

(Re)discovering the Physical Body Online: Strategies and Challenges to Approach Non-Cisgender Identity in Social Virtual Reality

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ABSTRACT

The contemporary understanding of gender continues to highlight the complexity and variety of gender identities beyond a binary dichotomy regarding one's biological sex assigned at birth. The emergence and popularity of various online social spaces also makes the digital presentation of gender even more sophisticated. In this paper, we use *non-cisgender* as an umbrella term to describe diverse gender identities that do not match people's sex assigned at birth, including Transgender, Genderfluid, and Non-binary. We especially explore non-cisgender individuals' identity practices and their challenges in novel social Virtual Reality (VR) spaces where they can present, express, and experiment their identity in ways that traditional online social spaces cannot provide. We provide one of the first empirical evidence of how social VR platforms may introduce new and novel phenomena and practices of approaching diverse gender identities online. We also contribute to re-conceptualizing technology-supported identity practices by highlighting the role of (re)discovering the physical body online and informing the design of the emerging metaverse for supporting diverse gender identities in the future.

CCS CONCEPTS

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

KEYWORDS

social virtual reality, non-cisgender, gender presentation online, embodied interaction

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1 INTRODUCTION

Gender is a complex and profound concept regarding one's identity in the offline world, as the more contemporary understanding of gender continues to highlight the complexity and variety of gender identities beyond a binary dichotomy (i.e., male or female). Yet, the emergence and popularity of various online social spaces makes the digital presentation of gender an even more sophisticated phenomenon, leading to key HCI research agendas regarding identity, technology, and social justice, such as feminist HCI [12, 76], queering HCI [53], and intersectional HCI [79]. In particular, prior research has shown that technology users who do not identify with their sex assigned at birth (e.g., transgender, non-binary, and genderfluid users) are often considered marginalized: despite various efforts to support these users' online experiences, a growing concern is that many technologies and platforms still seem not to be inclusive enough to serve these users' needs for appropriately presenting, expressing, and experiencing their diverse gender identities [15, 43, 44]. As digital social spaces continue to evolve, a more in-depth investigation of nuanced gender presentation and expression online and how emerging new technologies may support or hinder such experiences is crucial to not only continuously advance the HCI knowledge on technology-supported identity practices but also make this field more diverse and inclusive.

Therefore, in this paper we use *non-cisgender* as an umbrella term to describe diverse gender identities that do not match people's sex assigned as birth, including Transgender, Genderfluid, and Non-binary. In particular, we explore non-cisgender users' identity practices and their challenges in social virtual reality (VR) – 3D virtual spaces where multiple users can interact with one another through VR head-mounted displays and immersive virtual content [69, 70] (See Figure 1 and 2). We focus on the social VR context because it offers novel and unique techniques to present, express, and experiment one's identity in ways that traditional online social spaces such as social networking sites and online gaming/virtual worlds cannot provide. For example, Sykownik et al. describe social VR as *the most social platform ever* due to its multiple modalities of interactivity such as full-body tracked avatars (i.e., one's avatar body actions would correspond to one's physical body actions),



Figure 1: AltspaceVR (www.altvr.com)



Figure 2: VRChat (www.vrchat.com)

predominate voice communication, body language and gestures, and simulated immersive activities [84]. However, despite identity becoming a growing research agenda in the social VR scholarship, most existing studies have largely focused on cisgender users and white male users (e.g., [17, 37, 38]). Still little is known regarding non-cisgender users’ unique experiences of understanding and presenting their identities in these emerging novel social spaces. This research gap thus motivates us to investigate the following research questions based on 15 in-depth interviews with non-cisgender social VR users:

RQ1: What strategies do non-cisgender users use to build and experience their diverse gender identities in social VR?

RQ2: What challenges do non-cisgender users often face in their identity practices in social VR?

Our contributions to HCI are two-fold. First, there is a growing interest in HCI research on nuanced identity practices in social VR (e.g., [6, 37, 38]). Yet, presenting and exploring diverse gender identities from non-cisgender social VR users’ perspectives is an understudied topic. Our study, therefore, provides one of the first empirical evidence of how novel technologies such as social VR platforms may introduce new phenomena, practices, and challenges of approaching diverse gender identities online. Second, we contribute towards a broader research discourse in HCI on revisiting and re-conceptualizing technology-supported identity practices in emerging online social spaces. We do this in two ways: (1) we shed light on how the *physical body* is re-introduced and re-discovered in

the social VR context. Since the concept of gender is closely related to one’s physical body (e.g., biological sex assigned at birth) and to what degree one conforms to such a body, this insight points to the importance to reconsider a new body-avatar relationship in identity practices where the physical body plays an essential role even in an online/virtual environment; (2) we provide potential implications for designing future socio-technological systems, such as the emerging *metaverse* where various virtual worlds, augmented reality, and the Internet are all seamlessly intertwined [33], for supporting more diverse and inclusive gender identities.

2 RELATED WORK

2.1 Non-Cisgender as Marginalization in Online Social Spaces

Non-Cisgender as Marginalization. Marginalized individuals are broadly defined as populations who are a minority within a specific field or space, or who are treated as peripheral or outsiders in relation to the dominant group. Marginalization can occur from a number of social, economic, political, physical as well as cognitive factors, such as gender, race/ethnicity, sexual orientation, or people’s physical and intellectual limitations [39]. For example, a large body of existing HCI research has focused on how socioeconomic disadvantages shape marginalized users’ experiences with technology or hinder them from such engagement [4, 40, 72, 73]. In particular, significant HCI research has attended to different groups of marginalized users based on their demographics, such as gender identity and sexual orientation. Among them, Bardzell and Rhode respectively called for the emphasis on the construction, performance, and embodiment of gender in everyday life [12, 76]. Intersectional HCI proposed a framework for engaging with complex identities and its interaction with gender, race, and class [79]. Focusing on the historical exclusion of trans individuals in HCI research, Ahmed advocated the trans competent interaction design that recognizes trans embodiment by highlighting practices that “pay particular attention to the unique identities, circumstances, and social locations of users” [2]. Following this line of research, in this paper we specifically focus on users who are systematically marginalized in online social spaces due to their diverse *non-cisgender* identities.

Traditionally, gender is perceived to be derived from one’s biological sex, meaning that a person is either born a man or a woman. In this view, gender is binary as biological sex dictates one’s gender identity [89] and individuals fall into one of the two categories: male or female. Therefore, the term *cisgender* describes a person whose gender identity matches their sex assigned at birth. In contrast, *transgender* individuals are in direct opposition to cisgender individuals as they identify outside the gender binary assigned at birth. *Non-binary* individuals also do not identify strictly as male or female and fall under the broader umbrella of transgender. However, not all non-binary individuals are transgender. Common gender identities that fall under the non-binary umbrella include but is not limited to i) agender – having no gender identity, ii) genderqueer – not ascribing to binary identity, iii) genderfluid- shifting between two or more different gender identities, and iv) bigender - having two gender identities or expressions [32]. Especially, non-binary individuals tend to use non-gendered pronouns to help communicate their gender identities in everyday interactions with others. In

addition, genderfluid individuals' gender identity or gender expression change over time. Despite not having a fixed gender, genderfluid individuals might also self identify with a non-binary identity. Therefore, in this paper, we use "non-cisgender" as a broad umbrella term to describe diverse gender identities that do not match people's sex assigned at birth, including *transgender*, *non-binary*, and *genderfluid*. We chose this term rather than other alternatives such as transgender, gender non-conforming, or non-traditional gender in hopes of referring to a variety of different gender identities (e.g., not all non-binary or genderfluid individuals identify as transgender) in a more inclusive and respectful way.

Gender Presentation in Online Social Spaces. Compared to cisgender users, non-cisgender individuals often encounter limitations and restrictions with regard to how they present and express their gender identity in various online social spaces, including online games and virtual worlds. These virtual environments have been proved beneficial for experiencing and developing one's gender identity due to the opportunity for self-exploration through embodied experiences with avatars [14, 19, 24, 30], the relationships between identity in virtual worlds and the offline world [66, 88], the crafted expression of identity through clothing and fashion [3, 51], the physical body as a signifier for identity [52], and the focus on multiple and fluid identity [86]. For example, Yee et al. found that gender differences are socially constructed, and that gender is often reproduced in online games such as world of Warcraft [91]. Francino et al. highlighted that users can explore the "hidden and stigmatized aspects" of their self through online identities and gendered interactions in virtual worlds [34]. Despite these benefits, non-cisgender users face several challenges.

First, varying platforms, systems, and designs reinforce a binary gender oriented framework (e.g., very often players can only choose to create a female or male avatar in gaming) [15, 47, 83, 87]. For example, Spiel et al. documented the challenges gender diverse individuals face daily in their navigation and interaction with technology, touching on issues such as misgendering, erasure, and misrepresentation [83]. Other studies by Keyes et al. [47] and Scheurman et al. [78] found that facial recognition systems such as the Automatic Gender Recognition (AGR) present another risk for the erasure of non-binary individuals' identities.

Second, these individuals often subject to an online culture that is not inclusive to non-cisgender users. Haimson et al. reported the stress transgender users receive on Facebook while transitioning [43]. They also highlighted the exclusion of non-confirming users and other marginalized identities from Facebook due to the "real name" policy, which forces users to provide names they are known for in the offline world and verify their names using legal identification [44]. Likewise, Brookey and Cannon found that the heteronormative and cishnormative demand is effectively propagated as the "natural" state in Second Life [20].

Third, despite the effort to support non-cisgender users' online social experiences, the design of many online social spaces may actually introduce new barriers to these users' needs to appropriately present their identity. For example, Tumblr as a queer friendly space introduced a new tag system. Such a system allows for a new kind of exploration and affirmation of gender identity that is "*separate[d] from the rest of one's life and everyday network*" [41]. However, it also forces non-cisgender users to label themselves for

visibility and limits their visibility as posts with certain tags get flagged as inappropriate [41, 43].

In summary, existing HCI studies have pointed to the importance of designing and developing technologies to support various users' gender expressions. They have also highlighted the urgent need for more research on non-cisgender as a form of marginalization in online social spaces and these users' unique challenges to present and express their identity through new technology. We thus introduce social VR – novel and increasingly popular digital social spaces that both innovate how people meet, connect, and interact in an embodied way and introduce new opportunities and challenges for non-cisgender users' identity practices online.

2.2 Social Virtual Reality for Embodied Experiences and Identity Practices

Broadly defined, social VR refers to 3D virtual spaces where multiple users can interact with one another through VR head-mounted displays and immersive virtual content [69, 70]. Examples of popular social VR platforms include AltSpaceVR, VRChat, RecRoom, Facebook Horizon, High Fidelity VR, and so forth. They tend to afford diverse activities and social atmospheres. For example, RecRoom focuses on VR gaming. VRChat supports a wide range of creative activities and avatar customization. AltSpaceVR is well known for its combination of various activities, including communicating with others through chat and attending events and professional development. Facebook Horizon emphasizes virtual interaction with people who are already friends. And High Fidelity VR highlights large-scale public events and performances. Many popular platforms, such as VRChat and AltSpaceVR, support full body tracking by using commercial body trackers such as HTC's Vive Trackers or Microsoft's Kinect. On these platforms, social VR users can conduct and enjoy real-life social activities such as walking in public space, playing a game, watching a movie, participating in a concert, and having a party in a highly realistic 3D virtual environment through full body tracked avatars (i.e., one's avatar body actions would correspond to one's physical body actions) (Figure 3). These platforms also afford nuanced modes of interactivity such as sleeping in VR [56], nuanced nonverbal communication [61], and strengthening long distance relationships [35, 60, 92].

Social VR for Embodied Experiences. In particular, social VR continues to grow as an important and popular media for more natural and immersive *embodied experiences*. Embodiment in immersive VR environments has been extensively studied in the HCI and VR communities [8–11, 45, 48, 49, 55, 62, 63, 74, 75, 85]. 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 [82]. This notion 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 [48]. In general, embodiment is defined by the constructs of agency, self-presence, and body ownership [48, 81]. Agency refers to the subjective experience of action, control, intention, motor selection and the conscious experience of will through the body; self-presence is one's perception of feeling "present" in a virtual environment; and the sense of body ownership refers to one's self-attribution of a body and



Figure 3: Full body tracking in VRChat (Source: www.youtube.com)

how such a body becomes the source of the experienced sensations [48]. According to Skarbez et al., full embodiment in VR can be achieved through the combination of full (e.g., wearing tracking suit) or partial tracked avatars (e.g., above waist only tracking), synchronous movements (e.g., matching users' physical movements), and in a fully immersive environment (e.g., mediated by wearing an VR headset [81]. Others also highlighted the effects and sentiments of embodying a different avatar body (e.g., in terms of height and skin tone) compared to one's physical body [8, 75].

Grounded in these understandings of *embodiment*, social VR seems to support unique and full spectrum embodied experiences: it significantly enhances one's sense of being physically immersed in the virtual environment not only through the 360 degree immersive virtual content but due to the fact that avatar behavior in social VR corresponds to the body motions in the offline world. This correspondence and combination thus leads to a higher awareness of all three dimensions of agency, self-presence, and body ownership [48, 81] and more physical and transformative interactive experience. 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 further heightens one's agency of the virtual body [61].

Social VR for Identity Practices. Therefore, due to social VR's focus on embodied experiences, existing research has highlighted the importance of social VR as an attractive space for experimenting and presenting one's identity in a realistic setting [7, 37, 38, 61, 77]. First, the naturalistic agency over the embodied avatar in social VR has been known to enhance the subjective experience of presence [37]. Second, social VR platforms tend to provide a flexible manner for users to experience different forms of visual and aesthetic forms of digital representation, including different avatar genders, races, hairstyles, and accessories. Third, social VR also provides an immersive environment to conduct different identity practices – e.g., either using an avatar that resembles one's physical self or experimenting an avatar completely different from their self (e.g.,

non-humanoid) for fun [37]. However, despite being a growing research agenda in HCI, most existing HCI scholarship on social VR experiences has largely focused on cisgender users and white male users (e.g., [17, 37, 38]). There is an urgent need to involve and further emphasize how historically ignored groups such as people of color, youth, women, and non-cisgender users conduct such identity practices in social VR. This is especially true as these groups often experience social VR differently as compared to the majority users – for example, women preferred to use male avatars to avoid harassment [61] and bullying in social VR is different based on age groups [35, 57, 58].

This research represents our effort to address this limitation. As social VR becomes a potential online social space for nuanced and immersive identity practices, it is critical to explore how non-cisgender users, in addition to the cisgender population that has been studied, experience and express their diverse gender identities in this novel space. Therefore, in this paper we focus on non-cisgender users' nuanced strategies to build and experience their gender identities in social VR (RQ1) and the unique challenges they encounter in this process (RQ2).

3 METHODS

Recruitment. Due to the exploratory nature of our research questions, we conducted a multi-year interview study to investigate non-cisgender users' identity experiences and practices in social VR. We chose interviews as the study method because this method is able to obtain detailed and thorough information from a small number of people [1]. 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, and we followed existing ethical considerations for social VR research [59]. We posted recruitment messages on popular online forums for queer gamers and social VR users (e.g., r/gaymers, r/Oculus, r/AltspaceVR, r/VRChat in Reddit) and on Discord servers for social VR and queer users (e.g., VRC LGBT on Discord) to recruit participants who self-identify as non-cisgender (including trans,

non-binary, and genderfluid) 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, two authors attended various events for queer users in AltspaceVR and VRChat, two of the most popular social VR platforms, and asked random social VR users' willingness to participate.

Participants. We interviewed all participants who responded to our requests and agreed to participate. As a result, we conducted 59 semi-structured in-depth interviews as part of the broader project from October 2019 to February 2021 via text/voice chat over Discord, video chat over Zoom, or within social VR, depending on participants' modality preferences. For this particular study, which focused on non-cisgender (i.e., those who identify as trans, non-binary, and genderfluid) social VR users' experiences and challenges, we used the interview data from all participants who self identify as non-cisgender (N=15) out of the 59 participants. Among the 15 participants, seven self-report as trans woman, four as genderfluid, three as non-binary, and one as trans man. Regarding ethnicity, 12 are White, one is mixed race, one is Native Hawaiian or Pacific Islander, and one is Black. Participants aged from 15 to 32 (Average age: 22.67; SD=4.94) and with diverse social VR experience ranging from 1 month to 48 months (average: 20.25 months; SD=15.26). They spent 1 to 25 hours on these platforms per week (average: 10.73; SD=8.75). Participants had also experienced various popular social VR platforms, including VRChat, Rec Room, BigScreen, AltspaceVR, vTimeXR, ChilloutVR, Roblox, and NeosVR. Four participants only exclusively used VRChat, one participant only exclusively used AltspaceVR, and 10 participants mentioned that they were frequent users of more than one social VR platforms to explore different social activities – e.g., VRChat for creative activities and experimenting avatars, Rec Room for playing VR games, and AltspaceVR for workshops and meetups. Table 1 summarizes the demographic information of our participants.

Interviews. Prior to the interviews, we provided an informed consent document to all participants based on their communication preference, such as via emails or Discord messages. We did not collect names or identifiable information from participants. Additionally, interviews conducted 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 to further protect their privacy. We also collected participants' self-reported pronouns to describe their identity experiences and practices in social VR accurately. Interviews started with questions about basic demographic information and social VR applications/devices that participants used most. The main interview questions were related to their strategies, experiences, and engagement related to presenting and expressing their gender identity in social VR. Example interview questions related to this particular study included: *"have you ever disclosed your gender, race, and/or sexuality and sexual orientation to a stranger in social VR? Why or why not. If so, how did they react? How do you feel about this experience?"*, *"do you feel the gender or ethnicity of your avatar significantly affects how other people perceive and interact with you? If so, in which ways?"*, and *"As a non-cisgender user, how do you feel*

the impacts of using social VR on your gender identity?" The average length of interviews was 78 minutes.

Data Analysis. We adopted a Grounded Theory Approach [23] to conduct an in-depth qualitative analysis of the collected data. A qualitative approach is appropriate for this study because qualitative methodologies are well-suited for investigating questions about "how people interpret their experiences, how they construct their worlds, and what meaning they attribute to their experiences" [71]. Based on McDonald et al.'s [67] 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 themes of interest, find relationships among them, and formulate them into more complex groups and broader themes.

We analyzed the collected interview data in the following steps: (1) two authors read through the participants' narratives line by line to acquire a sense of the whole picture as to how non-cisgender users present and experience their gender identity in social VR; (2) all authors independently and conducted open coding [23] of each transcript, categorized participants' responses into thematic topics, and developed sub-themes emerging in participants' descriptions of their experiences of gender identity in social VR for further analysis. Some preliminary themes were identified by the authors when re-reading participants' accounts, while some others were added as particular quotes required additional themes or subthemes; (3) all authors discussed and refined themes and sub-themes in a collaborative and iterative axial coding process [23] to streamline non-cisgender users' experiences and challenges regarding gender identity in social VR and group these themes by each research question; (4) the same two authors involved in step one extracted quotes based on themes and sub-themes refined in the third step through focused coding [23]; and (5) all authors further discussed and refined themes and sub-theme and used the quotes to generate a rich description synthesizing answers to the research questions.

Positionality Statement. In qualitative research on online identity, 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 [50, 79]. Such disclosure would also help clarify the researcher's position in the world, their goals, as well as their position in their intellectual and, to an appropriate extent, political beliefs [13]. Therefore, we believe that it is necessary to share the context of our positionality in relation to the participants. All authors of this paper identify as cisgender, which can be a limitation as participants in this study identify as non-cisgender. However, similar to participants featured in this study, all researchers involved in this work are part of various marginalized communities in computing based on gender, race, or sexual orientation. All authors are ethnic minorities, including an Asian woman, a Black man, an Asian gay man, and a Black woman. One author is gay and the others are straight. All 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 non-cisgender users as a marginalized group in the sociotechnological context of social VR.

Table 1: Demographic Information of Interviewees

ID	Gender	Sexual Orientation	Ethnicity	Age	Social VR platforms used	Experience (months)
P1	Genderfluid	Queer	White	21	Rec Room; VRChat; AltspaceVR	8
P2	Non-binary	N/A	White	20	VRChat; Rec Room	24
P3	Trans Woman	Lesbian	White	23	VRChat	13
P4	Genderfluid	Pansexual	White	21	VRChat	36
P5	Trans Woman	Bisexual	NH/PI	15	VRChat	1
P6	Non-binary	Pansexual	White	20	VRChat	30
P7	Trans Man	Straight	White	19	VRChat; Roblox	48
P8	Non-binary	N/A	Black	28	AltspaceVR	10
P9	Genderfluid	Asexual	White	24	AltspaceVR; VRChat	30
P10	Genderfluid	Bi-curious	Mixed	25	VRChat; ChilloutVR	7
P11	Trans Woman	Queer	White	15	VRChat; Rec Room; AltspaceVR	4
P12	Trans Woman	N/A	White	30	AltspaceVR; VRChat	6
P13	Trans Woman	N/A	White	32	VRChat; Rec Room	6
P14	Trans Woman	N/A	White	26	VRChat	18
P15	Trans Woman	N/A	White	21	VRChat; High Fidelity; AltspaceVR; Rec Room, BigScreen	24

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

4 FINDINGS

In this section, we first explain three main strategies through which our participants build and experience their diverse non-cisgender identities in social VR (RQ1). Second, we present two emergent challenges and tensions that our participants encounter because of their gender identity practices in social VR (RQ2). We also use participants' self-reported pronouns to describe their experiences.

4.1 Strategies to Present and Experience Non-Cisgender Identity in Social VR

Our participants highlight three main strategies they often use to build and experience their non-cisgender identity in social VR, namely, experimenting embodied avatars, leveraging voice chat to train and validate a gender appropriate voice, and community engagement with other non-cisgender users and supporters in an immersive way.

4.1.1 Experimenting Embodied Avatars. In general, experimenting embodied avatars in various ways constitutes a main strategy for social VR users to present and experience their non-cisgender identity in a realistic and natural manner.

"Wearing" various avatars to build an understanding of non-cisgender identity. Similar to traditional online gaming and virtual worlds, social VR users also tend to tryout various virtual avatars with differing gender identities to help them find and build a digital representation that they are comfortable with. Participants thus note that *wearing* different avatars in social VR allows them to effectively build, solidify, and understand their gender identity, especially if it is different than the gender they were assigned at birth. P1 (Genderfluid, White, 21) described their experiences in VRChat, *"I have a couple different avatars that I switch depending on how I'm feeling. Most of them looks androgynous or feminine, which*

is very useful when exploring gender identity. In the past week or so I'm using more feminine looking. Especially early on when I was kind of exploring my gender identity, it was very useful to try different avatars." P1 explained how they leveraged different avatars (e.g., androgynous and feminine avatars) in social VR to explore their non-cisgender identity. To them, experimenting various avatars is helpful to compare and eventually identify an avatar that matches their gender identity and the image of self that they desire to show others.

It is important to note that even though users may try out various avatars to find the most accurate presentation of their non-cisgender identity, they still seem to at least maintain certain similarities between their avatar appearance and physical appearance. P4 (Genderfluid, White, 21) explained, *"A lot of [my avatars] are feminine, and my body in real life is very masculine. Since I lived with my parents, I have to keep up the appearance. But in VRChat, my avatars are either feminine or very androgynous. But I still keep similar hair color and eye colors to me."* P4's non-cisgender identity seems to lead to different gender expressions online and offline: P4 physically looks very masculine in the offline world but would present as either feminine or androgynous in VRChat. Despite this difference, users like P4 still try to incorporate some of their physical characteristics such as hair and eye colors with their VR avatar. To them, maintaining certain similarities seems to allow them to feel more immersed and self-identified with their virtual body.

Participants whose gender identity often switch find wearing various avatars especially useful. P4 continued to add, *"Being genderfluid, I switch [gender identity] quite a lot. And it can be very dependent on my emotions a lot of the time. I have one masculine avatar, which I very rarely use but mostly 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, which have been great."*

As someone who identifies as genderfluid, P4's gender can change frequently. By switching between various avatars in VRChat, users like P4 are able to adequately represent their emotions and gender identity in a dynamic way – e.g., P4 would use masculine or ambiguous avatars when they feel more masculine and a female avatar when they feel more feminine. For them, this flexibility to wear different avatars and switch is essential to present and express their non-cisgender identity appropriately.

Customizing avatars to further develop non-cisgender identity through accessories and clothing. Some of our participants have already established a solid understanding of their non-cisgender identity. Therefore, they highlight careful avatar customization and crafting as a key strategy to further develop their identity presentation. These users usually have one or two avatars that they consistently use. They would then carefully incorporate various virtual assets, such as clothing and accessories, with their avatars to further improve their gender presentation. For example, P12 (Trans Woman, White, 30) mentioned how they created their avatar in AltspaceVR and VRChat, *"I'll go on Pinterest and search a fashion style that I like. And then I'll use those fashion idea to like to help pick out clothes to put on my avatar that matches the image of my gender."*

P3 (Trans Woman, White, 23) also added that people would go out their way to seek the best customization of their avatars in VRChat: *"When I first started out, I searched for an avatar that somehow aligned with how I wanted to set myself at the time. It took a lot of searching for a female avatar with pants and a proper shirt. I used her until I learned to upload my own. Eventually, I made my own base and everything from scratch. I'm definitely a lot more confident now that my avatar matches myself to a huge degree."* According to P3, piecing together appropriate assets in social VR (e.g., hair style, clothing, and accessories) to craft and customize an avatar that best presents her non-cisgender identity can be challenging – even finding a simple female avatar who wears pants and shirt is difficult. Instead, users like P3 sometimes tend to use other third party applications (e.g., Unity and Blender) to design customized avatars from scratch and upload them to social VR for use. As P8 (Non-binary, Black, 28) summarized their experiences in AltspaceVR, this approach *"was definitely empowering by making my avatar closer to what I feel like I look like. [...] It is an other you."* To these users, despite the learning curve, this approach seems to build a high degree of matching between their avatar appearance and their own gender identity.

Embodying full-body tracked avatars to experience non-cisgender identity in a realistic way. Unlike traditional social networking sites or online gaming/virtual worlds where users control their on-screen avatars through keyboard, mouse, or joystick, social VR users are able to leverage the novelty of full-body tracked avatars (i.e., the avatar body movements correspond to one's physical body movements). In this way, they are able to move as their avatar, see themselves move as their avatar, and interact with others as their avatar, such as through the gestures, hand movements, and body language. To many, this becomes a unique and nuanced strategy to express and experience their non-cisgender identity. P10 (Genderfluid, Mixed, 25) explained why they engaged in VRChat, *"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*

and help find my identity through looking in the mirror. Seeing my feminine avatar kind of exhibiting hip sway makes it feel like myself more."

For P10, as a genderfluid user, how they express and experience their non-cisgender identity in social VR is beyond just through a visual representation. According to them, one of the most powerful aspects of gender presentation in social VR is that they can *see* and *feel* how their virtual body moves in a way corresponding to the movements of their physical body (e.g., hip sway). P14 (Trans Woman, White, 26), a trans woman, thus further described this experience in VRChat as *"I feel uncomfortable in a body that I don't have as much control. It's like a different art style from my own, but it's because it's a body that I don't want, I don't really feel comfortable."* For many of these non-cisgender users, embodying a social VR avatar may be the first time when they can vividly feel a different *body*, which may provide them with comfort, affirmation, and validation of their gender identity.

Others also note the importance of embodiment in social VR to empower their gender exploration journey. P13 (Trans Woman, White, 32) shared their experience in VRChat and Rec Room, *"For me personally, it's incredibly validating. I actually really like to move around a lot and like seeing myself in that body. The body that's in VR mimics every movement that you're making that your brain is telling you wow, that's really me."* As P13 describes, embodying a full-body tracked avatar in social VR is such an immersive and realistic experience – they not only *see* that avatar but *move within that avatar*. For them, the fact that their VR body *"mimics every movement"* they make both helps them further self-identify with that virtual body and validates their understanding of their gender identity even more.

Therefore, many participants comment on how such embodied experience "free" them from potential social stigma regarding presenting non-cisgender in the offline world. For example, P6 (Non-binary, White, 20) said, *"Some people are held back mentally by what they present as, and it can be draining and exhausting to be in a body that's not how you feel. So having an avenue to free yourself of those restrictions could definitely boost people's motivation and energy levels. It's incredible to find people that move towards an agenda that they support. Basically, just being yourself can let you do what you want to do."* In this sense, embodiment in social VR appears to empower non-cisgender users in several ways: they are able to freely present gender identity in an immersive way without offline restrictions; they are motivated to seek their own agenda after this embodied experience (e.g., seek transition procedures in the offline world), and they achieve a high level of self-understanding through this process (*"just being yourself can let you do what you want to do"*).

4.1.2 Leveraging Voice Chat to Train and Validate A Gender Appropriate Voice. In addition to experimenting embodied avatars in various ways, our participants also leverage voice chat, a predominant way to communicate in social VR, to train and validate their gender appropriate voices. This is an important exercise for them as they are able to practice presenting themselves with a modified voice that matches their non-cisgender identity. P2 (Non-binary, White, 20) described their experiences in VRChat and Rec Room, *"When I was going through gender experimentation, I would just go*

into different sex avatars. I would turn my mic on and go to different worlds to interact with people by trying out different voices. I think it was important in my journey of being perceived only by those physical traits such as voice." According to P2, presenting and experiencing non-cisgender in social VR goes beyond designing and embodying an avatar. Rather, voice has become another key physical trait to present their gender online. It is crucial for non-cisgender users to try out different voices, identify a voice that best matches their understanding of their own gender identity, and then be perceived by others through this voice. For many, how to find the right voice is central to their gender exploration journey.

Some social VR platforms even offer specific features to facilitate these users' effort to train and validate their gender appropriate voice. For example, P15 (Trans Woman, White, 21) added their experience in Rec Room, "On rec room, you can choose to set your voice to be a couple of octaves lower or higher. I obviously set mine higher cause I'm trying to create this feminine front." P15, a trans woman, was assigned male at birth. Biologically, they have a deeper voice that does not match the feminine identity that they identify and endeavor to present in social VR. For them, only embodying and experiencing a feminine avatar is insufficient for presenting their gender identity. Similar to P2, P15 felt that the opportunity and ability to carefully craft and tune a modulated feminine voice across various social VR platforms was important to appropriately and accurately present their gender online and could shape how others perceived their gender.

Therefore, many participants agree that a continued voice training is necessary for them to feel more comfortable with a voice and thus better match such a voice with their non-cisgender identity. However, though they are aware that they are able to use social VR as a tool to train their voice, they point out several barriers to actually modify their voice. One of the main reasons is that some users still try to conceal their non-cisgender identity from family members. For example, when talking about VRChat, P4 (Genderfluid, White, 21) suggested, "When I'm completely alone at home, I change the way that I speak in social VR. But most of the time, like now when my family is at home, I speak like I normally do because I don't want them to hear me and find out." Another reason is that users often find the need and pressure to simply match their voice to others' perceptions, as P1 (Genderfluid, White, 21) said when talking about Rec Room and VRChat: "Sometimes I tend to use a deeper voice if I feel like the person has perceived me as a cisgender male." In P1's case, as a genderfluid user, they felt the need to cater to others' existing perception of their gender (e.g., switching to a more masculine voice), no matter they agreed with it or not.

4.1.3 Community Engagement with Other Non-cisgender Users and Supporters in An Immersive Way. One of the main attractions of social VR is how people can socialize with other users in a way that is similar to face to face interactions but transcends the geographical limitations. Therefore, our participants consider such community engagement with other non-cisgender users and supporters in an immersive manner a key strategy to collectively present, experience, and affirm their non-cisgender identity online. Being in social VR together also seems to provide them with a window to experience and test how their non-cisgender identity might be perceived and treated in the offline world. Our participants especially

highlight two important aspects of community engagement for presenting and expressing their non-cisgender identity in social VR: exchanging community-based social support, and participating in non-cisgender focused immersive virtual events.

Exchanging community-based social support for marginalized identity. Many participants note that they are able to naturally build and be part of a supportive community in social VR, due to the immersive and embodied interaction features. This thus helps them build allies, find courage, and further validate and affirm their non-cisgender identity. P2 (Non-binary, White, 20) shared, "Usually with a group of friends we'll just load up a private world and just hang out and talk until like we get bored or then sometimes, we go to different avatar worlds trying different avatars, kind of just messed around. This helps me go through those difficult, self-doubting moments." P2, a non-binary user, highly appreciated two forms of social support from their friends in VRChat and Rec Room who helped them go through the gender exploration journey: (1) socializing in private worlds provided them with more intimate and safe spaces to have conversations, learn about each other, and conduct activities without the risk of having potential harassers or people whom they felt uncomfortable with in the same space; (2) going through different avatar worlds together where they and their friends could collectively design and craft an avatar that best represent P2's identity. In P2's opinion, these supportive interactions and experiences encourage them to be more confident about their identity ("go through those difficult, self-doubting moments").

Other participants also comment that they engage in creating safe, comfortable, and welcoming virtual places in social VR for non-cisgender users and supporters. In these spaces, people 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. P4 (Genderfluid, White, 21) shared, "I appreciate the fact that I can be with people I genuinely like in a form that I'm happy with. Being genderfluid means that it's sort of hard for me to present myself because I switch a lot. So, VRChat definitely helps with me dealing with my dysphoria."

This participant recalled how being in a non-judgemental community in VRChat made them feel safe and comfortable to "come out" or become less stressful about how they should approach their gender online (e.g., having agency to change their avatar to match the gender they feel at the moment). Sometimes, such support may even naturally extend beyond social VR. For example, P3 (Trans woman, White, 23) described the friendship she built with others who support non-cisgender users in VRChat as similar to a long-distance relationship. For her, the process of moving from VR to offline "relatively seamless" because she got to know so much about others through body language and all other rich information conveyed in social VR.

Participating in Non-Cisgender Focused Immersive Virtual Events. Various social VR platforms offer regular queer- or non-cisgender focused events and meet ups that are open to anyone wherever they are located. These events are especially helpful for non-cisgender users who want to interact with other users who identify similarly as them in a way that simulates face-to-face interaction. In doing so, they are able to share and learn from others' journeys of building and experiencing non-cisgender identity both in social VR and in the offline world. Several participants explained,

"It's nice to know that there are recurring LGBTQ meetup [in Rec Room and VRChat]. 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. It made me learn more about myself." (P1, Genderfluid, White, 21)

"The fact that there are specific rooms [in VRChat and Roblox] just for LGBTQ people is a great way to get advice from other LGBTQ people. Those advice are really valuable to me as in real life it's hard to find other LGBTQ people." (P7, Trans Man, White, 19)

P1, a genderfluid queer user, and P7, a trans man, highlight that they live in an area where non-cisgender identity is not particularly welcomed or acknowledged. For them, without anyone in the physical vicinity who may share similar gender identities with them puts them at a disadvantage when it comes to learning and understanding their gender identity. Instead, engaging in these non-cisgender focused social VR events provides them with valuable opportunities to go beyond their geographic limitations – they are able to find and socialize with other non-cisgender individuals and allies from all over the world in an immersive and embodied way.

Such events are also particularly helpful for users who are still experimenting their identity. P15 (Trans Woman, White, 21) shared, *"I am physically male, and I'm married. But I kind of self-identify trans. So, it's a big gray area that people are all over the place. But I definitely enjoy inhabiting female space and meeting other people with me in a feminine avatar. And that was another huge appeal of VR to me. There are a lot of programs out there that allow you to gain an experience being another gender and allowing you to meet other non-cisgender people."* P15 self-identifies as a trans woman. However, as someone who was assigned male at birth and in a heterosexual marriage, it was difficult for them to explore this identity in the offline world. This also seemed to make them confused and uncertain about their identity (e.g., "a big gray area"). Attending events with other non-cisgender users on various social VR platforms, therefore, provided them with an alternative to experiment their feminine identity. This not only helped them clarify confusions but also built a necessary social network for further affirming such an identity.

4.2 Emergent Challenges & Tensions for Presenting and Experiencing Non-Cisgender in Social VR

Despite employing several nuanced strategies to present and experience their non-cisgender in social VR, our participants also express concerns about emergent challenges and tensions for their identity practices, including the prevalence of physicalized anti non-cisgender rhetoric in cisnormative public spaces and the common behaviors of misgendering.

4.2.1 Physicalized Anti Non-Cisgender Rhetoric in Cisnormative Public Spaces. In our study, many participants highlight that social VR is still largely a cisnormative space that normalizes cisgendering but is less supportive of individuals who do not identify with the sex they were assigned at birth [29, 90]. For them, this cisnormativity leads to the prevalence of prejudice language and behaviors towards non-cisgender users in social VR. This prejudice is described by transgender users such as P11 (Trans Woman, White, 15) as being *transphobic*, which may happen in forms of slurs, trolling, and

other social VR specific harassing behaviors triggered by how they present and express their gender. According to P6 (Non-binary, White, 20), identity specific slurs are also commonly used to attack users of other non-cisgender identities once they are identified in VRChat: *"some people really like using the F slur when they learn that you're not cisgender."*

In some cases, such hostile rhetoric even escalates to physical forms of harassment towards non-cisgender users through the embodied interaction features in social VR. P15 (Trans Woman, White, 21) shared an example in Rec Room: *"There's a lot of the trolling stuff that I just mentioned, like when me and my buddy were in rec room together and people would come in and then they just walk up to you and they use a bunch of foul language, like, hey, I'm gonna cut you or something. And then they pretend to cut you up."* As P15 describes, while embodied interaction in social VR provides richer and more natural social experiences, it can also physicalize anti non-cisgender rhetoric. This thus leads to physical attacks and harassment (e.g., cut up) toward non-cisgender users and makes it an extremely damaging and disturbing experience.

This physicalized anti non-cisgender rhetoric also seems to happen often in public social VR spaces. P12 (Trans Woman, White, 30) explained their experiences in both AltspaceVR and VRChat, *"I've had somebody who literally just followed me around and being really negative and like using homophobic slurs. They followed me like a couple of places just to continue to use their derogatory language at me."* According to P12, the inherent openness of social VR seems to lead to a higher risk of non-cisgender rhetoric in public spaces. In most social VR platforms, users can travel to different parts of the virtual space, most often in forms of different rooms (both public lobbies and private rooms), virtual places, and platform related events (e.g., games, concerts, and theatres). However, this also means that non-cisgender users cannot stop certain people from following them to different public spaces if they encounter potential harassment or anti non-cisgender rhetoric. Therefore, participants like P8 (Non-binary, Black, 28) questioned how much social VR platforms such as AltspaceVR can support non-cisgender users: *"I feel it's comfortable because of the communities there. But I don't feel that I am more affirmed because there are a lot of folks that that I don't necessarily identify with. [...] There should be more open gay LGBTQ spaces and more black spaces."*

Our participants also actively reflect upon why such a physicalized anti non-cisgender rhetoric exists in social VR. P2 (Non-binary, White, 20) considered the disrespect of others' gender choices as a potential reason: *"if it's someone I'm talking to and they continuing to use a pronoun I don't like, I will try to explain that 'They' are the pronoun that I go by. I think some people just disrespect others' gender choices, like those people making loud and blatant call outs. It's just disrespect."* P8 (Non-binary, Black, 28) added that the visibility and presence of the non-cisgender users, especially the ethnic minority non-cisgender users, was still very limited in social VR due to financial concerns: *"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."* Therefore, their absence may lead to the lack of knowledge and experience in diverse types of gender representations as another reason. P9 (Genderfluid, White, 24) described, *"I found that younger people, such as*

those in their early teens, may not really know or not fully grasp the concept of how complicated gender can be. Like one time I was playing *Cards Against Humanity* with a group and someone called me a 'she.' I blatantly corrected them. And they basically made fun of me for using they/them pronouns." Most social VR platforms are open to any users age 13 and older. As social VR become increasingly appealing to younger users, in P9's opinion, this growing popularity also leads to new challenges for non-cisgender users: some younger users' lack of understanding and exposure to different forms of gender identity may incite harassment and further fuel the already existing anti non-cisgender rhetoric.

4.2.2 The Common Behaviors of Misgendering. The challenge of misgendering is a common theme in our interviews with participants. More than half of our participants comment on the normality of being misgendered or stereotyped in social VR. For them, an underlying assumption most people have about social VR seems to be: it is still perceived as a male (especially white male) dominated space, which introduces significant barriers and social stigma for non-cisgender users to appropriately present themselves and to have a voice. P5 (Trans Woman, NH/PI, 15) described this assumption in VRChat as *"the social norm for most people is that 'everyone is a guy until proven otherwise'."*

Several participants highlight that misgendering often happens in social VR due to the mismatch between their voice and others' expectations of their gender based on their voice. For example, P14 (Trans Woman, White, 26) commented on their experience in VRChat, *"When I've worn a character with the dress, I get harassed because people are like, Hey, you got a man's voice but you're in a dress. What's up with that? What are you doing?"* For P14, while they consider voice a powerful way to appropriately present how they understand their gender, the predominant use of voice in social VR may also create extra difficulties for others to correctly perceive their gender, especially when their voice and the expectations for the perceived gender do not match. This can be seen as a burden along with the specific expectations that come with their identity.

Other participants also reveal that the social pressure for traditional gender roles that they must content with adds to the complexity of misgendering. P9 (Genderfluid, White, 25), a genderfluid user, expressed such pressure in AltspaceVR and VRchat, *"I still sometimes feel that I'm expected to act feminine. Because that is my biological sex. Like how a lot of people want to try to put people into a box. They say oh you're a female, then you should be feminine; you're a male, then you should be masculine, If non binary, you should be androgynous. But I don't always want to appear as androgynous. I don't fit into any of those boxes; because even though I do prefer to keep my avatar looking androgynous, I still want to have the option to change it as many times as I want."* For P9, one of the benefits of identity practices in social VR is the ability to present their identity in which ever manner they choose. However, this is also one of the drawbacks – the complex expectations for gender that is often placed on non-cisgender individuals. In social VR, how non-cisgender users like P9 choose to present themselves as well as how they interact with others based on such gender presentation can be a fluid process, which may sometimes cause unique unwanted tensions between their identity practices and the expectations for traditional gender roles.

Sometimes, such tensions can even arise from the offline world. P5 (Trans Woman, NH/PI, 15) shared an example, *"I need to make sure my voice passes consistently because how it can strain my vocal cords sometimes. I also need to make sure my dad doesn't hear me using my 'girl' voice."* For non-cisgender users like P5, the challenge to navigate their identity practices in social VR does not only lies in addressing traditional social expectations for gender roles in social VR but also involves struggles to simultaneously balance their gender presentation across these two different worlds – both VR and offline.

5 DISCUSSION

To answer our research questions, our findings have shown the following highlights. First, when building and experiencing their diverse non-cisgender identities online, people tend to employ several strategies that are unique to social VR, including experimenting various embodied avatars that are controlled by their physical movements and highly customizable through accessories and clothing, leveraging voice chat to train and practice their voice to match their gender presentation, and finding community support by participating in various immersive non-cisgender-focused virtual events (RQ1).

Second, though there is a growing number of non-cisgender social VR users, these historically ignored populations continue to experience emergent challenges and tensions in social VR when presenting and expressing their gender identity. In particular, pervasive anti non-cisgender rhetoric in social VR becomes more physicalized and disturbing due to the embodiment and immersiveness of the platform. Additionally, the mismatch between their voice and others' expectations of their gender based on their voice, as well as the social pressure for traditional gender roles both in VR and offline, often lead to their struggles of being misgendered or stereotyped in social VR (RQ2).

In this section, we further discuss the implications of these findings for re-considering and re-conceptualizing gender presentation practices in novel online social spaces, especially with regard to how the *physical body* is re-introduced and re-discovered in the social VR discourse. We also explain how our findings may inform a new research agenda on designing the emerging *metaverse* for diverse gender identities in the future – a collective, persistent, and shared 3D virtual shared space including the sum of virtual worlds, augmented reality, and the Internet that many social VR and HCI researchers, designers, and practitioners are pursuing [33].

5.1 Re-discovering the Physical Body for Gender Presentation Online

Similar to how non-cisgender users may leverage traditional online spaces such as social networking sites and online gaming/virtual worlds to creatively uncover and experience their identity online [2, 12, 16, 42–44, 76, 79], our findings also highlight some paralleling aspects of their identity practices in social VR, including engaging in immersive interactions and exploring embodied avatar creation and customization. However, one of the most significant and unique insights from our study is the role of (re)discovering the *physical body* in presenting and experiencing non-cisgender users' diverse gender identities online. This is especially important since

the concept of gender is closely related to one's physical body (e.g., biological sex assigned at birth) and to what degree one conforms to such a body.

The role of the physical body in the traditional online identity discourse vs. in social VR. In conventional online social spaces such as social networking sites, the physical body is often absent when it comes to construct and present one's online identity – their online presentation is often mainly text or visual (e.g., video and image) based. On the one hand, this absence leads to various issues regarding technology-supported identity practices, such as the authenticity of digital identities [65] and the multiplicity in self-presentation online [26, 31]. On the other hand, this absence also allows users, especially marginalized users such as those who identify as non-cisgender, to be anonymous to a certain degree, which diminishes the potential online and/or offline discrimination targeting their gender identity. Even in those more avatar-oriented spaces such as online gaming and virtual worlds, the presentation and experience of one's online identity is mainly based on the constructed *virtual body* rather than the *physical body* [27, 54]. In this context, one's virtual body refers to a digital representation of self that a user designs, creates, or chooses based on their offline identity, including personality, appearance, gender, and sexual identity through the affordance that a specific platform provides. However, it is still just a symbolic representation or a signifier of the *physical body* rather than the *physical body per se* [52].

In contrast, as our findings show, one's physical body is introduced, discovered, and even (re)discovered in social VR: social VR users have much higher control over their avatars 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, suggests a unique dynamic for non-cisgender user to construct and express their diverse gender identities in social VR – their gendered experiences are not *mediated* by their virtual body or physical body but directly *through* their physical body (e.g., gestures, hand/finger movements, and body language). Furthermore, another way to directly experiencing gender through their physical body is to leverage their voice as an additional physical dimension if they endeavor to appropriately represent their gender identity to others. Certainly, cisgender social VR users may enjoy this novel relationship between their avatar and their physical body as well [6, 7, 37, 38]. Yet, non-cisgender users in our study especially emphasize how this dynamic is uniquely action-oriented and built upon a more substantial body ownership: rather than merely depending on how they look (e.g., avatar appearance and profile picture) and/or write (e.g., usernames, textual communication, and posts), non-cisgender users can explore, experiment, and express their diverse gender identities in a more natural, intimate, and direct way in the process of discovering and rediscovering their *physical body* through engaging in social VR.

The physical body as an empowerment for gender presentation online. As the physical body is directly implemented in social VR and becomes an immediate interface for both avatar-user connections and user-user interactions, a critical question thus becomes: how does this (re)discovery of the physical body online affect the presentation and experience of diverse gender identities?

As we have mentioned at the beginning of this paper, how people perceive, understand, and approach their physical body could significantly affect how they construct and express their gender identity. Similar to the cisgender population that has been studied in previous social VR research [6, 7, 37, 38], our non-cisgender participants appreciate the embodied aspect of social VR. Yet, for them, this new physical body-virtual body dynamic also seems to go beyond just a VR feature and becomes an *empowerment* for exploring more equal gender presentations online. In our study, a non-cisgender individual's avatar body is seamlessly and uniquely intertwined with their physical body when engaging in social VR. As we have shown, many of our participants report how they feel more powerful, engaged, or confident by experiencing and experimenting this direct correspondence between their physical body and virtual body in various ways. For example, for trans users, this unique connection may encourage them to face their marginalization and pursue changes in the offline world. For genderfluid users, this dynamic can significantly fulfill their needs to present and experience their gender in a flexible and dynamic process. For non-binary users, this feature also seems to help them build a better matching between their avatar body/appearance and their own gender identity. In this sense, compared to traditional online social spaces where the physical body is absent [18, 22, 64], (re)discovering their physical body online supports non-cisgender users' unique considerations and exploration of diverse gender identities in more nuanced and powerful ways.

The physical body as a double-edged sword in public online social spaces. While highlighting the potential empowerment of (re)discovering the physical for gender presentation online, we also want to provide a more critical view, as the physical body can serve as a double-edged sword and make non-cisgender individuals subject to unwanted tensions and challenges in their identity practices especially in public online social spaces. Most social VR platforms (e.g., RecRoom, VRchat, and AltspaceVR) provide users with both public and private social spaces. Private spaces are most commonly represented as intimately designed rooms where users can have privacy and control over who enters their space, whereas public spaces can be described as open social hubs where any user can enter and interact with one another. In our study, our participants highly appreciate their unique experiences of naturally and immersively constructing and experiencing their diverse gender identities through fully embodied avatars and voice chat. They also appreciate how they can freely express their gender identities to others due to the open and interactive nature of social VR. Nevertheless, these strengths also make them easy targets for anti non-cisgender rhetoric in public spaces when they may be identified, tracked, and followed by anyone. Though harassment towards these populations in virtual worlds or online gaming is not new [25, 28, 68, 80], our findings show that the same strengths that support non-cisgender users' nuanced identity practices through their physical body may also lead to more complicated and severe forms of physicalized anti non-cisgender rhetoric towards them in open and public spaces. This may put such users at greater risk of being physically harassed. Similarly, the prevalent use of voice chat in social VR helps non-cisgender users interact with others and present their gender identity in a more comprehensive way (e.g., practicing a gender-appropriate voice). However, it also creates

unexpected challenges that they have to face. In social VR, voice is typically used as a main method to verify one's perceived gender identity. The mismatch between voice and the gender/appearance of their avatar could trigger unpleasant behaviors and experiences of misgendering.

These conflicting phenomena and tensions, therefore, call for more research on understanding the multidimensional role of social VR in non-cisgender users' identity practices online and how they may reconsider and approach a new body-avatar relationship where the physical body plays an essential role even in an online/virtual environment. These insights also point to the urgent need to design future online social spaces to better support diverse gender identities, which we will discuss in the next section.

5.2 A New Horizon: Designing the Emerging Metaverse for Diverse Gender Identities

The findings from our work demonstrate both the nuanced opportunities and challenges of presenting and exploring gender identities that are often considered *marginalized* or *historically ignored* (e.g., people who do not identify as cisgender) in online social spaces. These insights may directly inform a growing research agenda on designing and innovating future socio-technological systems for a society where we are not bound by our identity at birth (e.g., gender, sexuality, and race), such as the emerging *metaverse* where various virtual worlds, augmented reality, and the Internet are all seamlessly intertwined [33].

First, our findings highlight the importance of re-considering avatar design in future metaverse to better serve users with diverse gender identities. As mentioned above, similar to prior social VR scholarship, our work also reveals the benefits of exploring one's identity through embodied avatars [6, 7, 37, 38]. Yet, our study further points to the key differences between how cisgender and non-cisgender users experience such avatars. For cisgender users, their avatar-mediated experiences tend to focus on cross-gender play for fun as in traditional gaming [36, 46, 91]. In contrast, for non-cisgender users, their avatar become a direct and intimate interface for experimenting and affirming their understanding of their own identity through the seamless integration of the physical body and the virtual body. Such experimentation is crucial for their gender exploration journey and helps them try out how people may perceive them in the offline world in a realistic way. As we have discussed in the last section, this aspect of embodied avatar can often serve as a double edged sword for non-cisgender users: it is beneficial to provide immersive exploration; yet it can also trigger unwanted attention, stereotypes, and physical harassment [17].

How can the future metaverse systems be designed in a way to highlight the benefits of identity exploration while mitigating the risk of physical attacks through embodied avatars? A potential solution may focus on the combination of both neopronouns and androgynous avatars in such spaces. Prior research have shown that non-cisgender individuals tend to consider binary pronouns or they/them as inappropriate identity labels and thus prefer other options for neopronouns [5]. As we have shown in section 4.2.1, our participants such as P2 and P9 also state that traditional pronouns, especially the pronoun "they," may trigger hate speech and physical attacks because people may not respect others' gender choices. This

thus motivates them to use singular third person pronouns such as *ze*, *ae*, and *co*. In addition, our participants highlight the benefits of androgynous avatars. Such avatars allow them to have the option to tune their identity towards masculine, feminine, between masculine and feminine, or neither masculine or feminine, which can cover a broad spectrum of gender identities visually. As online social systems continue to grow to be more diverse and inclusive, introducing the combination of both neopronouns and androgynous avatar designs may further help diverse users' identify practices while fostering the evolving concept of identity.

Second, our findings point to the urgent need to re-evaluate the boundary between the online and offline worlds regarding identity presentation when designing future metaverse. One insight from our findings lies in the much closer and more intimate relationship between one's physical body and virtual body in social VR, as we discussed in the last section. While people often claim that they could present their identity online in whichever manner they choose, the *perceived freedom* to present and express one's identity in social VR in fact is much more restrained, as one's online identity is always linked to one's physical identity. In this sense, users may be "*separate[d]* from one's life" [41] yet in someways still tied to the offline world. How would this fading boundary between online and offline shift our concerns about privacy and data concerns (e.g., sharing personal information) regarding online anonymity? And how would such an intertwining relationships between online and offline redefine one's responsibilities and accountability in the future metaverse?

Third, we also emphasize the necessity to establish and educate new social norms and expectations emerging from the affordance of diverse gender identities in future metaverse. To achieve a diverse, dynamic, and inclusive social atmosphere, it seems to be crucial to both support the delicacies of diverse gender identities and build necessary mechanisms to inform and educate users who are either unfamiliar with or uninformed about appropriate social norms associated with perceiving, understanding, and interacting with such identities, especially on a global scale. As the concept of *metaverse* is still evolving and has the potential to innovate how people communicate and socialize through technology in the near future, the role of diverse identities, including gender identities, in the current social VR systems may unlock and introduce various complex issues that our society is not appropriately equipped to handle. While we envision that future metaverse may involve users, agencies, and organizational bodies from various cultures, regions, and backgrounds, the question becomes: who should set up such norms, policies, and rules regarding building, presenting, and respecting diverse identities? In this sense, collaboratively establishing a coalition of governing bodies, organizations, and activist groups on a global scale, seems to be essential for defining strategic policies and initiatives of the metaverse, especially regarding how diverse identities should be expressed and approached in a safer and healthier way.

5.3 Limitations

This study has three main limitations. First, though 59 participants were interviewed for the broader study, the sample for this study,

which focuses on social VR users who do not self identify as cisgender, is relatively small ($N=15$). Though this is understandable considering how unique this studied population (i.e., non-cisgender social VR users) is and the typical interview sample size for CHI (i.e., 12) [21], we will attempt to recruit a larger sample to capture the full spectrum of non-cisgender users' identity practices in social VR for our future research. Second, despite our effort to recruit diverse participants, our sample is white dominated with only three ethnic minority participants. In future work, we will also endeavor to recruit a more racially and culturally diverse sample to explore how marginalized identities are presented and experienced in social VR. Lastly, our research team lacks gender diversity as stated in our positionality statement. However, all authors identify as part of various marginalized communities in computing based on gender, race, or sexual orientation, which helps us understand interpret non-cisgender social VR users' experiences.

6 CONCLUSION

As social VR spaces continue to rise in popularity for various social interactions and experiences during and beyond the global pandemic, they play an increasingly important role in marginalized or historically ignored individuals' (e.g., people who do not identify as cisgender) identity practices online. In these novel spaces, such individuals are able to re-invent and re-discover their diverse gender identities in a way that goes beyond what traditional online social spaces can offer due to the more immersive 3D virtual content and full-body tracked avatars. To further explore these users' nuanced experience and strategies for constructing, exploring, and experiencing their non-cisgender identities in social VR, we have identified three main strategies non-cisgender users use to present and experience their identity. We have also highlighted that their identity practices in social VR may lead to the additional burden of physicalized anti non-cisgender rhetoric and common instances of misgendering online. We hope that our findings shed light on the importance of a new body-avatar dynamic in technology-supported identity practices and the complicated role of social VR in exploring and presenting diverse non-cisgender identities online. We also hope that these insights can guide future efforts to design safer and more supportive online social spaces, such as the emergent metaverse, for more nuanced and inclusive identity expressions.

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