer users' conscious choices on presenting and/or disclosing non-hetero or non-cisnormative identity expressions to others through a sense of embodiment about wearing and acting upon one's virtual body, rather than merely viewing an on-screen visual representation*. Specifically, a virtual body refers to a 3D immersive digital representation of self that a specific platform provides and a user designs, creates, or chooses based on their identity, including personality, appearance, gender, and sexual orientation. Using this conceptualization, in this paper, we focus on: (1) how queer users build and experience embodied visibility in social VR and the limitations of their strategies to do so (RQ1); and (2) impacts of embodied visibility on their identity practices online (RQ2).

3 METHODOLOGY

Recruitment. Due to the exploratory nature of our research questions, we conducted an interview study to investigate queer users' rich and in-depth personal experiences of identity practices and visibility in social VR. This study was part of a broader research project on social experience in social VR. The university's Institutional Review Board (IRB) approved this study for research ethics. We posted recruitment messages on popular online forums for queer gamers (e.g., r/gaymers, r/Oculus in Reddit) and Discord servers for social VR and queer users (e.g., VRC LGBT on Discord) to recruit participants who self-identified as queer (e.g., lesbian, gay, bisexual, transgender, genderqueer including gender non-binary, gender fluid, and gender non-conforming, intersex, asexual, questioning, and others) and had experienced social VR in the past 12 months for interviews. We also reached out to two popular social VR blogs to further distribute the recruitment message. In addition, the second author attended various events for queer users in AltspaceVR and VRChat and asked participants' willingness to participate. We provided an informed consent document

to potential participants based on their communication preference, such as via emails or Discord messages.

Interviews. All participants who responded to our requests and agreed to participate were interviewed. As a result, 29 semi-structured in-depth interviews were conducted from October 2020 to February 2021 via text/voice chat over Discord, video chat over Zoom, or within social VR, depending on participants' preferences of modality. No names or identifiable information were asked and interviews done within social VR were conducted in a private world where only the interviewer and the participant were present to protect participants' safety and privacy. For participants who were younger than 18 years old, the interviews were only conducted via text chat or other text-based communications to further protect their identity. Pronouns used by participants were also collected to report participants' experiences accurately.

Interviews started with questions about basic demographic information and devices and social VR applications that participants use most. The main interview questions were related to participants' activities in social VR (e.g., *"What do you usually do when you use social VR platforms?"*, *"Who do you use social VR with?"*), avatars and identity (e.g., *"What are your criteria/considerations to create your avatar?"*, *"Do you feel presenting yourself in social VR affects how you understand/confirm your own identity in any way?"*, and *"Do you feel the appearance/gender of your avatar significantly affects how other people perceive and interact with you?"*), and interactions (*"Have you disclosed your gender identity and sexual identity to strangers in social VR?"*, *"Have you ever encountered negative, awkward, or unpleasant social interaction or harassment in social VR because of how you present your gender identity or sexual identity?"*). The average length of the interviews was 73 minutes. All interviews were voluntary and no compensation was provided.

In addition, one of the authors conducted participatory observations [8, 57] in queer-focused communities and events on AltspaceVR and VRChat from November to December 2020 by attending activities, conversations, and social gatherings, such as G-A-Y Talk, G-A-Y Meet-up social, and LGBTQ+ and Friends Meetups and Hangouts. In total, he conducted 64 hours of observations. In this paper, these observations were not part of the data analysis but mainly used to better understand and interpret the sociotechnological context of participants' social VR experiences, for example, the common types of events and occasions where queer users often hang out/interact with others in social VR and the popular social activities that they conduct.

Participants. Among the 29 participants, 15 self-identify as man, seven as woman, four as gender fluid, and three as non-binary. 18 self-identify as cisgender. Regarding ethnicity, 19 self-report as White, three as Hispanic, two as Asian, two as mixed race, one as Indigenous Australian, one as Native Hawaiian or Pacific Islander, and one as Black. Participants were located all over the world, including the USA (N=15), United Kingdom (N=5), Denmark (N=2), Canada (N=2), Philippines (N=1), Australia (N=1), and Switzerland (N=1). Participants age ranged from 15 to 35 at the time of the interview (Average age: 21.32; SD=4.8) and with diverse social VR experience ranging from 1 month to 48 months (average: 22.3 months; SD=17.29). They spend 1 to 50 hours on these platforms per week (average: 13.52; SD=11.03). Participants have also experienced various popular social VR platforms, including VRChat, Rec Room, BigScreen, AltspaceVR, vTimeXR, ChilloutVR, Roblox, and NeosVR. Following Dym et al.'s reporting of gender identity and sexual orientation [21], Table 1 summarizes the demographic information of our participants.

Data Analysis. We adopted a Grounded Theory Approach [12] to conduct an in-depth qualitative analysis of the collected data. Our goal is to generate a rich and empirical examination of how queer social VR users experience embodied visibility and how it affects their identity practices, which may extend existing theories of queer visibility online. Based on McDonald et al.'s [53] guidelines

Table 1. Demographic Information of Interviewees

ID	Gender Identity	Sexual Orientation	Ethnicity	Age	Experience (months)	Social VR platforms used
P1	Cisgender Woman	Bisexual	White	23	36	VRChat; Rec Room
P2	Genderfluid	Queer	White	21	8	Rec Room; VRChat; AltspaceVR
P3	Cisgender Man	Gay	Hispanic	20	48	VRChat
P4	Non-binary	N/A	White	20	24	VRChat; Rec Room
P5	Cisgender Woman	Gay	White	22	36	VRChat
P6	Cisgender Woman	Gay	White	18	24	VRChat
P7	Transgender Woman	Lesbian	White	23	13	VRChat
P8	Genderfluid	Pansexual	White	21	36	VRChat
P9	Cisgender Man	Gay	Asian	32	3	BigScreen; vTimeXR; Rec Room; VRChat
P10	Cisgender Man	Gay	Indigenous Australian	17	15	VRChat; Rec Room
P11	Cisgender Man	Bisexual	White	19	48	VRChat
P12	Transgender Woman	Bisexual	NH/PI	15	1	VRChat
P13	Cisgender Man	Bisexual	White	N/A	12	Rec Room; VRChat
P14	Non-binary	Pansexual	White	20	30	VRChat
P15	Cisgender Man	Bisexual	White	19	12	VRChat; ChilloutVR; Rec Room
P16	Cisgender Man	Bisexual	Hispanic	18	15	VRChat
P17	Cisgender Man	Bisexual	White	18	60	VRChat
P18	Transgender Man	Straight	White	19	48	VRChat; Roblox
P19	Cisgender Man	Gay	White	N/A	4	VRChat
P20	Non-binary	N/A	Black	28	10	AltspaceVR
P21	Cisgender Man	Gay	Mixed	N/A	1	AltspaceVR; vTimeXR
P22	Cisgender Man	Gay	White	24	36	VRChat
P23	Cisgender Woman	Bisexual	Hispanic	35	2	Rec Room; BigScreen
P24	Cisgender Man	Gay	White	17	24	VRChat; NeosVR
P25	Genderfluid	Asexual	White	24	30	AltspaceVR; VRChat
P26	Genderfluid	Bi-curious	Mixed	25	7	VRChat; ChilloutVR
P27	Cisgender Man	Bisexual	White	N/A	14	VRChat; ChilloutVR
P28	Cisgender Man	Bi-curious	Asian	20	48	VRChat; NeosVR
P29	Transgender Woman	Queer	White	15	4	VRChat; Rec Room; AltspaceVR

Note: N/A - participant preferred not to answer;
NH/PI refers to Native Hawaiian and other Pacific Islanders;

for qualitative analysis in CSCW and HCI practice, our analytical procedures did not focus on inter-rater reliability but endeavored to yield recurring concepts and categories of interest, find relationships, connections, and comparisons among them, and formulate them into more complex groups and broader categories.

We analyzed all collected interview data in the following steps: (1) one of the authors conducted eight initial interviews and wrote conceptual memos. The research team discussed the memos, highlighted emergent categories in the data, made distinctions and connections, and then used theoretical sampling [12] to recruit more participants and update the interview guide with several more focused questions; (2) once all interviews were conducted, both authors closely read through the participants' narratives line by line to acquire a sense of the whole picture as to how queer users build and experience embodied visibility through social VR. The author who conducted observations before also shared his insights to help the research team familiarize themselves with the common types of events, occasions, and social activities that queer users often engage in social VR. These insights have been published in one of our prior works [1] and were only used to provide background knowledge about the queer social VR community in this paper; (3) both authors independently and carefully conducted open coding [12] of each transcript, categorized participants' responses, and highlighted comparisons and connections emerging in participants' descriptions for further analysis; (4) both authors discussed and refined categories, connections, and comparisons in a collaborative and iterative axial coding process [12] to streamline queer users' experiences of embodied visibility in social VR and group them by each research question; (5) one of the authors extracted quotes based on the connections and comparisons refined in the

previous step through focused coding [12]; (6) both authors further refined these categories and relationships and used the quotes to generate a rich description synthesizing how queer social VR users experience embodied visibility.

Positionality Statement. In qualitative research on online identity practices, it is both important and ethical to acknowledge how the researchers' identities and cultural backgrounds may influence the research and the analysis and interpretation of the data [44, 67]. Such disclosure would also help clarify the researchers' position in the world, their goals, as well as their position in their intellectual and, to an appropriate extent, political beliefs [2]. Therefore, we believe that it is necessary to share the context of our positionality in relation to the participants. One of the two authors self-identifies as a gay man of color. The other author self-identifies as a straight woman of color. Both authors identify as cisgender, which can be a limitation as some participants in this study identify as transgender, non-binary, or genderfluid. Both authors have extensive experience in social VR both as users and as researchers. Our own identities thus help us be aware of the unique challenges for queer users' identity practices in the sociotechnological context of social VR.

4 FINDINGS

In this section, we explain the primary strategies that our participants use to build and experience embodied visibility in social VR and the main limitations of these strategies (RQ1). We also highlight the impacts of embodied visibility on queer social VR users' identity practices (RQ2). We use participants' self-reported pronouns to describe their experiences.

4.1 Strategies to Build and Experience Embodied Visibility in Social VR

Our participants highlight several main strategies that they use to build and experience visibility in an embodied way in social VR. However, they also point out concerning limitations associated with each strategy.

4.1.1 Visualizing Queer Identity through Avatar Creation and Design. Similar to traditional online gaming and virtual worlds, one's avatar is still the key to build visibility in social VR. Yet, queer users seem to have more flexibility to generate and customize their social VR avatars based on their gender identity and sexual identity. For example, they can create their avatars by mixing several predefined avatar templates or combining physical characteristics such as eye color, body shape, and clothing to represent themselves. In some social VR platforms (e.g., VRChat), they can even use third-party applications such as Blender and Unity to create their avatars from scratch. In contrast to online gaming or traditional virtual worlds where players often pick a "cool" avatar or whichever is available to them [26], our participants regard creating their avatar as a continuous process involving significant emotional investment and deep personal feelings – not just creating a digital visualization but "*an artistic expression*" (P5, cisgender woman, gay, White, 22) of how they understand themselves. Especially, participants mention that they are able to further visualize their queer identity through carefully customizing their avatar and experiencing various avatar bodies.

Crafting Avatars to Display Queer Identity Accurately. One main strategy many queer users employ to build their visibility in social VR is to create avatars that can present their queer identity as accurately as possible. As P9 (cisgender man, gay, Asian, 32) suggests, "*I try to make my avatar as close as possible to how I look and whom I really am. That has been great for me to get immersed because it's mostly my perception of my identity.*"

Echoing P9's strategy, P7 (transgender woman, lesbian, White, 23) tells a story about her journey from having to choose from prebuilt avatars to creating her own to accurately present her queer identity: ("*This provides people with an accurate idea of who I am*"). P18 (transgender man, straight, White, 19) goes even further to scan himself to create the most accurate avatar: "*I got a 3D scan*

of myself and I use it as my avatar." For these users, having an avatar that closely resembles them allows them to present and express their queer identity more accurately in social VR. This focus seems to be even more important for queer users of color, as they situate at the complex intersection of trying to build both queer visibility and racial visibility in social VR. P23 (cisgender woman, bisexual, Hispanic, 35) highlights,

"I think it is really important to get the right skin color. I feel I should do more to represent brown queer people in these places. That's the angle I'm coming from when creating my avatar. I really like my sense of fashion and the way I dress and I feel I do kind of reflect that in my avatar of brown skin."

P23 emphasizes the importance to not only present herself as a queer user but also as a *queer user of color* when creating her VR avatar (e.g., the focus on brown skin). For her, her queer identity and racial identity are inseparable. This intersectionality thus motivates her to seamlessly visualize both her queer identity and racial identity, which is essential to accurately present herself and build her visibility online (e.g., *"do more to represent brown queer people in these places"*).

For participants who self-identify as genderfluid, the ability to change avatars instantaneously in social VR is also beneficial for accurately reflecting their queer identity. P8 (genderfluid, pansexual, White, 21) reveals,

"Being genderfluid, basically, I switch quite a lot. And it can be very dependent on my emotions a lot of the time. [...] VR chat definitely helps with me dealing with my dysphoria that I have. If I'm feeling male, I use my ambiguous one. If I'm feeling really feminine, I'll use one of my feminine avatars and I have a few of them. I think switching between these avatars helps others see whom I want to be based on my emotions."

P8 explains that their self-identified gender is fluid based on their feelings and emotions. For them, how to better reflect this fluid process is critical to build their online presence in social VR – for example, how to help others see exactly whom they want to be depending on their emotions. In this sense, instantly switching the gender of their avatar (e.g., ambiguous and feminine) is an effective strategy to express their identity dynamically.

In contrast to switching between different avatars, some other genderfluid participants recommend solely using an androgynous or a non-human avatar to build a stable presence, thus increasing their visibility in the community. P25 (genderfluid, asexual, White, 24) and P26 (genderfluid, bi-curious, mixed race, 25) note,

"[My avatar] represents what I would like to look like, mainly with much shorter hair, a more androgynous look. My gender can change from once a week to even multiple times in a day. So, it is easier to use androgynous avatars, so it is also easier for people to recognize and know me." (P25)

"I find it interesting to be able to blend in or represent myself in a non-human form like a robot. I usually choose such avatars because they are non-gendered and non-sexualized and thus make presenting my gender easier in social VR. I also can just use one stable avatar and don't bother about switching back and forth." (P26)

Both P25 and P26 acknowledge the difficulty in presenting their genderfluid identity through avatars, which may somehow hinder their visibility due to the lack of consistent online presence. To address this, P25 chooses to simply use an androgynous avatar to represent their fluid gender identity, whereas P26 prefers non-gendered and non-sexualized avatars (e.g., a robot). For them, using such an avatar not only accurately represents their gender identity but also helps them be recognized by the social VR community through a stable and consistent presence.

In summary, by actively crafting avatars to accurately and dynamically represent their queer identity, our participants often draw attention to the queer community and make themselves visible in social VR. As P2 (genderfluid, queer, White, 21) shares, *"I wanted other people to be able to recognize me having LGBTQ identity. If people really want to know about me, they will ask. [...] I get the chance to share with them."* For participants like P2, sharing and signifying their queer identity is essential in their social VR experience. Knowing that other social VR users are interested in learning about the queer community and engaging in a conversation with them is particularly valuable.

Experiencing Various Avatar Bodies to Explore How Queer Users Want To Be Seen. Our participants also mention that "wearing" different avatar bodies in social VR allows them to freely explore and experiment how they want to be seen and treated by others, which eventually helps build their visibility. P20 (non-binary, sexual orientation unknown, Black, 28) and P22 (cisgender man, gay, White, 24) describe,

"The ability to wear different bodies is definitely empowering. By doing this, I can figure out a body that is closer to what I feel like I look like and what I want to be seen." (P20)

"For the feminine [avatar], it is mainly based on my already existing persona, something that exists in my head anyway. I would prefer that body, if that makes sense. The masculine one is because recently, I started exploring a more masculine identity. Either way helps me better be seen by others." (P22)

For P20, a non-binary user, experiencing different avatar bodies helps them to better understand their preference on how to present themselves to others. Likewise, P22 has the need to "try out" both feminine and masculine avatar bodies. P22 self-identifies as a man but considers femininity part of his *"already existing persona."* This thus leads him to present himself in social VR with a more feminine body. However, he is also open to explore a more *"masculine identity,"* motivating him to experiment a masculine body sometimes. For both participants, immersively experiencing various avatar bodies in social VR meets their need for gender exploration and helps build and communicate their queer identities to others (e.g. *"better be seen by others"*).

In addition, for participants who have less visibility in the offline world, wearing a different avatar body in social VR becomes an important method to build and experience how they want to be seen by others. P8 (genderfluid, pansexual, White, 21) shares,

"A lot of [my avatars] are feminine. My body in real life is very masculine because I have to keep up the appearance since I live with my parents. They are very much against everything, but in VRChat, [my avatars] are either feminine or very androgynous avatars. So, they are what I want to be seen by others. They make me feel other people can see the real me."

P8 is in a challenging situation in the offline world because their parents would not accept their queerness. This issue forces them to keep their gender identity largely "invisible" in the offline world (e.g., maintaining a masculine appearance). Engaging in social VR and putting on more feminine avatar bodies thus provides them with valuable and safe opportunities to experience and display their actual gender identity to others. As P8 highlights, it becomes a meaningful way for them to gain more visibility because *"other people can see the real me."*

Strategy Limitation: Restricted Avatar Design to Fully Present Queer identity. Though participants appreciate the opportunity to visualize their queer identity through creating and crafting VR avatars, they highlight the restricted avatar design offered by most social VR platforms as

a limitation for fully representing their queer identity. Several participants mention such restrictions across different social VR platforms:

"It is pretty hard to find a plain or non-sexualized ("eboy") male avatar. It also was hard to find long hairstyles for male avatars." (P16, cisgender man, bisexual, Hispanic, 18)

"I was still feeling very much more feminine than masculine at the time. So, I obviously needed to find more female avatars, which was, thankfully, not that hard. I can imagine if I felt the other way around, I probably would have had issues. I know there are a lot more options for female avatars; even the male ones look a lot more feminine usually as well." (P22, cisgender man, gay, White, 24)

"There could be more options for gender expression. Say if someone wants to be androgynous, it is usually still a bit feminine rather than ambiguous." (P25, genderfluid, asexual, White, 24)

For P25, it is challenging to fully express one's non-hetero or non-cisnormative identity through predefined avatar characteristics in social VR. For example, even if a genderfluid or a non-binary user chooses to use an avatar displaying no clear gender identity, such an avatar still ends up being *"feminine rather than ambiguous."* P16 and P22 highlight similar issues, such as the shortage of well-designed male avatars on most social VR platforms. For P16, the main challenge is the lack of just plain or non-sexualized male avatars and the limited customized features for male avatars (e.g., *"long hairstyles"*). P22 adds that male avatars may still tend to look strangely feminine. In this sense, queer users who prefer to use male avatars in social VR face a double challenge: they first at least have to find a male avatar that they can wear, then they have to make sure that their male avatar actually look like a man.

As an alternative, some queer users choose to create their avatars using third-party applications and upload them to social VR platforms such as VRChat. However, this often leads to additional technical challenges to present themselves. P6 (cisgender woman, gay, White, 18) reveals, *"I have gone through like a two-day phase [of creating my avatar] but very quickly gave up since I am not that technical for that type of stuff."* According to P6, the learning curve for using third-party applications, acquiring necessary digital assets, and importing the 3D models to social VR as customized avatars can be too sharp and more demanding than what people expect. This leads to a dilemma for queer social VR users: they may not be able to fully present their queer identity using pre-existing avatars and avatar features available in social VR; or they are aware of the option to create their own avatar from scratch outside social VR, but there is a lack of resources, instructions, and support to help and guide them actually do it.

4.1.2 Acting Out Queer Identity via Full-body Tracking and Embodied Events. Besides avatar design and customization, social VR avatars are unique because they support full-body tracking – the avatar's movements correspond to the physical body movements in the offline world by tracking the bodily movements of arms, legs, and hips. This makes queer users' avatars beyond just a digital visualization on the screen – they become physical acts to perform their queer identity online.

Using Full-body Tracking to Actively Act Out Queer Identity. For queer social VR users, the ability to "do" what their avatars are doing by making the same body movements in the offline world, rather than merely "seeing" what their avatars are doing on screen, is the key to building a strong body ownership and actively acting out who they are. P26 (genderfluid, bi-curious, mixed race, 25) explains,

"I love to exercise and express my femininity [in social VR]. I know that I am male and probably stay as one. But I very much do identify with my feminine avatar body. It helps me find my identity through looking in the mirror and doing hip sway, and finding ways to move my body. So people will see me as more feminine." (P26)

For participants like P26, their queer identity becomes visible not merely through how their avatar looks but also based on how they move, including the ways they walk and sway their hips. Therefore, to better present and express their gender identity or sexual identity in social VR, they also need to move their physical bodies accordingly. In this sense, building and experiencing queer visibility goes beyond visualization – it is also about action. P22 (cisgender man, gay, White, 24) thus summarizes that the key value of using a full-body tracked avatar is to let him seriously reflect upon *"how I act"* and *act out* whom he wants to be, which in turn increases his visibility in social VR (e.g., *"better see me"*).

Such an action-based visibility through full-body tracking even encourages some participants to (re)discover their gender identity or sexual identity. P27 (cisgender man, bisexual, white, age unknown) shares his story:

"I initially got a [simple] VR headset, then a few months later I got a full-body set which allows me to move my legs and hand and everything as my avatar. After that, things started escalating. I started changing sexually in terms of what I like. Previously, I thought I was straight. And then, I started enjoying being gay more and more. Being in full-body made me interested in that. [...] Other people could also easily realize I'm interested in [exploring the gay community] by just watching how I use my full-body avatar."

For P27, upgrading to a full-body set that tracks head, hand (e.g., doing high fives and thumbs ups), arm, hips, and leg movements results in a very different experience of exploring his sexuality. Using a full-body tracked avatar not only makes his sexuality more visible to others (e.g., *"by just watching how I use my full-body avatar"*) but also to himself. At the time of the interview, P27 told us that he self-identifies as bisexual rather than straight because of his experience of such avatars in social VR.

Engaging in Embodied Immersive Activities to Build Queer Visibility. Another key method to act out queer identity in social VR is to engage in various embodied immersive activities that simulate offline social activities. Examples may include drinking at bars and clubs, playing piano, dancing, watching movies, playing games, and hanging out with friends. Our participants highlight three focuses to build their visibility through these embodied activities: 1) seeking a natural and realistic way to build visibility; 2) revealing emotions and personalities through simulated physical behaviors; and 3) attending queer-focused immersive events.

1. *Seeking a natural and realistic way to build visibility.* In social VR, users can perform activities just as what they do in the offline world. Therefore, queer users are able to build their visibility naturally and realistically but with reduced limitations and risks compared to the offline world. For example, P27 (cisgender man, bisexual, white, age unknown) describes how events in social VR can be replications of any offline events where queer users have a presence,

"Like in real life where you go somewhere like clubs. In this case, we go to different worlds. It could be a bar world or any replication of real life. In a sense, if you want to dance, if you want to go to a strip club, they have worlds specific for those that exist in VRChat."

In P27's account, places of interest in the offline world exist in social VR to accommodate equivalent activities. Those types of themed worlds in social VR also allow users to have certain expectations on what type of interaction they would encounter in that environment. P4 (non-binary, sexual orientation unknown, White, 20) adds,

"Say like if I go to the drinking world, there is going to be people that are playing games or drinking, and others expect that is the kind of social interaction they are getting. Versus going to BlackCat, which is a place where people chill, just groups that are having random conversations."

P4 describes that the worlds in social VR are built around people's expectations of how that particular environment should facilitate certain social atmospheres and interactions offline. For example, drinking worlds accommodate embodied activities such as playing games and drinking, while *BlackCat*, a hang-out world, facilitates activities centered on conversations. Whichever world a queer user chooses to visit, they can interact with others with similar expectations for related offline activities. This correspondence thus helps them behave naturally and also be seen naturally in that particular environment.

2. *Revealing emotions and personalities through simulated physical behaviors.* As we have described, using full-body tracked avatars helps queer users "act out" their identity. With this ability, our participants are able to better reveal their emotions and personalities through simulated physical behaviors. These behaviors seem to enhance their sense of agency [40], as they gain subjective experience of action, control, intention, motor selection and the conscious experience of will through a virtual body that corresponds to their physical body. Such a correspondence also becomes the source of the experienced sensations, thus leading to the sense of body ownership [40]. Both senses help build their visibility on various occasions. P10 (cisgender man, gay, Indigenous Australian, 17) describes his experience of playing piano in a public virtual space,

"I would go to a random public world, and I would play the piano. I would leave my microphone on, and I would play on my piano in my room and people would listen. I have met more people who are part of the LGBTQ+ community in that way."

For P10, conducting an embodied physical activity in social VR (i.e., play piano in social VR while actually playing piano in the offline world) makes him visible to others: such activity not only draws others' attention to him but also lets him meet and connect with other queer social VR users.

Similarly, P3 (cisgender man, gay, Hispanic, 20) and P26 (genderfluid, bi-curious, mixed race, 25) add that the simulated physical behaviors such as hugs, high fives, and cuddling in social VR allow them to better express themselves and their feelings, which enhances their presence to others in turn. They explain,

"I have had people come up and hug you and give you a high five. Even though it is something that you will not feel. It makes me feel good about the interaction. It makes me feel that they see me." (P3)

"It simulates cuddling with the presence of another person so well. You get a heck of a warm feeling when you have someone else is cuddling you, yet you do not have someone beside you." (P26)

For these participants, simulated physical behaviors in social VR seem to make them feel more connected with others and more aware of others' presence. In this way, they build their visibility by making others feel about their existence beyond merely avatar appearance. As P27 (cisgender man, bisexual, white) summarizes,

"Doing these activities allow people to feel a person's presence that is not really there. It also allows people to understand the person for who they are, what do you like about them, what do you like to do, instead of relying on how they look."

In this sense, building queer visibility in social VR is more than just presenting and customizing an avatar. Rather, queer visibility is felt, experienced, and demonstrated in a more dynamic way,

such as through simulated physical behaviors (including body languages) and activities that help queer users better reveal their emotions and personalities.

3. *Attending queer-focused immersive events to build visibility.* Participants also mention that attending queer-focused immersive events is a highly effective way to build their visibility. P23 (cisgender woman, bisexual, Hispanic, 35) describes such events in Rec Room as:

"There is so much openness for LGBTQ people in Rec Room. It just seems like it is so out there. The LGBT club and then there will be events. There is a nightclub just for LGBTQ. It is nice to know that there is a recurring LGBTQ meet-up. I love the fact that it is like establishing an idea that being LGBTQ is normalized. It is good to know that if I want to connect with somebody who is queer, I can go there. There are all kinds of LGBTQ stuff there. It is endless."

According to P23, these events in social VR are immersive, diverse, and well attended. Such events help queer users to find each other and foster the understanding that being a queer user in social VR is not unusual. Many participants even consider attending such events one of the most valuable aspects of their social VR experiences. P9 (cisgender man, gay, Asian, 32) highlights:

"Before, when I just started, I have not really been active on any of the events, because I do not really like the different topics and attendees. Then I found the LGBTQ-focused events. They became my escape room. I felt that it is a safe place. I went in there, and I was able to express my identity and interact with people more freely." (P9)

For P9, attending queer-focused events allows him to share and talk about his identity with other queer users. Such events also introduce him to virtual places where he can identify with and where his identity is respected. P9 acknowledges that though some virtual events in social VR are open to everyone, they are not particularly queer friendly – not every attendee welcomes queer users and/or appreciates how they express themselves. In contrast, engaging in queer-focused events encourages him to express his identity "more freely" and actively. This makes him both more visible and builds an overall visibility of the queer community in social VR. P5 (cisgender woman, gay, White, 22) and P18 (transgender man, straight, White, 19) reveal,

"I spend a majority of my time in these LGBT circles. It is very nice to know that there is a place where I can express myself in more ways than one and find people like me. Together we can do a better job to let others know and accept we exist." (P5)

"There are LGBT rooms that let LGBT people communicate with other LGBT people. If someone did not know what the LGBT community was, they would be able to see. The fact that there are specific rooms just for LGBT people is a great way to show others who we are as a community." (P18)

As these quotes show, attending these events and knowing that many others share the queer identity encourage P5 and P18 to express their identity and bond more with the queer community in social VR. Altogether, queer users like P5 and P18 are able to collectively foster a strong presence and advocate the queer community (e.g., "let others know and accept we exist," "show others who we are as a community").

Strategy Limitation: The Potential of Embodied Harassment. Social VR's unique focus on embodied interaction helps queer users act out their visibility. Yet, this uniqueness also allows potential harassers who target queer users to conduct harassing behaviors in a physical and more disturbing way. P23 (cisgender woman, bisexual, Hispanic, 35) shares her experience in BigScreen,

"They [the harassers] will come to sit next to me in a theater. I will jump in almost different spots in the theater, and they still follow me around. I have to start calling them out."

P23 describes a common form of embodied harassment in social VR: following people around. After recognizing P23's queer identity, P23's harassers constantly followed her around a theatre world in BigScreen, where users can gather to watch a movie. For P23, this is a disturbing and harmful experience as she clearly feels a violation of her personal space. The immersive and embodied nature of social VR also makes the behavior of "following around" feel as realistic as in the physical world. In this sense, embodied harassment towards queer users in social VR can be as damaging and destructive as in the offline world.

P22 (cisgender man, gay, White, 24) describes another novel form of harassment in social VR:

"Today, I got lost in a public world with a friend who just joined, and all I can hear is 'look at this furry guy, look at this furry guy' and then I got crashed. He crashed the entire room. It's like 'crasher beams' where you can point to that person if that person sees that shader pop up, they will just get crashed off the game on their PC."

P22 was harassed because of his queer identity in several ways. First, he was verbally harassed. Second, the harasser crashed the entire world by using a technique that overloaded the system (e.g., pointing laser beams to other users to overload their system). This is a very disturbing experience to P22 due to how it is conducted in an embodied and physical way: his avatar is crashed and the whole world surrounding him also crashes.

Sometimes, such embodied harassment may even happen between queer users. P23 (cisgender woman, bisexual, Hispanic, 35) continues to share how she was sexually harassed by another queer user:

"I have been harassed by cisgender males. However, I was also once sexually harassed by a girl who said she is lesbian. I joined a party type room. Immediately, two girl avatars near me started fawning over my Steampunk Corset, and I complimented their outfits too. Then, one of the girls declared that I was now her girlfriend. She asked me to come with her, away from everyone else, and I did start to follow her. She actually identified as a girl, and was not faking it. Then she sexually assaulted me. I think I was so shocked by how quick and sudden this happened, that I just went along with it. Looking back on it now, I wish I would've reported her. This was super unacceptable and inappropriate."

In P23's story, engaging in embodied immersive activities (e.g., a party) makes both her and her harasser (another queer user) visible to each other – for example, they are aware that they both are women and are likely interested in women as well. However, such visibility also leads to the other queer user's physical harassment towards her. For P23, it is a shocking experience and "super unacceptable and inappropriate."

Queer users of color especially point out that embodied harassment towards them can be intertwined with racism. P3 (cisgender man, gay, Hispanic, 20) shares one example,

"One time I went to a club setting and I was playing a lot of Latin and Spanish sort of music and I was dancing with the music. People were just straight mocking it and started to joke about both the color of my avatar skin and my sexuality. Some physically harassed me as well. People hate me because my avatar has brown skin and I'm gay. So dumb."

As mentioned in Section 4.1.1, queer users of color situate at the complex intersection of trying to build both queer visibility and racial visibility in social VR. P3 is one of them and builds his identity in various ways, such as through his avatar skin and playing/dancing with Latin and Spanish music. While these strategies make his queer identity and racial identity visible, they also make him more identifiable for physical harassment targeting both his queer identity and racial identity. Therefore, it seems to be more challenging for queer users of color to build and experience visibility in social

VR than, for example, white queer users, as they may likely encounter more embodied harassment due to this intersectionality.

4.1.3 Vocalizing Queer Identity through Voice Communication. In social VR, voice is the primary communication modality, which becomes another critical dimension for queer users to build their visibility. P2 (genderfluid, queer, White, 21) explains the importance of voice for making her feel both *seen* and *heard* by others,

"The ability to actually use my voice is very helpful rather than just like having a chatbox. When people are interacting with me, I can feel they are seeing and interacting with the person whom I am."

The unique combination of voice and embodied full-body tracked avatars also helps queer users conduct *voice training*, which may best reflect their queer identity to others. P4 (non-binary, sexuality unknown, White, 20) and P7 (transgender woman, lesbian, White, 23) share,

"There's a couple of times when I would use different sex avatars, and I would turn my mic on and go to different worlds to interact with people. So, I get blank perceptions from others, and that was also important. It was some of the best experiences out there during my transition journey." (P4)

"I already have a passing voice, but I am constantly bad about keeping up with voice training. Talking to people in VRChat kind of gives me that extra practice with my voice training. After that, I feel I can better present myself through both my avatar and my voice, and people have a better idea about my identity." (P7)

For these participants, the use of voice adds to the depth of their embodied experience. They feel that their presence is recognized by others ("*they are seeing and interacting with the person whom I am*"); their visibility is acknowledged ("*have a more comprehensive idea about my identity*"); and their identity is positively affirmed ("*some of the best experiences out there during my transition journey*"). In doing so, their queer identity is both *seen* through their avatar design and *acted out* by full-body tracking and *heard* through their voice communication.

However, this does not mean that queer users tend to make themselves visible to everyone in social VR. Rather, participants mention that they still take some measures to be selective about whom they want to (gradually) come out to:

"I started sharing with people that I found like myself and outside of my social circles who are safe." (P7, transgender woman, lesbian, White, 23)

"Having the LGBTQ community online in VRChat has helped me with support and dealing with homophobia at school and such. Occasionally, I would still use my normal voice and pretend I am straight due to fear of someone making a rude remark or looking at me funny." (P10, cisgender man, gay, Indigenous Australian, 17)

P7 and P10 reveal that they are open to sharing their queer identity with other social VR users in general. However, they are still cautious about who and when to share. In P7's case, she tends to reveal her queer identity with people whom she considers safe and trusted. P10 has been experiencing homophobia in his offline life. Therefore, despite finding social VR a generally supportive space for queer users, he is still worried about the potential online discrimination and harassment due to his queer identity. As a result, sometimes he still chooses to conceal his queer identity from others in social VR.

Strategy Limitation: Cisnormative Expectations for Voices. Participants acknowledge that voice chat appears to be a more robust and direct way to signify their presence in social VR compared to text-only chat commonly used in other traditional social spaces. Yet, our participants

highlight that social VR is still largely a cisnormativity based space, where queer users are often subjected to traditional sociocultural norms regarding gender – for example, anticipating one’s gender identity based on how their voice sounds. Therefore, how to match one’s voice and avatar appearance is a common hurdle to accurately express their queer identity. P16 (cisgender man, bisexual, Hispanic, 18) describes,

"I feel my voice and how I present my avatars correlate, but they do not necessarily correlate to some people. I have a friend who is non-binary get annoyed by some people who badgered them with questions about why their voice was feminine/androgynous because their avatar was a person in military/sci-fi gear."

According to P16, though some queer users endeavor to present their voice and avatar appearance correspondingly to portray themselves more accurately, their voice and identity is still viewed as inconsistent by others. For example, the mismatch between a feminine or androgynous voice and a masculine appearance fails to accurately present a user who identifies as non-binary. For P16 and his friend, despite experiencing visibility in an embodied way (e.g., through a combination of voice and avatar) in social VR, how such visibility is conveyed and interpreted by others may not be satisfactory to them.

This mismatch between their voices and the cisnormative expectations for how their voice and gender should correspond may even lead to potential harassment for some. P12 (transgender woman, bisexual, NH/PI, 15) notes,

"I'm a trans girl and I was really scared that people would be able to tell I was trans and harass me. They did when they found out when I just started using social VR. So I practiced my voice and now I would say I have a pretty passable 'girl' voice, which matches my girl avatar."

P12 is well aware of the cisnormativity in social VR. For her, there seems to be established sociocultural expectations for traditional gender roles (e.g., a girl should have a girl voice) and violating such expectations may lead to potential harassment, as she has experienced. For these users, how to present their voice that matches their identified gender identity without triggering potential harassment seems to be challenging.

Other participants also share similar sentiment. P9 (cisgender man, gay, Asian, 32) reveals,

"I was trying to sing a song and because of my voice, some people tried to harass me. They might figure out I'm gay from my voice. Someone actually said that here's is my dick and some other horrible things."

As a cisgender man, P9’s voice matches his gender and does meet the cisnormative expectations for voice in social VR. However, his voice also reveals other information about his sexual orientation, which still leads to harassment targeting his sexuality. Therefore, some queer users choose not to use voice all together in social VR to avoid either the mismatch between how they present themselves and how others view them or the anti-LGBTQ rhetoric.

4.2 Impacts of Embodied Visibility on Queer Identity Practices

In this section, we attend to the potential influences of embodied visibility on queer social VR users’ identity practices. In general, our participants highlight that *"social VR helps people understand their identity in a way that any other social experience or platforms cannot do"* (P3, cisgender man, gay, Hispanic, 20). Specifically, we identify four main themes: (1) impacts on self-awareness of queer identity; (2) impacts on self-confidence to reinforce one’s queer identity; (3) impacts on building a supportive queer community beyond geographic limitations; and (4) impacts on queer visibility in the offline world.

4.2.1 Impacts on Self-Awareness of Queer Identity. For participants who are still exploring their identity, experiencing embodied visibility helps them be more aware of their queer identity by confirming their understanding of self and validating such confirmation through how others see them. P7 (transgender woman, lesbian, White, 23)'s story explains this process of self-awareness:

"It is nice to be able to present me. I was not sure about my identity when I was first starting, and I feel I'm more like myself all the time now. It was like a breath of fresh air and a confirmation when I was first able to present as I would like. I saw myself in the mirror; my appearance, emotions, and even how I moved my body matched up. That was the moment when I had sort of an affirmation from myself and validation from others. It changed how I act and how I feel about myself."

P7 started in social VR with no clear idea about her queer identity. For her, building self-awareness of her own identity is a gradual and dynamic process. Being able to present herself in an embodied way effectively facilitates this process so that she can feel "more like" herself "all the time now." As a result, she seems to be able to confirm how she would like to act and validate such act through how others interact with her.

P4 (non-binary, sexual orientation unknown, White, 20) and P28 (cisgender man, bi-curious, Asian, 20) both add how experiencing embodied visibility encourage them to be more aware of themselves and thus start exploring their queer identity:

"It is a very unique experience to put on a different avatar and walk in front of a mirror and move within that avatar. I think that was one of the biggest things that made me start my gender exploration journey. It makes me better see myself in the avatars and understand what I feel comfortable with and what I want or desire for myself, like these physical traits. It also makes me know how I want to be perceived and made others perceive me that way. It solidifies how I feel and what I want. I also think exploring those things in VR chat is something you can't do in real life without judgment." (P4)

"I've never really gave it any thought whether I'm LGBT or not because how I grew up until I started using social VR. I'd say it definitely helped me explore everything and feel reaffirmed, like, Okay, this is who I am and this is how I can change and be myself." (P28)

In these quotes, P4 highlights that embodying, seeing, and moving through an avatar that is different from how they usually understand themselves motivates their gender exploration journey. Similarly, P28 feels encouraged and reaffirmed about exploring his sexual orientation, which he may have never thought about before engaging in social VR. For these participants, being visible and interacting with others in a world using this embodiment seems to allow them to update and "solidify" their understandings of their identity without facing unnecessary or unfair judgments that they might have encountered offline. As P16 (cisgender man, bisexual, Hispanic, 18) summarizes, "social VR definitely provides an environment to experiment and affirm my identity without consequence."

4.2.2 Impacts on Self-confidence to Reinforce One's Queer identity. For participants who already have a certain understanding of their queer identity, experiencing embodied visibility in social VR further enhances their confidence in that identity. P7 (transgender woman, lesbian, White, 23) shares,

"I am definitely a lot more confident now that I have something that matches me to a huge degree. Back when I was like my original one, it was hard for me to speak up on anything. Now when I feel dysphoric, I could just get my avatar, enter social VR, and walk over to a mirror or interact with others and feel confident again."

Despite realizing and acknowledging her queer identity, it is challenging for P7 to *"speak up on anything"* due to the mismatch between her gender identity and physical body. Instead, having an embodied presence in social VR that seamlessly matches herself seems to help her mitigate this challenge: making movements via that avatar and being perceived through that avatar boosts her confidence about herself.

In addition, the enhanced self-confidence seems to help participants, especially younger queer users, grow and develop a strong self. P10 (cisgender man, gay, Indigenous Australian, 17) and P12 (transgender woman, bisexual, NH/PI, 15) highlight:

"I think being in social VR had a pretty big impact on how I understand myself better. I knew that I am a femboy. But letting others see me that way in social VR also helped me a lot with coming out to my family and friends as homosexual. It helped me feel more confident with myself and my sexuality." (P10)

"Social VR helps build my self-confidence very much. People only know me as a girl in VR, not a trans girl. I'm only treated as a girl, not as a trans girl in VR. This means a lot to me." (P12)

Younger queer users such as P10 and P12, who are also people of color, may face additional challenges in their teen lives as they are in the process of building stable gender identities and sexual identities. Being able to actively practice their identity in front of others in social VR thus seems to offer them valuable opportunities to establish a comprehensive understanding of what it means to be a queer individual in an embodied way. It also helps them be confident about their queer identity in the offline world, for example, coming out to family and friends as P10 did.

Therefore, some participants even consider engaging in social VR as "empowerment" for queer users. P26 (genderfluid, bi-curious, mixed race, 25) and P27 (cisgender man, bisexual, white) note,

"I do believe that the strength of social VR is cultivating the LGBTQ community and help them gain confidence. With the confidence about themselves, they can then have the power to advocate their rights on other platforms such as social media." (P26)

"Social VR gives you more confidence in whom you become, or how you find yourself as a person like if you are gay, lesbian, or transgender. So, in my opinion, it is really empowerment because you build the confidence that you are gay or transgender." (P27)

According to these participants, experiencing social VR empowers queer users at two levels. On the one hand, the embodied experiences in social VR build their confidence to better understand their queer identity and possibly be more open about it, thus making them more visible. On the other hand, such confidence may also encourage them to further advocate queer rights, which can go beyond the social VR spaces.

4.2.3 Impacts on Building A Supportive Queer Community beyond Geographic Limitations. As described earlier in this paper, through various immersive queer-focused events, the queer community in social VR seems to be able to build their collective visibility in an embodied way. This visibility directly facilitates the exchange of community support among queer users without geographic limitations. P18 (transgender man, straight, White, 19) and P21 (cisgender man, gay, mixed race, age unknown) mention,

"Social VR is a great way to get advice from other LGBT people. In real life, it's hard to find other LGBT people." (P18)

"All my friends offline are straight. I don't have any gay friends in real life and I don't know any who live nearby. So it's nice to be able to talk to and connect with other gay people in social VR." (P21)

Both P18 and P21 have limited access to the broader queer community in the offline world due to where they live. It is also challenging for them to receive support in the offline world. Therefore, knowing that queer communities exist in social VR is important. Being able to turn to such communities for advice, express themselves to others, build friendships, and learn more about their identity thus significantly supports their identity practices.

Others also note that social VR helps them experience visibility that they may not be able to experience in the offline world:

"Social VR 100% enables trans people by giving them the ability to present in a gendered manner they may not have the opportunity to in real life because of abusive family or friends." (P16, cisgender man, bisexual, Hispanic, 18)

"I'd say it's immensely valuable because many times, people are put in places that are generally less socially accepting of LGBTQ status. So if they know there is a community in social VR, they can go there and feel they can be accepted for who they are. This is definitely a huge benefit and allows people to escape from whatever harsh reality that they're living in and go somewhere where it's a lot more peaceful and kind." (P17, cisgender man, bisexual, White, 18)

Both P16 and P17 express their concerns that, very often, queer individuals may be forced to conceal or suppress their queer identity based on where they live and whom they live with, thus rendering them invisible and possibly vulnerable in the offline world. Therefore, social VR offers *"more peaceful and kind"* virtual spaces where they can feel more visible and accepted because they can find welcoming and supportive communities. In these spaces, queer users can interact with each other and seek social support by listening to others' experiences and "coming out" stories, answering questions, or just hanging out together.

However, some participants warn that social VR may in fact introduce additional barriers to building a supportive queer community online. One main barrier is the difficulty to enter the community due to financial concerns. P20 (non-binary, sexuality unknown, Black, 28) shares their concern,

"When I was exploring, I didn't personally see a lot of LGBTQ. [...] I think one challenge is the price of those things [the VR headset]. I'm lucky that I was able to get a good discount but I don't know a lot of black people even myself can afford it."

According to P20, the visibility and presence of queer users, especially queer users of color, is still very limited in social VR. One reason is that a VR headset is required to enter these spaces, and certain types of users (e.g., rich and educated white users) are more likely to afford the device than others. This power dynamic thus does not warrant a fair entry to the queer social VR community—some can enter and be visible and some others cannot. As P16 (cisgender man, bisexual, Hispanic, 18) says, *"it had a bigger barrier to entry into the community than I expected. A lot of people I met in some queer events can be cliquy and others are there just for joking around without opening up to any degree."*

P16's account also points to another potential barrier: social VR seems to create a close-knit queer community that may actually limit queer users' visibility in broader online spaces. P9 (cisgender man, gay, Asian, 32) explains,

"Engaging in social VR as a queer user is more a negative experience for me. It creates restrictions for the queer community because we focus so much on events that are specific for the LGBTQ community. Yes, those events are more of my escape room. That's the safe place thing. But I feel we are losing the opportunity to interact with other social VR users who are not LGBTQ."

P9 appreciates the various immersive queer-focused events in social VR. Yet, he considers that too much emphasis on such events can become a negative experience – the queer community may limit itself in its own community/events as *"escape rooms"*. For P9, it is important to establish a balance between a closely connected queer community and open communication/interaction with the broader social VR community to build queer visibility online.

4.2.4 Impacts on Offline Queer Visibility. After building and experiencing embodied visibility in social VR, queer users may also translate such practices and experiences to the offline world, thus contributing to their growing offline visibility. P5 (cisgender woman, gay, White, 22) explains this process,

"I dress a lot in alternative fashion in social VR to show I'm gay. When I started dressing in real life in the same fashion, I noticed that it made me a lot more confident and a lot happier with myself. It made me less anxious around other people and more open to tell them I'm gay. I think social VR helps you find something that represents you very well, and you get to essentially represent yourself that way in real life."

P5's account is insightful because she highlights the transformative nature of embodied visibility in social VR. She is able to experience visibility via dressing up and using embodied avatars immersively. This satisfactory experience thus encourages her to initiate actions to change her offline life (*"started dressing in real life in the same fashion"*) and seek more offline visibility (*"more open to tell them I'm gay"*). For her, social VR seems to offer a virtual workshop where she can practice how to present herself and then apply these techniques and practices to build her offline visibility effectively.

P10 (cisgender man, gay, Indigenous Australian, 17) shares similar experiences in VR Chat,

"Having the LGBTQ community online in VR chat has helped me with support and dealing with homophobia at school. If I had to talk to someone about my identity or had any questions regarding the LGBTQ community, I was happy I could go to them about it. I feel like people accept me whenever I'm in VR Chat. This makes easier for me to look at people in the face in real life. I've become more open about my self outside of social VR because of this."

In P10's case, presenting and sharing his sexual orientation in social VR allows him to overcome the homophobia targeting his queer identity in the offline world. Like P5, P10's experiences of practicing how he can build his queer visibility and deal with others' reactions in social VR are transformative, which helps him be more open with sharing his queer identity in his offline life.

Nevertheless, queer visibility in social VR does not always transfer to the offline world, and not every queer user supports such transformation. P28 (cisgender man, bi-curious, Asian, 20) provides an example,

"Social VR is a safe place to learn about queerness and learn about yourself. I wouldn't say that you really want to extend it beyond social VR, because there's just such a disconnection between VR and your life. And honestly, I don't think people should breach the safety that VR offers to explore their identity. Personally, it's sort of a sanctuary almost."

For some queer users like P28, they are motivated to explore their identity in social VR because it is a safe *"sanctuary"* that is disconnected from their offline lives. To maintain this safe environment, it seems to be necessary to maintain such a disconnection as well. Therefore, they do not expect or plan to expand their visibility beyond social VR.

5 DISCUSSION

To answer our research questions, our findings have the following highlights. First, queer users often employ three main strategies to build and experience *embodied visibility* in social VR: visualizing queer identity through avatar creation and design; acting out queer identity via full-body tracking and engaging in immersive embodied events; and vocalizing queer identity through voice communication. However, these strategies often show several limitations, including, restricted avatar design inhibiting fully present queer identity, the potential for embodied harassment, and the cisnormative expectations for voices (RQ1). Second, experiencing embodied visibility in social VR may influence queer users' identity practices through its impacts on their self-awareness of queer identity, self-confidence to reinforce one's queer identity, efforts and barriers to build a supportive queer community beyond geographic limitations, and the feasibility to transform visibility from online to offline (RQ2).

Now we discuss how these findings shed light on queer users' identity practices in nuanced online social spaces to broaden existing HCI and CSCW knowledge on queer online presentation and visibility. We also discuss potential design implications for further supporting queer visibility in social VR.

5.1 New Perspectives of Queer Visibility Online through the Sense of Embodiment

In this paper, we have explored queer social VR users' visibility as their way to explore, experiment, and perform non-hetero or non-cisnormative identity expressions both to themselves and to others. We have especially highlighted the embodied nature of such visibility: it is both built upon and experienced through a sense of embodiment about wearing and acting upon one's virtual body (i.e., an immersive 3D digital representation including personality, appearance, gender identity, and sexual identity) rather than merely viewing an on-screen visual representation, rendering it a novel form of online visibility – *embodied visibility*.

5.1.1 The Nuances of Embodied Visibility vs. Queer Visibility in Other Online Social Spaces. Our findings demonstrate some similarities between the dynamics to build and experience embodied visibility in social VR and queer users' online presentation and engagement in other online social spaces that have been widely studied in prior work. For example, similar to being in online gaming and virtual worlds [27, 38, 58, 64, 65, 80], queer social VR users highlight the central role of avatars in their identity practices – carefully crafting avatars to accurately display their queer identity and using avatars of different genders to explore and affirm their queer identity are still essential to building and experiencing embodied visibility visually. As in live streaming and video sharing platforms [25, 69], queer users are able to enhance their high-fidelity physical presence by manipulating their voice and appearance, which helps make them visible to others. Similar to social networking sites [7, 11, 21, 45, 52], they are still cautious in regard to when and whom they are willing to disclose their queer identity to in social VR (e.g., via voice), especially in public worlds and virtual events that are not queer focused, leading to their selective visibility to some degree.

However, our findings also provide new and unique perspectives of queer visibility online by highlighting *physically acting out a virtual body, being heard along with an embodied avatar, and limited selective visibility* as nuanced identity practices through the sense of embodiment for queer users to build and experience visibility in social VR.

The focus on physically acting out a virtual body. As mentioned earlier in this paper, social VR's unique focus on embodiment lies in the fact that a user is able to immersively embody an avatar through full body tracking – not only "seeing" but also experiencing a virtual body representation as their own physical body [70]. In this sense, they are inside, having, and controlling a virtual body

as their own body in social VR [40]. Compared to other online social spaces that often focus on various forms of on-screen digital representations (e.g., on-screen 2D/3D avatars, videos, streams, text, or image), queer social VR users' visibility is largely built upon experiences of physically acting out their virtual body to present and express their identity through the three dimensions of embodiment: sense of self-location, sense of agency, and sense of body ownership [40].

For example, in social VR, queer users have higher control over their avatar with their physical body movements through full-body tracking: they not only are equipped with an immersive first-person view through their avatar body but also directly use the motion of their physical body to animate their virtual avatar body. This correspondence, therefore, fosters both a sense of self-location and a sense of self-agency for building and experiencing visibility in social VR: presenting and expressing queer identity to others through one's avatar will require physical movements through one's physical body (e.g., gestures, hand/finger movements, and body language), leading to one's spatial experience of being inside a body (*sense of location* [40]). One will also need to actually conduct physical activities in the offline world (e.g., playing piano and dancing) when attending virtual events in social VR if one endeavors to be visible, which involves physical actions, controls, intentions, motor selections and the conscious experience of will through their virtual body (*sense of agency* [40]). As a result, experiencing a full-body tracked avatar in social VR leads to *sense of body ownership* (i.e., one's self-attribution of a body and how such a body becomes the source of the experienced sensations [40]). This seems to foster a more intimate and direct connection between users and avatars than in other online social spaces, which thus makes presenting their queer identity to others a highly sentimental process.

The focus on being heard along with an embodied avatar. Another nuance of embodied visibility in social VR lies in its focus on presenting audio cues of queer identity through voice communication. Prior research has proved the importance of voice in presenting and perceiving one's identity in various online social spaces, such as live streamers' and vloggers' presentation of gender and sexuality [25, 69] and how voice may make online gaming more social but remove potential opportunities for identity play [74, 77]. While the idea of using voice communication in virtual worlds is not new, our findings show the powerful combination of presenting one's voice along with their embodied avatar. This unique combination significantly affects how queer users may become visible in social VR: they are visible because they are not only seen (e.g., through avatar design) and felt (e.g., through full-body tracking) but also heard (e.g., through voice) by others. In doing so, they are able to present and express a more comprehensive image of themselves, which signifies both gender identity and sexual identity. They can also observe how others react to their voice, which may reinforce and affirm their vocalized visibility.

In this sense, queer social VR users' focus on being heard when building their visibility seems to suggest the research need for further exploration and elaboration on the role of voice in understanding virtual bodies and embodiment. Existing theories of embodiment in VR literature tend to emphasize how a virtual body may simulate, transmit, and become the source of the physical body's sensational experiences (e.g., [40, 70]); yet they do not specify if and to what degree voice may also play a role in this process. In our study, embodying a virtual body does not only involve immersively experiencing an avatar body's physical traits such as facial features, height, and body shape but also means embodying the voice associated with the avatar body (e.g., through voice training) to better present themselves. Therefore, how voice may shape one's definition of a virtual body and one's sense of embodiment in terms of self-location, agency, and body ownership [40] would need further research.

Selective visibility is limited. Though embodied visibility can still be selective in some situations (e.g., a queer user can decide when and to whom they disclose their queer identity to via voice),

queer users' ability to build selective visibility in social VR is somewhat limited. In conventional social networking sites, queer users can often create multiple different accounts in the same platform [11, 30] or carefully craft and control what aspect of their identity they would make visible to specific groups of friends [11, 14] as part of their *selective self-presentation/performance* online [28]. Likewise, in online gaming and virtual worlds, players can create multiple accounts and even share their characters [78]. "Throwaway accounts" are also commonly used on online forums such as Reddit to ensure that online users can be anonymous when expressing themselves [43]. However, our study shows that it is rare for queer social VR users to create multiple accounts on the same platform or create "throwaway" accounts. They also do not have a clear method to organize their social VR friends nor apply a strategy to selectively present different aspects of their identity to various groups. In fact, all of our participants mention that they only have a single account for each social VR platform that they use; and they tend to behave the same when interacting with different people and groups in social VR.

This observation thus leads to an interesting question: how and why is selective visibility limited in social VR, while it is a primary lens to understand online visibility in other online social spaces? From our study, it is unclear if selective visibility is limited by the specific design of social VR platforms or if queer social VR users consciously choose to consistently rather than selectively present themselves to others, which requires future research. It is possible, though, that the tremendous effort to create and customize avatars in social VR, the robust body ownership via full-body tracked avatars, and the unique combination of embodied avatars and voice, make queer users reluctant to create multiple accounts or conceal certain aspects of their identity, leading to their limited selective visibility.

5.1.2 Embodied Visibility as a Double-edged Sword. With the above-mentioned nuances, embodied visibility seems to have the potential to empower queer users' presence online and offline (e.g., advocating queer rights online and become more visible offline) and further facilitate their practices to present, explore, and experiment their identity in a multidimensional manner (e.g., through appearance, voice, and physical action). However, we also offer a critical reflection of how embodied visibility can be a double-edged sword that creates new challenges and barriers for queer visibility online.

First, while experiences of embodied visibility in social VR can be quite novel and nuanced to its queer users, such experiences are not inclusive but subject to complex sociocultural and economic power dynamics. For example, as social VR platforms are generally considered English, male, and cisnormativity dominated [6, 61], queer users in our study collectively highlight an underlying challenge regarding who gets to be visible and/or more visible than others – e.g., how can transgender users be visible with the common cisnormative expectations for their voices? Similar to being in the offline world, in social VR, certain specific queer subcultures with intersectional identities (e.g., transgender people of color) tend to be more marginalized than others (e.g., white gay men) as they may encounter intersectional challenges (e.g., both transphobia and racism). These concerns thus limit to what degree they are willing to present and express their identity in social VR, or if they are willing to do so at all, which seems to reinforce homonormativity [18] and cisnormativity [22, 79].

In addition, while VR hardware and software has become more accessible and affordable compared to their prices in the past, the financial costs to purchase a VR headset along with full body tracking features and to use social VR (e.g., using stable and high-speed Internet) still prevent many queer users, especially queer users of color, from engaging in social VR and experiencing the uniqueness and benefits of embodied visibility that social VR provides. As a result, a major concern emerging in our data is: certain types of queer users, who often tend to be financially stable and educated

white men, are able to access and experience embodied visibility in social VR more so than others, such as queer users of color. In this sense, embodied visibility is novel but also privileged – it may make certain queer users more "invisible" rather than help them build visibility in a broader sense.

Second, besides these complex power dynamics, even for queer users who can access and be visible in social VR, existing social VR platforms still do not fully support their unique needs to appropriately and accurately present themselves to others. In fact, pursuing embodied visibility may pose additional pressure and burden upon queer users, such as the tremendous time and efforts required for creating an avatar from scratch that fully represents their gender identity and sexual identity. This may possibly discourage queer users from seeking visibility in social VR. The benefits of embodied visibility may also be accompanied with online harassment (e.g., invasion of personal space and physical harassment) as queer users become more identifiable through their embodied visibility (e.g., through avatar design, body language, and voice).

In summary, our study highlights the need for further unpacking the complicated role of embodied visibility in queer users' online social experiences and the importance of designing future technologies to both support diverse queer users' needs for visibility and mitigating potential risks. We also point to the potential to use *embodied visibility* as a new lens for the CSCW community to analyze queer users' online presentation and visibility beyond the traditional lens of selective visibility. This new lens may pay special attention to the multidimensional online presentation of queer identity (e.g., appearance, voice, and action), the control over both virtual body and physical body, the nuanced body ownership, and the complicated sociocultural and economic power dynamics involved in building online visibility. As online social spaces evolve towards more natural and immersive embodied interaction, this new lens will be essential to explore how queer visibility can be supported and challenged in novel ways in these spaces and lead to new research opportunities.

5.2 Design for Supporting Queer Visibility in Social VR

Informed by our findings and our critical reflection, we propose *five potential design considerations* for further supporting diverse queer users' visibility in social VR. These implications are mainly directions that emerge in our participant's accounts; thus, these are neither complete nor exhaustive. However, our goal is to push the conversation in an open manner to inform future design directions for making social VR a more inclusive and diverse space.

Design Consideration 1: Improving Accessibility to Diverse Queer Communities by Fostering an Inclusive Culture. As we discussed in the previous section, currently, accessing social VR and the benefits of embodied visibility seem to be a privilege to certain queer communities over others due to various power dynamics. Therefore, one of the most important considerations to support queer visibility in social VR should focus on how to improve accessibility of this opportunity to diverse queer communities, especially those with intersectional identities (e.g., transgender users of color). This does not only mean helping them access VR hardware and software with more affordable costs but also involves fostering an overall inclusive culture and atmosphere both in and out of social VR, for example, by providing them with necessary social support and outreach activities to navigate the existing power dynamics to have a stronger voice.

Design Consideration 2: Easier Access to Customized Avatar Design/Creation for Diverse Queer Identities. Built upon Consideration 1, we should also emphasize how diverse queer communities can better present themselves once they do have access. From our data, two main barriers are: the lack of both non-sexualized male avatars and avatar characteristics/accessories that signal various queer identities; and the sharp learning curve to create their avatars using third-party applications.

Regarding the first barrier, we recommend that social VR platforms should provide less gender-specific accessories, outfit, body type, and facial features for avatar customization to accommodate more flexible and fluid gender and sexuality settings rather than a binary choice. It may also be

helpful to offer more prominent design features for queer users to better signal their queer identity if they choose to, such as cross-world pins and badges that signal queer identity. Regarding the second barrier, we recommend that social VR platforms provide users with a more flexible and dynamic avatar creation process that does not depend on a third-party application. This recommendation will require such platforms to open to import and accept user-generated and user-uploaded avatar models, templates, and designs. This change will also require such platforms to provide tools and training materials such as detailed and step-by-step tutorials and a collection of easy-to-use digital assets that users could quickly incorporate into their avatars.

Design Consideration 3: Adding Emotions to Full-body Tracked Avatars to Expand Embodied Visibility. Our findings have shown that a queer user's experience of embodied visibility also encompasses their emotions. Therefore, building a higher level of embodied visibility would require showing emotions in real-time. For example, a queer user's emotions can be "seen" and "felt" by others through facial expressions or more subtle gestures in addition to their voice and bodily movements to further enhance their visibility. Therefore, we recommend that social VR platforms consider implementing real-time face tracking technologies and more accurate hand and finger tracking, which will support more delicate and subtle communication to express in-depth feelings or more complicated emotions.

Design Consideration 4: Diverse Voice Modulators to Accommodate Different Queer Identities. While voice is crucial for our participants to build embodied visibility in social VR, they express various needs for potential platform-embedded voice modulators based on their different queer identities. For transgender users, the main desire is to match their voice and the presented gender identity of their avatar. Some others prefer to present a voice with no apparent gender indication to better reveal their genderfluid or non-binary identity. However, there is also a concern that a voice with no apparent gender indication (e.g., sounding too robotic) may make themselves sound fake or conspicuous and even attract unwanted attention. Therefore, we recommend that social VR designers and developers consider the unique needs of users with different queer identities to comprise different voice variants when developing platform-embedded voice modulators, rather than solely modifying pitch.

Design Consideration 5: Preventing Embodied Harassment. In our findings, a significant risk of queer users' embodied visibility is the potential to encounter embodied harassment in social VR due to their increased identifiability. This risk may even be higher for queer users with intersectional identities. For example, they may encounter harassment both targeting their queer identity and racial identity. Therefore, how to both support queer users' embodied visibility and protect them from novel harassment should be taken into account when designing future social VR platforms. Our participants mention the usefulness of some existing security tools in social VR, such as blocking, muting, and personal bubbles. Those tools help protect them from certain harassing behaviors such as verbal attacks. However, they also point out that these existing tools cannot solve some more novel harassment (e.g., "crasher beams" to overload/crash a user's device either through software or hardware manipulation). It seems valuable to protect queer users or all social VR users if social VR platforms could monitor user-created assets that have objectionable impacts on other users. One helpful feature would be allowing users to decline seeing or loading assets that were created by other users and have not been verified by the platform. Such a feature will also help social VR designers to proactively prevent potential harassment caused by software or hardware vulnerabilities from happening rather than passively reacting to an ongoing harassment.

5.3 Limitations

A few limitations of this study should be noted. All interview participants were recruited from online forums or social media. There is a potential bias towards social VR users who maintain

an active social media account. In addition, as our findings show, certain types of queer users, who often tend to be financially stable and educated white men, are able to access and experience embodied visibility in social VR more so than others. This is also demonstrated in our sample. 19 out of the 29 participants are white and 8 are cisgender white men. Therefore, we acknowledge that our data and contributions may center cisgender white men within the queer community. Another limitation is the lack of even distribution between participants and the platforms they use. While our participants reported their use of diverse mainstream social VR platforms, most of our users are mainstream commercial platform users, including VRChat, AltSpaceVR, and Rec Room. Future work should aim to recruit a broader participant pool to include more voices from certain queer subcultures, especially those with intersectional identities (e.g., transgender users of color). Future work should also focus on recruiting participants from more diverse social VR platforms to further explore the relationship between queer users' experiences of embodied visibility and the technological features of specific social VR platforms.

6 CONCLUSION

As social VR platforms continue to rise in popularity, they play an increasingly important role in queer users' experiences of exploring, experimenting, and expressing their queer identity online, leading to their *embodied visibility* (i.e., conscious choices on presenting and/or disclosing non-hetero or non-cisnormative identity expressions to others through a sense of embodiment about wearing and acting upon one's virtual body, rather than merely viewing an on-screen visual representation). To explore this nuanced form of online visibility, we have identified three main strategies that queer users use to build and experience embodied visibility in social VR, limitations of each strategy, and impacts of such visibility on their identity practices online. We believe that these insights shed light on *embodied visibility* as a novel and multidimensional mechanism for both supporting and challenging queer users' practices to present and act out their queer identity in emerging virtual spaces. We hope that our findings can help further examine the complicated role of visibility in queer users' online social experiences and guide future efforts to design safer and more supportive online social spaces for diverse queer users' identity expression.

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