"We Cried on Each Other's Shoulders": How LGBTQ+ Individuals Experience Social Support in Social Virtual Reality

Lingyuan Li
Clemson University
Clemson, South Carolina, USA
lingyu2@g.clemson.edu

Guo Freeman
Clemson University
Clemson, South Carolina, USA
guof@clemson.edu

Kelsea Schulenberg
Clemson University
Clemson, South Carolina, USA
kelseas@g.clemson.edu

Dane Acena
Clemson University
Clemson, South Carolina, USA
dacena@clemson.edu

ABSTRACT

Although social support can be a vital component of gender and sexual identity formation, many LGBTQ+ individuals often lack offline social networks for such support. Traditional online technologies also reveal several challenges in providing LGBTQ+ individuals with effective social support. Therefore, social VR, as a unique online space for immersive and embodied experiences, is becoming popular within LGBTQ+ communities for supportive online interactions. Drawing on 29 LGBTQ+ social VR users' experiences, we investigate the types of social support LGBTQ+ users have experienced through social VR and how they leverage unique social VR features to experience such support. We provide one of the first empirical evidence of how social VR innovates traditional online support mechanisms to empower LGBTQ+ individuals but leads to new safety and equality concerns. We also propose important principles for rethinking social VR design to provide all users, rather than just the privileged few, with supportive experiences.

CCS CONCEPTS

• **Human-centered computing** → **Collaborative and social computing**; **Empirical studies in collaborative and social computing**;

KEYWORDS

LGBTQ+, online social support, social VR

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1 INTRODUCTION

The more contemporary understanding of gender and sexuality has led to an urgent need for better identifying, recognizing, and acknowledging diverse sexual identities and gender expressions. In doing so, the term *LGBTQ+* has been widely used as an acronym for lesbian, gay, bisexual, transgender and queer/questioning with a "+" sign to recognize the limitless sexual orientations and gender identities used by members of our modern society [23, 96]. Despite various efforts to achieve more inclusive gender and sexuality presentations, LGBTQ+ people still belong to a community where their identities are stigmatized and therefore face various forms of explicit or implicit discrimination, harassment, and challenges in their personal lives, workplaces, and the public sphere [45, 76, 86]. As a result, they rarely experience sufficient social support within their offline social networks (e.g., family, school, and workplace) to help them cope with these negative experiences [87, 107, 123], which drives them to turn to online social spaces for such support.

Indeed, extensive HCI literature has highlighted the increasingly critical role various online social spaces play in supporting many LGBTQ+ individuals' identity formation and presentation, community building, and information seeking [13, 25, 31, 44, 48, 61, 63, 90, 91, 106, 127]. For example, live streaming platforms help form community bonds and create intimate relationships for LGBTQ+ individuals [105]; LGBTQ+ youth consider social media a safe space to explore issues of sexuality and gender [84]; and multiplayer online gaming motivates LGBTQ+ individuals to build coalitions to confront and combat harassment collectively [103]. However, traditional online technologies still reveal several challenges for providing LGBTQ+ individuals with effective social support, as they often lack emotional and social cues and physical presence to express support, are limited to providing satisfactory online support compared to tangible offline support, and may paradoxically expose LGBTQ+ individuals to greater online risks [16, 32, 34, 60, 79, 80, 98, 99, 119, 122]. As evolving social technologies continue to foster new and novel online social spaces, the question becomes: how, if at all, can these new spaces further help LGBTQ+ individuals seek and experience online social support in more nuanced and empowering ways?

Therefore, in this paper, we focus on LGBTQ+ individuals' experiences of social support in one such nuanced online social space - social Virtual Reality (VR). Social VR refers to a social ecosystem where multiple users can interact with one another through

their avatar representations in 3D virtual spaces via immersive VR technologies, such as standalone VR head-mounted displays (e.g., Meta Quest) or VR headsets that can be used with a gaming console (e.g., PlayStation VR), a smartphone (e.g., Samsung Gear VR), or a desktop (e.g., HTC Vive) [42, 50, 59, 92]. Although a VR headset is typically required to access and fully engage in social VR in an immersive way, some popular social VR platforms can also be accessed without such devices. For instance, AltspaceVR and Mozilla Hubs can be accessed through traditional 2D surfaces (e.g., a web browser on a desktop) without a VR headset. Such experiences may not be as immersive as the typical VR experience via a headset, but they are often seen as an introduction to, or trial of, the more immersive social VR experiences for people who cannot afford a VR headset yet.

In this sense, rather than merely looking at avatars on a computer screen, social VR, typically through the use of VR headsets, provides people with immersive and embodied interaction experiences through partially or fully body-tracked avatars (i.e., one's avatar movements correspond to one's offline body movements in real-time), synchronous voice conversations, and simulated touching and grabbing features. These unique features seem to attract a large number of LGBTQ+ users. For example, some popular social VR platforms, such as AltspaceVR and Meta Horizon Worlds, feature regularly scheduled LGBTQ+ focused virtual events and meetups [3–5]. A growing body of HCI scholarship has also paid attention to LGBTQ+ users' needs and experiences in social VR, especially in regard to how transgender social VR users are able to explore, express, and experiment with their gender through embodied avatars [50, 51]. While these works provide valuable insights on LGBTQ+ individuals' novel identity practices mediated by social VR, they only involved small samples of LGBTQ+ social VR users. More in-depth investigations of how exactly social VR may become an increasingly important new space for LGBTQ+ individuals' online social lives are still needed, e.g., how to support each other in more nuanced ways than traditional online social spaces can provide.

To contribute towards this emerging research agenda, we explore the following research questions based on 29 interviews with LGBTQ+ social VR users across various countries and cultures:

RQ1: What types of social support have LGBTQ+ users experienced in social VR?

RQ2: How do LGBTQ+ individuals leverage unique social VR features to actually seek and experience such social support?

We contribute to existing HCI research on online social support and social VR in two ways. First, we expand the growing body of literature on online social support for LGBTQ+ individuals by providing one of the first empirical evidence of the specific types of social support LGBTQ+ users have experienced in social VR, a novel online social space, and how exactly they seek and experience such support in more nuanced ways using this new technology. Second, our in-depth investigation is not only important for further unpacking the nuanced ways in which new technology continues to impact marginalized tech users', such as LGBTQ+ users', unique online social experiences but also is critical for HCI's key agenda on designing more inclusive and supportive technologies in the future. We do this by: (1) demonstrating three new mechanisms to innovate how social support can be experienced and exchanged online to empower LGBTQ+ individuals by leveraging unique social VR features, which helps reconceptualize traditional online social support practices; (2) pointing to the critical need for addressing new issues regarding unequal access to and concerning trade-offs of social support in social VR for the LGBTQ+ community; and (3) highlighting important principles for rethinking social VR design to provide all users, rather than just the privileged few, with supportive experiences and interaction dynamics.

2 RELATED WORK

Our focus on LGBTQ+ individuals' experiences of social support in social VR is grounded in prior research on understanding social support online and offline and the growing body of HCI research on online social support for LGBTQ+ individuals. Our work is especially motivated by how social VR, as novel online social spaces, has the potential to support LGBTQ+ individuals in more nuanced ways.

2.1 Theorizing Social Support Online & Offline

Social support as a concept has received extensive attention in a variety of fields over decades. At the most basic level, social support is described as a feeling or awareness that one is being helped, loved and cared for, and/or respected and valued by a social network of interpersonal relationships and mutual interactions, whether in formal support groups or informal relationships [2, 28, 77, 129]. Beyond this fundamental understanding, though, social scientists have proposed many different types of conceptualization of social support, such as the five communicative behaviors that are intended to provide comfort and help: emotional (e.g., expressions of care, comfort, and encouragement), esteem (e.g., behaviors directed at improving self-worth and praising attributes), informational (e.g., providing advice, facts, or recommendations), network (e.g., messages designed to help people feel a sense of belonging), and tangible (e.g., providing literal material goods such as money) [21, 33, 78, 133]. House [71] further teased out the intricacies of social support within four conceptualizations built off of Weiss' [126] work: emotional concern (e.g., liking or empathy), instrumental aid (goods or services), information (about the surrounding environment), and appraisal (information relevant to self-evaluation).

Moving into the online realm, extensive HCI research has explored how online spaces such as social media (e.g., [6, 17, 24, 68, 69, 104, 130]), online forums (e.g., [38, 75]), and live streaming (e.g., [83, 120, 131]) provide ample opportunities for supportive behaviors through various computer-mediated methods, including clicking reaction emojis and paralinguistic digital affordances [24, 130], textual cues such as comments and messages [17, 68, 69, 104], following/subscribing/donating [83, 120, 131], among others. A large body of research has also explored social support in a particular type of mediated environment: online gaming (e.g., [48, 52, 73, 118]). For example, verbal and non-verbal interaction between MMORPG (Massive Multiplayer Online Role Playing Games) players such as *World of Warcraft* can help develop people's sense of social support over a long period of time [100, 115, 128]. This connection is particularly strong in competitive gaming such as esports contexts, wherein teammates work together in intimate and complex interactions consisting of exchanges of instrumental support that build

into emotional and esteem support in tangible and intangible ways [52]. Even small-scale collaboration, such as in dyads in a virtual marriage [49, 55], can lead to feelings of closeness and willingness to provide tangible and emotional support within and outside of the gaming context, including intimate self-disclosures and emotional connections that go far beyond the demands of gameplay.

In particular, such online social support seems to be pertinent for sensitive self-disclosures and communities with stigmatized identities [7]. Examples include sex and sex-related workers such as OnlyFans creators [120] or communities that suffer from depression or mental health issues [10], pregnancy loss [9], and sexual abuse [8]. This further emphasizes the idea that different online contexts, disclosure situations, and member identities - stigmatized or otherwise - provide for and elicit different types of support [7, 10, 56, 68]. Inspired by this line of research, in this paper we especially focus on how LGBTQ+ individuals, one of the communities that are often considered to have stigmatized identities, may leverage nuanced online spaces for social support.

2.2 Online Social Support for LGBTQ+ Individuals

Although social support can be a vital component of gender and sexual identity formation, many LGBTQ+ individuals often lack offline social networks to discover, understand, and support gender and sexual exploration [74]. For example, LGBTQ+ students often report having a difficult time being accepted by their teachers and peers and finding allies in their offline lives [67], and LGBTQ+ individuals still report lower levels of social support and health regardless of how accepting their family members are of their identity [108]. In particular, this stigmatization is often further compounded by intersectional identity factors, such as sexual-minority women (SMWs) in China who are often subjected to strong stigmatization in their offline lives and additional difficulties to connect to other SMWs [32].

As a result, the unique challenges and hardships LGBTQ+ individuals often face in regard to stigmatization in the offline world make their online social support practices particularly important. Prior research has highlighted how evolving online social spaces (e.g., social media, online gaming, and online dating sites) support the identity development and presentation of many LGBTQ+ individuals [13, 25, 31, 44, 48, 61, 63, 90, 91, 106, 127]. For instance, social media can support LGBT parents' online disclosures and advocacy of identity in various ways [16]. Transgender and gender non-conforming individuals can also leverage social networking sites for disclosing, managing, re-adjusting, and coping with major identity changes [22, 61, 63, 64]. Online health communities and information networks are particularly vital for LGBTQ+ individuals to seek specific and relevant health information (i.e. informational support) [11]. Such support is beneficial for LGBTQ+ teens, as they have been shown to be more confident when engaging in social media as a means for exploring their gender and sexual identities compared to offline contexts such as school [84] and are often able to effectively access the health information resources they need [35, 36]. Additionally, within the online gaming and virtual world contexts, the use of avatars helps LGBTQ+ users experiment with entirely new identities (e.g., experimenting with digital bodies that are often very different from their physical bodies [39]) or reaffirm existing identities (e.g., queerness gameplay) [72, 106, 135]. Many LGBTQ+ individuals thus use gender swapping and/or gender performance to help explore and form their developing sense of self and/or to express and experience their own sexualities in safe ways [48, 72, 106, 111, 135].

Collectively, existing research has highlighted that engaging in online social spaces often offers LGBTQ+ individuals safe and anonymized virtual places to explore, discover, and express their identities, allowing for the potential of supporting their identity development in their offline lives [31]. However, traditional online technologies still reveal several challenges and limitations in providing LGBTQ+ individuals with effective social support [16, 32, 34, 60, 79, 98, 119, 122]. First, most online social spaces (e.g., social media, online gaming, live streaming, and online dating sites) still rely on traditional computer-mediated communication (e.g., through on-screen text chat) for LGBTQ+ individuals to exchange and share social support, which is not seen as a viable venue for the provision of social support [93] due to limited emotional and social cues, the inability to communicate material support, and the absence of physical presence [29]. Second, social support for LGBTQ+ individuals through traditional online technologies can still be felt far less satisfactory and effective compared to tangible offline support, as how much social support one feels is closely related to the medium through which one receives such support. For example, social support via face-to-face communication can be felt significantly more desirable and satisfactory than traditional computer-mediated communication [80, 99]. Third, many online social spaces, while facilitating exchanges of social support for LGBTQ+ individuals, often paradoxically expose them to greater online risks. Prior HCI research has shown that turning towards online sources of support does not necessarily guarantee positive outcomes for LGBTQ+ individuals. Rather, they can be at a greater risk of loneliness and homophobia [117], depression [70], sexually transmitted diseases [62], and public exposure on social media [16, 57]. Such issues are often even worse for individuals who are considered additionally marginalized within the LGBTQ+ community itself [79], e.g., bisexuals facing validity and normativity conflicts when trying to engage in traditional online social spaces for LGBTQ+ people [125]. Taken together, these challenges reveal patterns of constant vigilance and identity management that can ultimately limit both the availability of social support for LGBTQ+ individuals and the level of fulfillment derived from such support for them through traditional online technologies.

Therefore, as online social spaces evolve towards more realistic and immersive interaction, it is crucial to expand our scientific investigation on how LGBTQ+ individuals can seek and experience online social support in more nuanced, empowering, and safe ways while also limiting the aforementioned shortcomings. Such knowledge not only helps to better understand LGBTQ+ users' ever-evolving online social experiences but also informs inclusive and supportive technology design that can address some of the substantial challenges these users face both online and offline, such as social inequities, discrimination, and lack of access to resources [65]. To contribute towards this growing research agenda, we introduce social VR, immersive and embodied social spaces that attract a growing number of LGBTQ+ users.

2.3 Social VR and LGBTQ+ Identity

Popular social VR platforms such as *VRChat*, *RecRoom*, *AltspaceVR*, and *Meta Horizon Worlds* are increasingly shifting how people communicate, connect, and socialize with each other in a more immersive and embodied way [85]. They offer users a more immersive 360-degree space for interaction and allow them to interact via voice, embodied avatars through full-body tracking, and more customized self-presentation through their virtual avatar.

Figure 1: A LGBTQ+ meetup social event in a virtual theatre in AltspaceVR.

In particular, these unique affordances of social VR seem to be increasingly appealing to LGBTQ+ users. Some popular social VR platforms, such as AltspaceVR and Facebook Horizon Worlds, feature regularly scheduled LGBTQ+ focused meetups and virtual events [3–5] (Figure 1). Additionally, a growing body of HCI and CSCW literature has highlighted that the direct connection between one's physical body and self-presentation in social VR is impactful for users who struggle with their gender identities [50, 51]. Such research shows that this connection could provide some coherence between a user's gender and sex assigned at birth (e.g., the physical body) and mitigate symptoms of gender dysphoria (i.e. the negative impacts of perceiving a mismatch between one's gender and assigned sex [110]), and could even go so far as to encourage offline-world changes to one's gender for some users [50, 51].

This small body of work provides some of the first insights on LGBTQ+ users' needs and experiences in social VR, for example, how they present, explore, and experiment their own gender and sexual identity in social VR through embodied avatars [50, 51]. However, more research is still urgently needed to capture a more comprehensive image of LGBTQ+ users' unique engagement in social VR and the increasingly important role of social VR in these communities' online lives. Above all, existing works only involved very limited samples of LGBTQ+ social VR users. For example, in [50], only 4 out of 30 participants are transgender, while all other participants are cisgender. As social VR continues to rise as a vital online social space for the LGBTQ+ community, what is still relatively understudied is how exactly LGBTQ+ individuals feel supported in social VR and in which ways this novel technology can support them and provide them with a range of inclusive interactions. Therefore, in hopes of designing more inclusive and supportive social VR spaces in the future, our work seeks to contribute towards research on LGBTQ+ users' unique engagement in nuanced online spaces by focusing on (1) the types of social support LGBTQ+ users have experienced in social VR (**RQ1**); and (2) novel ways in which social VR fosters such social support for LGBTQ+ users (**RQ2**).

3 METHODS

Recruitment and Participants. This research was part of a broader, multi-year project on social experiences 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, a research assistant attended various events for queer users in AltspaceVR and VRChat and asked about users' willingness to participate. We provided an informed consent document to potential participants based on their communication preferences, such as via emails or Discord messages.

All 29 participants who responded to our requests and agreed to participate were interviewed. Among the 29 participants, 15 self-identify as men, seven as women, 4 as gender fluid, and 3 as non-binary. 18 self-identify as cisgender. Regarding ethnicity, 19 self-report as White, 2 as Hispanic, 2 as Asian, 2 as mixed race, 1 as Indigenous Australian, 1 as Native Hawaiian or Pacific Islander, and 1 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). They had diverse social VR experiences 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, RecRoom, BigScreen, AltspaceVR, vTimeXR, ChilloutVR, Roblox, and NeosVR.

Interviews. 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.

We developed our initial interview protocol based on existing literature on social support for LGBTQ+ individuals in traditional online social spaces [13, 25, 31, 44, 48, 61, 63, 90, 91, 106, 127], prior work on how LGBTQ+ users present, explore, and experiment their gender and sexual identity in social VR [50, 51], and our previous work on social interaction dynamics and relationship building in social VR [1, 46, 47, 54]. To help us develop potential follow-up

questions we could probe upon the given participant's specific background and experiences, one of the researchers conducted 8 initial interviews and wrote conceptual memos [27]. The research team discussed the memos, highlighted emergent categories in the data, made distinctions and connections, and drafted what types of follow-up questions we could ask based on participants' answers to the main interview questions. Preliminary findings based on this initial sample of 8 interviews have been reported in one of our prior works [1]. We then interviewed the rest of the 29 participants. 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' motivation to use social VR (e.g., *"What do you usually do when you use social VR platforms?"*, *"What entices you to keep using social VR?"*), identity exploration (e.g., *"As a LGBTQ+ user, do you feel using social VR makes you feel supported, empowered, affirmed, or more confident regarding your gender/sexual identity?"*), interactions (e.g., *"As a LGBTQ+ user, are there any unexpected social outcomes for you after engaging in social VR such as making new friends?)"*), relationships (e.g., *"Do you feel engaging in social VR improves your relationship with your existing friends/family members/significant others?"*), and design (e.g., *"As a LGBTQ+ users, what social VR features help your interaction/connection with others most and least?"*). The average length of the interviews was 73 minutes. All interviews were voluntary and no compensation was provided.

Data Analysis. We adopted the thematic analysis approach [19, 20] to conduct an in-depth inductive qualitative analysis of the collected data. Our goal is to generate a rich and empirical examination of how and why LGBTQ+ social VR users seek and experience social support in nuanced ways. Based on McDonald et al.'s [89] guidelines 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) Familiarizing ourselves with the data: once all interviews were conducted and audio-recorded data was transcribed, two of the authors closely read through the participants' narratives line by line to identify pieces of information that were relevant to the research questions by highlighting them and taking notes and to acquire a sense of the whole picture as to how LGBTQ+ users seek and experience social support in social VR [20]; (2) Generating initial codes: the same two authors began an iterative coding process. They independently and carefully assigned preliminary codes to identified pieces of information. Then the two authors combined the codes they had identified, eliminated redundant codes, and identified if the same highlighted information was supporting multiple codes. For example, the quote *"Friends that I've made in social VR has definitely made me see the good in the world and make me more confident in my identity"* was coded as "talking about friends made in social VR," "become more confident in identity" and "benefits," and then combined into "social VR friends help LGBTQ+ users become more confident in their identity." (3) Searching for themes: these two authors categorized codes into thematic topics related to our research questions based on prior literature of theories of social support [21, 33, 71, 78] and developed sub-themes emerging in participants' descriptions of how they experience different social support in social VR. For example, codes pertaining to LGBTQ+ experiencing self-improvement from others in social VR were categorized as esteem support – e.g., the code "friends help LGBTQ+ users become more confident in identity" was considered esteem support because the role of friends in social VR improved the participant's self-worth by communicating confidence [78]. Some subthemes were developed in this particular theme, such as "affirming LGBTQ+ identity." (4) Reviewing themes: all authors continued to discuss, integrate, and refine themes and subthemes to streamline LGBTQ+ users' experiences of social support in social VR to best capture and represent the data in relation to the research questions. (5) Defining and naming themes: all authors worked collaboratively to further refine these themes and name the final set of themes. At this stage, all authors considered themes across the entire data set and identified the "essence" of what each theme is about [20]. (6) Producing the report: all authors discussed selecting the most compelling quotes as examples and drafted the structure of the findings in a logical way. The goal of this phase was to create a narrative structure where all findings flowed naturally and coherently [20].

Positionality Statement. We focus on LGBTQ+ individuals and their intimate and personal experiences of social support in novel social spaces. Therefore, the sensitive nature of our research makes it both important and ethical to acknowledge how our identities and cultural backgrounds may influence this research and the analysis and interpretation of our data [81, 109]. Disclosing our positionality in relation to our participants is crucial for clarifying our position in this research context as well as our position in our intellectual and political beliefs [12]. Our research team includes a gay man of color, who conducted all interviews and helped the team better understand LGBTQ+ social VR users' experiences based on his own lived experiences. Our team also includes three straight cisgender women, two of whom are women of color. Though not every team member identifies as a LGBTQ+ individual, we all belong to marginalized communities in social VR (e.g., as women and minorities) and have extensive experience in social VR both as actual users and as researchers. Our own identities thus help us understand LGBTQ+ users' unique needs and practices for social support in the novel context of social VR.

4 FINDINGS

Grounded in existing theories of the types of social support explained in Section 2.1 [21, 33, 71, 78, 133], we first describe the main types of social support that our LGBTQ+ participants have experienced in social VR (RQ1). We then report three novel ways through which LGBTQ+ users have leveraged unique social VR features to actually seek and experience such social support (RQ2). We use participants' self-reported pronouns to describe their experiences.

4.1 Types of Social Support for LGBTQ+ Social VR Users

Our participants specifically acknowledge four types of social support that they often experience in social VR: *network support and emotional support for building a safe LGBTQ+ community in social VR; informational support* for guiding LGBTQ+ individuals' online

and offline lives; and *esteem support* for self-improvement through experimenting and affirming LGBTQ+ identity and experiences with others.

4.1.1 Network Support and Emotional Support for Building a Safe LGBTQ+ Community in Social VR. For many participants, friendships, mutual trust, and a sense of community seem to naturally emerge when they engage in social VR to meet people and interact with others. Therefore, almost all of our participants highlight that they were able to experience network and emotional support by getting to know and building social bonds with others in social VR.

In general, network support allows people to establish access to new members and form, expand, and belong to a supportive community [95]. P1 (23, Cis Woman, Bisexual, White) and P28 (20, Cis Man, Bicurious, Asian) share,

"As shy as I am, I have an amazing time getting to know people that I connect with well enough, and it's always a pleasure exchanging anecdotes and things with someone new." (P1, 23, Cis Woman, Bisexual, White)

"VRChat just sort of became my social experimentation ground. I find myself valuing hanging out with more people. I find it much easier just to hop in VR when I have the time and to hang out with people and to try and meet new people and usually I don't do that by hopping into like a public lobby. Make friends with them and then I'll meet their friends and it becomes like a chain." (P28, 20, Cis Man, Bicurious, Asian)

For both participants, LGBTQ+ users can *"get to know people"*, *"hang out with people"*, and *"meet new people"* in a relaxing, welcoming, and inviting space that social VR provides. Even P1, who is often *"shy"*, is able to socialize with strangers in social VR and start building her friendship network via social VR. Likewise, social VR is an ideal place for P28 to seek network support by practicing and building various social connections. Whether he is seeking friendship or more intimate interactions, he finds it much easier to connect with people and make friends compared to the offline world.

Such network support thus easily fosters emotional support for the LGBTQ+ community, which provides expressions of love, care, comfort, encouragement, and empathy [71, 126]. Many participants consider social VR a safe online community for LGBTQ+ users because they are able to "come out," get to know each other well by establishing closer social connections (i.e., network support), and then exchange positive emotional support within their networks. P4 (20, Non-binary, N/A, White)'s story well summarizes such experiences, *"They (one group of friends I have in VRChat) were like one of the first kind of groups I came out to about my gender expressions. This group made me feel really comfortable online. It felt kind of very euphoric, and they reacted very positively. We could all feel safe in that group. It felt very euphoric to be presented in that way."* Based on P4's account, many LGBTQ+ users seem to be open to coming out in social VR because they feel safe and comfortable to do so by building a safe network, while they may lack such support in their offline life due to various reasons. In this sense, social VR seems to offer them necessary emotional support through network support (e.g., how others reacted *"very positively"* to their practices) to assure that they would be accepted and supported when they come out, which adds to a *"very euphoric"* identity experience in social VR.

Some participants even mention that the network support and emotional support they experience in social VR could be transformative and positively affect their offline life. For example, P6 (18, Cis Woman, Gay, White) shares, *"This is growing close enough to someone to be able to send them packages in the mail [...] I'm thinking about how we send mail to each other and how we're sending each other Christmas presents."* P6's story is interesting because her experiences of network support and emotional support go far beyond the social VR space. These forms of support emerging in a virtual environment even turn into more tangible forms of support (e.g., offline friendship networks, mails, holiday presents) for her in the offline world

P22 (24, Cis Man, Gay, White) adds, *"I met them in VR from friends, clicked quite well. It just worked out between us. And I live here with another flatmate of mine. We were looking for a third person to move in. So, they came over at some point, worked out so well with us in real life as well."* The network support and emotional support P22 received in social VR naturally motivated her to become roommates with her VR friends in the offline world. Therefore, for LGBTQ+ users like P22, the social networks and emotional connections she is able to build in social VR can even gradually become genuine friendships offline, which significantly enriches her social life both online and offline.

However, some participants also express concerns about how such an overall safe, relaxing, and comfortable atmosphere in social VR for network support and emotional support may make some LGBTQ+ individuals too self-centered in social VR. P5 (22, Cis Woman, Gay, White), a moderator of a LGBTQ+ community in social VR, points out, *"In my case, when running a community of people who don't really fit into their normal communities, most of the time it's wonderful and beautiful and amazing. Then sometimes you get people who think that they can basically just 100% let it out, and that they don't really realize that maybe they might not be accepted in their local communities for a reason."* P5 reveals an increasing dilemma regarding network support and emotional support for LGBTQ+ individuals in social VR. On the one hand, this supportive atmosphere is extremely valuable for these individuals, as they may not be able to receive such support in their local communities. On the other hand, some individuals may abuse such support (e.g., *"just 100% let it out"*) because of how acceptable, tolerant, and non-judgemental social VR is.

4.1.2 Informational Support for Guiding LGBTQ+ Individuals' Online and Offline Lives. In addition to seeking network support and emotional support through friendships and community building in social VR, many participants also see social VR as a valuable venue to exchange important information and life lessons regarding how to better approach and manage their LGBTQ+ identities both online and offline. For example, P2 (21, Gender Fluid, Queer, White) describes, *"When I first got here, someone gave me quick lessons or some kind of orientation about how this thing works and how I make friends with people, all that kind of thing as opposed to just entering not knowing any of those and then feeling like already an outsider or you're stupid and don't fit in."* As a LGBTQ+ user, P2 felt *"like already an outsider"* and marginalized in social VR. Therefore, such

information and onboarding guidance from others are especially valuable to P2, which better prepares them to fit in social VR and *"not feel stupid."*

This type of informational support (i.e., providing advice, facts, or recommendations [21, 33, 78, 133]) is especially important for LGBTQ+ users who lack local peer support and access to LGBTQ+ related information. P6 (18, Cis Woman, Gay, White) and P18 (19, Trans Man, Straight, White) highlight,

"Social VR definitely expanded my social circle. It was pretty small, but now I can talk to different people about different topics, and also meet like-minded people." (P6, 18, Cis Woman, Gay, White)

"There are specific rooms just for LGBTQ+ people. It's a great way to get advice from other LGBTQ+ people. Most of it (advice) is more valuable to me as in real life it's hard to find other LGBTQ+ people." (P18, 19, Trans Man, Straight, White)

Indeed, for some LGBTQ+ users, it can be challenging to get in touch with other LGBTQ+ individuals and exchange useful information and advice in the offline world due to various reasons (e.g., geographic locations, peer/family pressure, and sociocultural acceptance of LGBTQ+ identities). This lack of access often creates additional difficulties for young LGBTQ+ individuals like P6 and P18, who are still in the process of constructing and understanding their own identities, to appropriately approach and manage their identity practices both online and offline. In this sense, social VR provides them, particularly those in areas where their gender and sexual identities are not well-received, with the opportunity to connect with and learn from people of diverse backgrounds beyond geographic limitations, especially from other LGBTQ+ individuals.

Therefore, these exchanges of information, suggestions, and advice that they gather in social VR may become their new information resources that they would otherwise have not accessed in their immediate offline world. For instance, P10 (17, Cis Man, Gay, Indigenous Australian) reveals,

"Having the LGBTQ+ community online in VRChat has helped me with support and dealing with homophobia at school and such. If I had to talk to someone about it or had any questions regarding the LGBTQ+ community, I was happy I could go to them about it. In this way I was never worried or confused about my sexuality." Here P10 not only felt enlightened, included, and relieved when seeking and getting advice and guidance in the LGBTQ+ community in social VR (*"I was never worried or confused about my sexuality"*) but also was prepared to improve his offline situation (*"dealing with homophobia at school"*) due to the informational support he received in social VR.

4.1.3 Esteem Support for Self-Improvement through Experimenting and Affirming LGBTQ+ Identity and Experiences with Others. Through network, emotional, and informational support, almost all of our participants recognize that they have also experienced esteem support (i.e., behaviors directed at improving self-worth and praising attributes [21, 33, 78, 133]). While social VR continues to transform how people work, learn, and interact through immersive and embodied experiences, our LGBTQ+ participants gradually build self-confidence and achieve self-improvement by using social VR as a sandbox to experiment, share, and affirm diverse facets of their identities and lived experiences with others in a way that they would otherwise not be able to do offline or in other traditional online spaces. For example, P12 (15, Trans Woman, Bisexual, Native Hawaiian or Other Pacific Islander) and P17 (18, Cis Man, Bisexual, White) explain,

"Social VR helps me learn and confirm my identity 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!" (P12, 15, Trans Woman, Bisexual, Native Hawaiian or Other Pacific Islander)

"Not only me but I would definitely assume for many people it's able to help them come to terms with their identity and definitely reaffirm it. It has certainly reaffirmed that it has made me a lot more comfortable with it." (P17, 18, Cis Man, Bisexual, White)

Both participants highlight how social VR seems to foster a more open, inclusive, and non-judgemental atmosphere for LGBTQ+ users. Situating in such an accepting environment thus helps LGBTQ+ individuals build confidence to further present, express, and affirm their identities when interacting with others. P12 as a teen trans woman, finally can be treated as a woman as she always desires in the offline world to further *"confirm"* her gender identity. And P17 feels more *"comfortable"* to share his LGBTQ+ identity offline.

This form of esteem support is especially crucial for LGBTQ+ users who suffer from depression or social anxiety in the offline world. Multiple participants share their stories,

"Even in a VR setting I'm very shy about making friends. So when someone decides to make the first effort to greet me, it makes a huge impact. I've got some real deep self-deprecation issues, but I'd say these interactions help to relieve a bit of that. Knowing that folks do in fact want to interact with me and acknowledge me and maybe even make the effort to do so again at a later date makes my heart warm." (P1, 23, Cis Woman, Bisexual, White)

"I guess personally I have trouble a lot of the time with social interaction and social cues and being able to express myself more openly. It helps make me more comfortable in social places and with meeting new people. I just feel more confident and calm." (P10, 18, Cis Man, Gay, Indigenous Australian)

"Because of the possibility of meeting people from across the world. I got into a decently bad depressive spell after some real life stuff caused some separation with a former friend group. Since Half-Life Alyx was gonna come out, I figured I might as well invest in a VR headset to mitigate this and kind of build up my social skills, being someone without social anxiety/depression." (P16, 18, Cis Man, Bisexual, Hispanic)

All three participants experienced difficulties regarding self-esteem in the offline world as a result of a combination of personalities, lack of social skills, and their struggles with their LGBTQ+ identities. P1 considered herself *"shy"* and was facing *"some real deep self-deprecation issues"*; P10 generally had trouble with *"social interaction and social cues"* as well as how to express himself more openly; and P16 was dealing with social anxiety and depression. Despite these challenges in the offline world, they all feel that engaging in social VR helps them to improve themselves and become more confident in various ways. For P1, simply knowing other social VR users are motivated and even make effort to interact with her helps her relieve her stress and feel supported. Such social interactions also encourage P10 to meet new people and be *"more confident and calm"* and help P16 to build up his social skills and improve his mental status. For all three participants, the esteem

support they have experienced in social VR seems to help them achieve self-improvement.

This self-improvement may also be extended beyond the social VR context. P10 (18, Cis Man, Gay, Indigenous Australian) and P22 (24, Cis Man, Gay, White) reveal,

"I felt more confident expressing my true self in public, occasionally I would still use my normal voice and pretend I'm straight due to fear of someone making a rude remark or looking at me funny, but it's gotten a lot better since using social VR." (P10, 18, Cis Man, Gay, Indigenous Australian)

"From shy and wanting to be alone, I absolutely love learning more about people. I'm never alone. I'm always speaking to someone in real life. Best example was at work. So they already knew me as slightly extroverted, I already integrated myself into the team. Being a little bit talky now, especially because it's the UK and whole working cultures, what I've noticed at least it's almost on a friendship basis now, I can really just joke around with my co-workers." (P22, 24, Cis Man, Gay, White)

For many LGBTQ+ users like P10 and P22, the esteem support they have experienced in social VR also becomes the source to boost their confidence about themselves and their identities in the offline world. As these quotes show, the esteem support they experienced in social VR motivates P10 to be open to sharing his LGBTQ+ identity in public offline and helps P22 improve her social skills (e.g., joking with co-workers) in her workplace.

Although most of our participants benefit from the esteem support they have experienced in social VR, some are worried that such support may "limit" them in turn, because they would rely on "the only safe place" too much. P9 (32, Cis Man, Gay, Asian) and P20 (28, Non-binary, N/A, Black) explain,

"That's the safe place thing but I just think that because that's the only safe place that I know I'll be able to get in and have an actual good time on social VR, it's affecting the other events that I do want to get into and be able to have fun because it's very limiting." (P9, 32, Cis Man, Gay, Asian)

"It's definitely because of the communities, otherwise I absolutely would not feel supported, because there are a lot of folks that I don't necessarily identify with." (P20, 28, Non-binary, N/A, Black)

Both participants have intersectional identities (i.e., as an Asian gay man and a Black non-binary individual). For them, the supportive environment in social VR indeed significantly helps them be more confident and affirmative about themselves. P20 even reveals that having access to a community of like-minded people or with the same identity as them is essential for LGBTQ+ individuals like them to feel safe, confident, and protected in social VR. However, it is unclear how they may react once they step out of their comfort zone and have to engage in other contexts or events that may not be particularly friendly to LGBTQ+ individuals. In this sense, they feel that social VR can both create a safe "bubble" to boost LGBTQ+ individuals' esteem and make them too dependent on this safe place.

4.2 Leveraging Unique Social VR Features to Support LGBTQ+ Individuals

As described earlier in this paper, social VR, typically through the use of VR headsets, allows users to experience immersive and realistic interactions comparable to offline worlds via embodied avatars with full-body tracking, voice, and more customized self-presentation using customized avatars. Our participants also highlight how they leverage such technological uniqueness of social VR to seek and share various types of social support that we have described in the previous section – by creating a sense of co-presence similar to face-to-face interaction despite being online; simulating physical behaviors to demonstrate embodied support for LGBTQ+ individuals; and imitating offline LGBTQ+ centered events in a natural and immersive way.

4.2.1 Creating a Sense of Co-Presence Similar to Face-to-Face Interaction Despite Being Online. The broad spectrum of both verbal (e.g., voice) and non-verbal (e.g., body language via full-body tracked avatars) communication modalities in social VR enhance the level of joint involvement and user connectedness in the same space, creating a strong awareness of co-presence similar to face-to-face interaction despite being online. Our LGBTQ+ participants thus explain how this unique sense of co-presence can directly facilitate their experiences of network, emotional, and informational support in social VR. P5 (22, Cis Woman, Gay, White) shares, *"I guess the experience of being there with your friend, and being able to interact with, be able to see them move around and stuff and just like exist in a room with them, is just very, very wonderful."* For her, the sense of simply "being there" together can lead to experiences of support and bonding, which makes it easier to express LGBTQ+ users' care and concern for each other to exchange their emotional support. Despite being online and not "physically" together in the offline world, she still could clearly see how her friends *"move around"* in social VR and thus felt that they were in the same room with each other like in a face-to-face interaction situation.

Others also highlight how this enhanced sense of co-presence significantly helps them maintain strong connections with others as in any offline social relationship, which fosters network support and informational support. For example, P7 (23, Trans Woman, Lesbian, White) and P16 (18, Cis Man, Bisexual, Hispanic) detail,

"It mimics a lot of what makes actual relationships with people work. Like my friends and I, we always got on fun time with each other, we caught up, told each other about our lives, we gave advice, helped the other around, cried on each other's shoulders, whatever was necessary at the time." (P7, 23, Trans Woman, Lesbian, White)

"It's more akin to going to a movie theater or something together - a shared experience where we mostly enjoy the environment rather than discussing personal stuff which we would usually do over a standard voice call. (P16, 18, Cis Man, Bisexual, Hispanic)

Both participants emphasize social VR's potential to create a sense of togetherness similar to how people interact with others offline. For P7, engaging in social VR *"mimics"* how she may hang out with and support her offline friends (e.g., chat, giving advice, and crying on each other's shoulders). In this sense, she is able to build network support through social VR in a way similar to building any offline friendships - by forming and expanding a supportive group and exchanging informational support within this network, such as getting advice. For P16, social VR also allows him to be "together" with his friends in environments and contexts similar to offline interactions (e.g., going to a movie theatre). Therefore, this high degree of realism and similarity to face-to-face interaction

is why they can vividly express their network, emotional, and informational support for others and be supported by others in social VR.

For some, this feeling of being together and interacting with others in a face-to-face manner is in fact the main motivation for them to keep coming back to social VR. P1 (23, Cis Woman, Bisexual, White) points out, *"it was those experiences that I did have in those early days that made me want to come back. I can still recall laughing and smiling, sitting back in my beanbag chair in reality while strangers in a virtual bowling alley tried to toss donuts into my avatar's mouth from a distance like it was some silly game. I don't know any of those people outside of that experience, but it's one I'm never going to forget, and the type that I hope to encounter again."* P1's account well summarizes one of the most unique ways for LGBTQ+ users to seek and experience various types of social support in social VR - directly simulating supportive experiences they could possibly encounter and engage in during face-to-face interactions.

4.2.2 Simulating Physical Behaviors to Demonstrate Embodied Support for LGBTQ+ Individuals. Unlike traditional social media applications/sites or online gaming/virtual worlds where users control their on-screen avatars through a keyboard, mouse, or joystick, social VR users are able to leverage the novelty of full-body tracked avatars to conduct physical behaviors such as gestures, touching and hugging, hand movements, and body language. Therefore, LGBTQ+ users can share their emotions and feelings through real-time simulated physical actions in social VR. To them, this novelty becomes a more realistic and "embodied" (i.e., experiencing a virtual body representation as our own body within a virtual environment [112]) way to demonstrate, exchange, and experience their support for each other, especially network support and emotional support, rather than just sending a supportive text or voice message as in other online spaces.

Overall, being able to physicalize such activities in a virtual environment helps people make friends and build connections (i.e., network support) in an engaging way – because to move their bodies or conduct physical actions in social VR, users need to perform the same bodily movements in the offline world (e.g., to make one's avatar hug others in VR, one will need to physically conduct the "hug" movement offline), which facilitates the emergence of potential support. P10 (17, Cis Man, Gay, Indigenous Australian) describes, *"So I tend to just play piano and wait for people to start conversations. With the piano, I normally just sit in the corner somewhere and I would leave my microphone on and I would play on my piano in my room and people would listen. Sometimes I remember I have managed to give other people who know instruments to get enough courage to play as well."* P10's physical act of playing the piano in the offline world directly leads to his avatar's act to play the piano in social VR and the actual melody that other users could hear in social VR. For him, engaging in such physical activities and experiences simulated in social VR is an effective way to initiate social interactions and build connections, which may eventually lead to exchanges of network support (e.g., getting to know other social VR users who play piano as well).

Others also highlight how actually performing these physicalized activities would generate a heightened sense of emotional support. P10 (17, Cis Man, Gay, Indigenous Australian) continues to explain, *"I think personally as it allowed us as a long distance relationship to have physical interaction to an extent, which really helped when they were sad I could go up to them and give them a hug and they would feel better, even though I'm not there giving them a hug in person the thought of it and seeing me do it I think is what helped."* Here P10 points out that being able to actually walk up to someone and give them a hug (while conducting the "hug" movement in the offline world) in social VR allows for *"physical interaction"* despite being in a long-distance relationship. This physicalized nature thus leads to a completely different experience and expression of care and love (i.e., emotional support) for LGBTQ+ users than just typing "hug" or sending an emoji of "hug" as in other traditional online social spaces.

P26 (25, Gender Fluid, Bicurious, Mixed) also highlights that simulated physical behaviors can be especially valuable to help LGBTQ+ users feel safe when using physical touch to express themselves and share emotional support for others,

"People that have extreme anxiety for physical touch actually can come here and express themselves, like hug other people without having a panic attack. I found this absolutely fascinating because this means it is an open door for them to have the opportunity to actually have physical interaction without actually physically touching, and they can train themselves to actually grow and expand, like turning what was an insecure heart into the very much more accepting and loving heart. This is just beautiful to me. I love it so much."

Indeed, as P26 shows, the highly simulated physical behaviors in social VR, on the one hand, allow for accurate and immersive expression of LGBTQ+ users' emotional messages through physical movements. On the other hand, this simulation does not require actual physical contact in the offline world, creating a safe environment for LGBTQ+ users to express themselves and interact with others freely, including when exchanging social support. P27 (N/A, Cis Man, Bisexual, White) even points towards an interesting phenomenon of what he terms as *"phantom touch"* – when people's avatar bodies are touched in social VR, they also feel that their physical bodies are touched. Therefore, he believes that simulated physical behaviors in social VR may greatly help strengthen people's emotional connections and experiences of mutual support even without actual physical touch in the offline world (e.g., hugging to show care and support) – *"sometimes we end up watching movies what we end up having a cuddling session which is basically just laid down together almost like in real life."*

4.2.3 Imitating Offline LGBTQ+ Centered Events in a Natural and Immersive Way. Built upon the enhanced sense of co-presence and simulated physical behaviors, our participants believe that hosting and engaging in LGBTQ+ centered events that imitate similar offline events can facilitate all four types of social support for LGBTQ+ social VR users. Many popular social VR platforms such as AltspaceVR and Meta Horizon Worlds offer regularly scheduled LGBTQ+ focused virtual events and meetups [3–5]. These events are largely replications of LGBTQ+ centered offline events (e.g., Pride Month), which allow LGBTQ+ individuals to gain equivalently immersive social experiences with their peers as in the offline world. Many such events in fact simulate mundane everyday activities and scenarios where LGBTQ+ individuals can interact with each other in

a natural and realistic way - for example, drinking in a bar. P15 (19, Cis Man, Bisexual, White) shares, *"Drinking in VRChat is actually a pretty big thing. It's basically just communities, getting together and playing drinking games."*

P23 (35, Cis Woman, Bisexual, Hispanic) also describes how social VR uniquely provides LGBTQ+ users with the ability to design and customize private spaces for their events,

"I think like the coolest times I've had are when either they come to my dorm room, or I go to their dorm room. And we are just editing and we're just hanging out, like building inventions and stuff like that because even though we're doing decorating, inevitably conversation about other things will sprout up. You still just get to know each other a little bit, and then some."

For her, being able to create and decorate a specific virtual place for LGBTQ+ focused social events directly leads to a more intimate and natural experience of network and emotional support: engaging in these shared activities not only helps foster the appropriate social vibe for networking (e.g., *"dorm room," "just hanging out"*) but lets emotional connections with other LGBTQ+ users naturally emerge (*"inevitably conversation about other things will sprout up"*).

Additionally, P5 (22, Cis Woman, Gay, White) points out that even if some events do not exclusively focus on LGBTQ+ identities, LGBTQ+ users may also leverage such events to seek and experience network and emotional support from various allies, *"They (events) aren't specifically LGBT-related so anyone can join, like just going to a game world and playing games and stuff. However, part of the point is, I guess that people can meet other people like them, and sort of form friendships and stuff."* In this sense, LGBTQ+ users can utilize social VR to host and engage in events where anyone could join regardless of their locations, which especially helps the LGBTQ+ community find and build bonds with allies from all over the world.

Several participants such as P2 (21, Gender Fluid, Queer, White) thus well summarize the importance of having such immersive events for supporting the LGBTQ+ community, *"It's nice to know that there are recurring LGBTQ+ meetups. It is like establishing that being LGBTQ+ is becoming normalized. It's good to see and know that it's there when really want to connect with somebody who's queer, I can go there."* By hosting and attending these events, LGBTQ+ individuals are able to seek network support and get informational support by finding each other, building a sense of community, and fostering emotional bonds in a natural and immersive way similar to attending equivalent offline events but with reduced limitations and lower risks (e.g., no need to travel to the offline event). Through these immersive events, it is also possible to establish a supportive and accepting culture for LGBTQ+ individuals in social VR in two ways: (1) by normalizing being LGBTQ+; and (2) by demonstrating how people are willing to interact with LGBTQ+ users and engage in the LGBTQ+ community. As a result, LGBTQ+ users may experience esteem support by achieving an affirmation of their self-worth and self-perception of their identities.

5 DISCUSSION

In answering our research questions, we have highlighted four types of social support that LGBTQ+ individuals have experienced in social VR, including *network support* and *emotional support* for building a safe LGBTQ+ community in social VR, *informational support* for guiding LGBTQ+ individuals' online and offline lives, and *esteem support* for self-improvement through experimenting and affirming LGBTQ+ identity and experiences with others (**RQ1**). For **RQ2**, we have identified three novel ways through which our participants leverage unique social VR features to actually seek and experience the above-mentioned social support: creating a sense of co-presence similar to face-to-face interaction despite being online; simulating physical behaviors to demonstrate embodied support for LGBTQ+ individuals; and imitating offline LGBTQ+ centered events in a natural and immersive way. In this section, we first discuss how our findings innovate existing HCI literature on traditional online social support by focusing on LGBTQ+ users' unique experiences of social support in emergent nuanced online spaces such as social VR. We also identify implications for rethinking future social VR design to better foster supportive and inclusive new online spaces for LGBTQ+ individuals.

5.1 Innovating Traditional Online Social Support Mechanisms to Empower LGBTQ+ Communities Through Social VR

Similar to how LGBTQ+ individuals gain online social support in traditional (e.g., text or video-based) social networking sites or online gaming/virtual worlds [13, 16, 25, 31, 44, 48, 61, 63, 90, 91, 106, 127], in our study, LGBTQ+ users also report that engaging in social VR helps them experience network support, emotional support, informational support, and esteem support to (1) connect and socially and emotionally bond with other LGBTQ+ users to build a safe online community regardless of geographical distance; (2) seek necessary information to improve the quality of their lives both online and offline; and (3) build confidence in their gender and sexual identity via interacting with peers, supporters, and allies. At the surface level, the types of social support LGBTQ+ users experience in social VR may not seem qualitatively different from what they can gain from other online contexts [18, 52, 88]. However, our findings highlight how LGBTQ+ individuals' experiences of social support can be felt as uniquely realistic, natural, and particularly empowering compared to what they can experience in other traditional online social spaces, mainly by leveraging novel social VR features. In this sense, social VR introduces new mechanisms to empower LGBTQ+ individuals and help address challenges and limitations of traditional technology-mediated social support for LGBTQ+ individuals shown in prior work [16, 16, 32, 34, 60, 79, 98, 119, 122]. Yet, it should be noted that social VR may also lead to new and critical questions about who can be more safely supported and fully experience social support through these new mechanisms over others.

5.1.1 New Mechanisms to Empower and Support LGBTQ+ Individuals. One highlight from our findings demonstrates that social VR introduces three new mechanisms to innovate ways in which social support can be experienced and exchanged online to empower LGBTQ+ individuals. Collectively, understanding these new mechanisms helps to reconceptualize traditional online social support practices by emphasizing such support in emerging online social spaces as a combination of (1) a more physicalized and embodied

nature; (2) a natural and direct translation to tangible offline support; and (3) a particular focus on fostering safe, comfortable, and non-judgemental online culture.

Seamlessly simulating the physicalized, offline social support for LGBTQ+ individuals. As described previously, one main challenge for traditional on-screen social spaces, such as social media [16, 61, 63], online health communities [11], live streaming [53], or even online gaming [48, 72, 106, 111, 135] to facilitate effective exchange and sharing of robust social support for LGBTQ+ individuals lies in their primary dependence on conventional computer-mediated methods (e.g., emojis, text- or voice-based messages, following/subscribing/donating, and avatar-mediated behaviors on screen) [17, 24, 68, 69, 83, 104, 106, 120, 130, 131]. This focus often leads to limited emotional and social cues, the inability to communicate material support, and the absence of physical presence in LGBTQ+ users' experiences of online social support [29, 93, 93]. Therefore, in our findings, the first new mechanism to innovate online social support emphasizes how social VR explicitly simulates social support that LGBTQ+ users can share in the offline world, leading to more realistic, physicalized, and natural experiences of support through full body tracking, voice conversations, and simulated offline spaces and activities [50, 92, 116] even though such experiences happen online. For example, our participants mention that they often experience social support in social VR in physicalized ways, such as hugs, touch, and behaviors to demonstrate emotional support (e.g., crying on each other's shoulder). For them, these supportive gestures and bodily movements happening in a realistic virtual place (e.g., dorm rooms) toward their virtual avatar body in social VR can be felt to be as realistic as what happens towards their physical bodies offline, which they described as *"phantom touch."* Such embodied experiences of social support for LGBTQ+ individuals can rarely be achieved in traditional on-screen online social spaces.

In this sense, this highly physicalized and embodied feature of social support in social VR compensates for the common lack of emotion in online experiences [26, 37, 102] and empowers the LGBTQ+ community by mitigating their challenges of lacking offline support networks and lacking physicalized, immersive, and realistic experiences of social support in other conventional online social spaces. Many of our participants are located in places where their LGBTQ+ identities are not well accepted, leading to difficulties to establish and access an offline network for peer support, emotional connections, and socialization. Through social VR, these users, despite lacking offline support networks, are empowered to experience and benefit from various forms of online social support in a way similar to how they might otherwise have experienced offline, which other traditional online spaces cannot offer. This aspect is also especially important to support LGBTQ+ users' unique social needs (e.g., identity affirmation) – while they may not be able, or are not safe to explore and affirm their LGBTQ+ identities by interacting with people offline, they can do it safely in social VR but still in a face-to-face manner.

Further blurring the boundary between online and offline social support to empower the LGBTQ+ community. Another challenge for traditional online social spaces to effectively provide LGBTQ+ individuals with social support lies in the fact that social support via face-to-face communication can be felt significantly more desirable and satisfactory than traditional computer-mediated communication [80, 99]. Therefore, the second mechanism highlighted in our findings is that social support in social VR does not merely "simulate" offline, physicalized support but also can directly be translated to and naturally bleed over into LGBTQ+ individuals' offline life. This further blurs the boundary between online and offline social support to empower the LGBTQ+ community, leading to as (if not more) desirable and satisfactory experiences of social support compared to offline, face-to-face social support. For example, many participants mention that because the various forms of social support they experience in social VR are felt as so realistic, such experiences naturally turn into tangible support (e.g., mailing each other presents) and new social connections offline (e.g., becoming roommates). In this sense, social VR re-configures how LGBTQ+ individuals' online and offline social lives bridge together in a nuanced way. For them, how they build confidence in their LGBTQ+ identities, become informed, and connect with others in social VR is not only similar to how they might have otherwise experienced social support offline but also naturally *becomes offline social support itself.*

As a result, social VR empowers LGBTQ+ individuals by offering them particularly *transformative* experiences of social support. On the one hand, compared to social support in traditional online social spaces, such as social networking sites [66, 134], the boundary between online and offline social support in social VR is more blurred due to the embodied and physicalized nature of social VR experiences, which facilitates LGBTQ+ users' unique social needs in a more powerful and realistic way. On the other hand, it is because such experiences of social support are realistic and immersive, that they not only happen organically in social VR but also naturally transit from online to offline. This suggests that social support built through social VR has lasting effects that go far beyond the VR platform itself, which help LGBTQ+ individuals expand their offline social circle and further enhance their identity affirmation and the sense of belonging both online and offline.

Fostering an especially safe, comfortable, and non-judgemental online place for LGBTQ+ users. While traditional online social spaces such as gaming and social media may help LGBTQ+ individuals seek and exchange social support, they may also expose these users to greater online risks, such as harassment and social interaction tensions toward LGBTQ+ users (e.g., when they come out, or when they go through transition) [30, 41, 58, 97, 121]. In this sense, while many LGBTQ+ individuals often lack safe and supportive offline social spaces [74], it can be challenging to find LGBTQ+ friendly space in traditional online social platforms as well. In contrast, our findings highlight how social VR offers the third mechanism to innovate online social support for the LGBTQ community – by focusing on a relaxing, welcoming, and non-judgemental social atmosphere to create a particularly safe zone for these users. Many of our participants believe that social VR, a still evolving new online social space, seems not to be fully impacted by the toxic gaming culture towards marginalized populations such as LGBTQ+ users. In fact, they even consider social VR a safe space to "come out" first and practice how to deal with people's reactions once they "come out." Many have created communities and social circles in social VR to foster a welcoming and inviting space for LGBTQ+ users and supporters. In these spaces, LGBTQ+ 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. For them, engaging in this safe, comfortable, and non-judgemental online place is an important preparation for "coming out" and for further advocating for their equal rights in the offline world eventually.

5.1.2 New Concerns about Who Can be More Safely Supported and Fully Experience Social Support Over Others. We acknowledge and applaud social VR's important and novel role in innovating how LGBTQ+ individuals can experience and benefit from various forms of online social support in more nuanced ways, especially in comparison to the social support they may gain in other traditional online social spaces. However, as HCI researchers, we are also well aware of new concerns embedded in this seemingly overly positive image that require further reflection and investigation.

Above all, there is a growing concern that the very features that help LGBTQ+ users experience more natural, embodied, and realistic social support in social VR can also lead to harassment that feels more realistic compared to other online social platforms, such as embodied physicalized harassment (e.g., groping, unwanted hugging, and sexual harassment) that have been reported in prior work on social VR [14, 15, 54]. As such, LGBTQ+ users who desire the embodied social support brought about by social VR are faced with a double bind: disclosing their identities and seeking those embodied social support would potentially put their online safety at risk (e.g., facing embodied harassment [54] as well). As shown in Section 5.1.1, our participants often consider that the benefits of social support they have experienced through unique social VR features typically overweight the risks of exposing them to more embodied and physicalized harassment via the same features. However, it is crucial to further explore who can be safely supported in social VR over others and how to both facilitate LGBTQ+ individuals' needs for seeking and experiencing embodied physicalized social support in social VR and effectively protect them from embodied physicalized harassment at the same time.

Additionally, another critical question is: who can fully experience and benefit from social support in social VR over others? Indeed, social VR has shown the potential to significantly facilitate LGBTQ+ individuals' efforts for seeking mutual support and pursuing community building. Despite VR hardware and software being more accessible and affordable compared to their prices in the past, this socioeconomic barrier may leave many LGBTQ+ users behind, especially those with intersectional identities. The financial costs to purchase a either standalone VR headset or a headset for desktop, gaming console, or a smart phone, along with full-body tracking features and stable and high-speed Internet to fully engage in social VR, can prevent many LGBTQ+ individuals, especially LGBTQ+ users of color, from experiencing and benefiting from the unique immersive and supportive interaction that social VR provides. As a result, only certain types of LGBTQ+ users, who often tend to be white, financially stable, and educated seem to be able to seek and experience social support more so than others. Further, while some social VR applications can be accessed without a VR headset (e.g., via a web browser on a desktop), this lower-cost solution, which only offers traditional 2D on-screen experiences, cannot provide the same fully embodied and immersive experiences of social support as those who own immersive VR devices [113].

In this sense, while social support in social VR can be a particularly novel and empowering experience to LGBTQ+ individuals, it may also be *"privileged"* due to who gets to fully experience immersive social support than others (e.g., accessing social VR via immersive VR headsets versus via a web browser on a desktop). For example, it is likely that certain specific LGBTQ+ individuals with intersectional identities (e.g., transgender people of color) may need more social support than others (e.g., white gay men) due to their intersectional challenges (e.g., both transphobia and racism) and the common culture of homonormativity [40] and cisnormativity [43, 132]. However, it is also these exact same reasons that make them less likely to afford a VR headset. Even if they could access social VR and experience social support via a 2D surface (e.g., a web browser), they would not be able to fully engage in social VR in an immersive way compared to others (e.g., white gay men). This not only prevents them from being empowered by social VR's novel mechanisms for social support but also may further reinforce their marginalization online. This issue is also reflected in our sample: 19 out of the 29 participants are white and 8 are cisgender white men.

This question about who can fully and immersively experience social support in social VR over others also creates other challenges and barriers for offering inclusive and supportive social VR experiences. As our findings show, on the one hand, it is likely for some people to abuse the tolerant, accepting, and non-judgemental atmosphere of social VR because only certain types of LGBTQ+ users are privileged to fully enjoy and benefit from it via a VR headset. On the other hand, it is also likely for these LGBTQ+ users to over-depend on this comfortable "safe zone" in social VR because of their privilege, which may undermine their ability to appropriately conduct identity practices and social interactions with others offline. In this sense, our study not only points to the increasingly important role of social VR to innovate the mechanisms through which LGBTQ+ individuals seek and experience online social support in more nuanced and empowering ways but also reveals the critical need for future research to unpack how to make these mechanisms more inclusive and equal to fully support all LGBTQ+ users, rather than just benefiting the privileged few.

5.2 Designing Supportive and Inclusive Social VR Spaces for LGBTQ+ Users

We believe that our findings may directly inform a growing research agenda on designing supportive and inclusive, rather than "privileged," future social VR spaces to empower marginalized users such as LGBTQ+ individuals. We especially propose two equally important principles at the high level for rethinking social VR design for this purpose.

Principle 1: Fostering an Overall Inclusive and Supportive Social Atmosphere through Educating Appropriate Social Norms and Expectations for Diverse Gender and Sexual Identities. Above all, our findings show that how LGBTQ+ users feel supported and empowered in social VR is grounded in how they experiment, share, and affirm diverse facets of their LGBTQ+ identities and lived experiences with others in a way that they would otherwise not be able to do offline or in other traditional online

spaces. Obviously, such experiences of social support and empowerment are unlikely to be achieved and enhanced simply at the technology design level but at the social level. In particular, as described in the previous section, hate speech, harassment, and other toxic behaviors in social VR have been reported in mass media and become an ongoing concern for social VR [82, 94, 114]. There are also growing efforts from both the academia and social VR platforms to set up policies, regulations, and codes of conduct to guide appropriate social behaviors and mitigate toxic behaviors in these emerging new social spaces [51, 101, 124]. We, therefore, argue that designing supportive and inclusive social VR spaces for LGBTQ+ Users should focus on fostering an overall inclusive and supportive culture in social VR spaces, which requires establishing and educating appropriate social norms and expectations for diverse gender and sexual identities.

Such a culture should both support LGBTQ+ users' unique social needs (e.g., identity experimentation/affirmation, networking, and safety) and create an open, accepting, and supportive atmosphere amongst all users. As our findings show, our participants are still worried that social VR events and virtual places that are not LGBTQ+ focused may not be LGBTQ+ friendly. In this sense, we must emphasize the necessity to establish appropriate social norms and expectations about the spectrum of gender and sexuality identities and expressions in future social VR spaces and to educate all social VR users to shape a diverse, dynamic, and inclusive social atmosphere. Ensuring that LGBTQ+ individuals can feel equally supported and included as any other populations do will require future social VR design to involve important education mechanisms in two ways. First, it is vital to inform and educate users who are either unfamiliar with or uninformed about appropriate social norms associated with perceiving, understanding, and interacting with users of LGBTQ+ identities, especially on a global scale. This will then help create a universal, inclusive environment for LGBTQ+ individuals to feel recognized and included as well as expand the horizon of social support they can receive in this new online space. Second, even for users who are familiar with LGBTQ+ identities or LGBTQ+ individuals themselves, it is important to learn to avoid abusing social support from others and how to maintain mutual respect, as shown in our findings. Additionally, fostering such an overall inclusive culture and atmosphere should happen both in and out of social VR, for example, by providing diverse LGBTQ+ populations, rather than just the privileged few (e.g., who are usually white, financially stable, and educated) with necessary social support and outreach activities to have a stronger voice in social VR.

Principle 2: Designing for Mutual Respect, Emotional Expressions, and Online/Offline Support Transformation to Support Diverse Gender and Sexual Identities. How LGBTQ+ individuals seek and experience social support in social VR is often informed by and intimately tied to their unique gender and sexual identities. To better help diverse users' needs for expressing, experimenting, and affirming their gender and sexual identities through sharing social support in social VR, one potential direction from our findings points to specific designs to promote mutual respect and understanding of gender and sexuality expressions as a foundation for fostering supportive interactions. For example, a useful new feature can simply be allowing social VR users to add preferred pronouns to their usernames or avatar designs to better express and convey their identities to others in social VR interactions. Another potential direction highlights the need for designs that can express *in-depth feelings or more complicated emotions* for all users to better experience social support, especially emotional support, which seems necessary to strengthen emotional connections and build social bonds for LGBTQ+ individuals through more delicate and subtle interactions. Additionally, with the high possibility of directly translating social VR support to offline, tangible social support (e.g., presents, letters, and offline relationships), it seems necessary to provide new design features to further facilitate this online and offline support transformation, such as directly posting screenshots of social VR events on other social media platforms or facilitating offline meet-ups. Ultimately, we envision that these design directions would not only benefit LGBTQ+ individuals but all social VR users by fostering supportive and inclusive social VR spaces.

5.3 Limitations

This work has a few limitations. 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 LGBTQ+ users, who often tend to be financially stable and educated white men, are able to access social VR and experience social support in such nuanced online spaces 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 findings regarding social support in social VR may center on cisgender individuals or white men within the LGBTQ+ community. Future work should aim to recruit a broader participant pool to include more voices from certain LGBTQ+ 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 LGBTQ+ users' experiences of social support and the technological features of specific social VR platforms.

6 CONCLUSION

As social VR continues to rise in popularity, its unique technical and experiential features have attracted a growing number of LGBTQ+ individuals to explore identities, build social bonds, and form communities. To unpack the increasingly important role of social VR in LGBTQ+ community's modern online social lives, we have explicated four main types of social support that they have experienced through social VR and highlighted three novel ways through which LGBTQ+ users utilize nuanced social VR features to actually seek and experience such social support. Our findings both shed light on how social VR innovates traditional online social support mechanisms to empower LGBTQ+ individuals and reveal underlying new concerns regarding the inclusion and equality issues of such mechanisms. We hope that these insights help to further understand LGBTQ+ users' online social engagement through new technologies and guide future efforts to design more supportive and inclusive online social spaces for all, especially marginalized communities such as LGBTQ+ individuals.

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