



"Creepy Towards My Avatar Body, Creepy Towards My Body": How Women Experience and Manage Harassment Risks in Social Virtual Reality

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Online harassment against women - particularly in gaming and virtual worlds contexts - remains a salient and pervasive issue, and arguably reflects the systems of offline structural oppression to control women's bodies and rights in today's world. Harassment in social Virtual Reality (VR) is also a growing new frontier of research in HCI and CSCW, particularly focusing on marginalized users such as women. Based on interviews with 31 women users of social VR, our findings present women's experiences of harassment risks in social VR as compared to harassment targeting women in pre-existing, on-screen online gaming and virtual worlds, along with strategies women employ to manage harassment in social VR with varying degrees of success. This study contributes to the growing body of literature on harassment in social VR by highlighting how women's marginalization online and offline impact their perceptions of and strategies to mitigate harassment in this unique space. It also provides a critical reflection on women's mitigation strategies and proposes important implications to rethink social VR design to better prevent harassment against women and other marginalized communities in the future metaverse.

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

Additional Key Words and Phrases: women, online harassment, social VR

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1 INTRODUCTION

On social Virtual Reality (VR) platforms, such as Meta's recently launched Metaverse paradigm [48], multiple users can interact with one another through VR head-mounted displays and immersive 360 degree virtual content in 3D virtual spaces [46]. As such, social VR has often been praised for providing enhanced embodied and immersive social experiences via an amalgamation of features that traditional on-screen gaming and virtual worlds either do not offer or only offer in reduced

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capacity, including: full-body tracked avatars (i.e., one's avatar body actions correspond to one's physical body actions in real time); predominate voice communication; body language and gestures; and simulated immersive activities [24, 46, 67] (See Figure 1 and 2).

Alongside this praise exists a growing concern regarding how social VR, a still largely cisnormative and male-dominated social space [6, 25, 27], may reinforce and amplify harassment risks seen in other comparable online contexts such as gaming and virtual worlds. These harassing behaviors may especially target marginalized users such as women and particularly women of color [32–34], which have been frequently documented in mass media and technology reports, such as trash talking women, drawing penises, virtual "groping," and the most recent "rape" in the metaverse [53, 54, 65, 66]. Indeed, harassment against women in gaming and virtual worlds has existed for decades, with documented incidents going as far back as the early 1990's [18]. Yet, the aforementioned reports have shown how social VR seems to create immersive, embodied social experiences for its users that surpasses the capabilities of other pre-existing, more conventional online games, such as Massive Multiplayer Online Games (MMOs), and earlier iterations of virtual worlds, such as the text-based LambdaMOO and on-screen avatar-based Second Life. Thus, the need to understand, mitigate, and prevent the harassment risks emerging from this next generation of immersive online social experience is vital to make strides towards creating a safer metaverse, and is particularly so when contextualized within its marginalized users' (e.g., women's) experiences [52, 57].

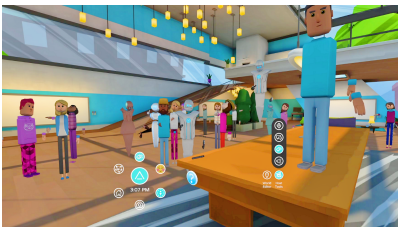


Fig. 1. AltspaceVR (www.altvr.com)



Fig. 2. VRChat (www.vrchat.com)

Following this call, an emerging research agenda in HCI, CSCW, and social VR research has focused on investigating and mitigating harassment in social VR (e.g., [6, 7, 27, 62]). Some of these works have called attention to the idea that individuals who are already marginalized in tech spaces (e.g., women, LGBTQ, and ethnic minorities) may face additional harassment risks in social VR compared to the majority culture (i.e., white, cisnormative, male-dominated) [6, 7, 27, 53, 54, 62]. Collectively, these works lay the groundwork for our work to sharpen the focus of such research to specifically amplify the voices, experiences, and mitigation strategies of marginalized users when dealing with harassment risks in social VR, in our case women.

Therefore, in this paper, we are motivated to conduct an in-depth investigation of women's experiences of emergent harassment risks in social VR in comparison to harassment targeting women in pre-existing online gaming and virtual worlds contexts, as well as women's strategies to manage such harassment. In doing so, we draw inspiration from Lisa Nakamura's [52] 2020 work on identity tourism in VR by understanding the comparison between social VR and pre-existing online gaming and virtual worlds to be one in which the nature of VR does not create *new* problems, but rather *modifies and amplifies* already existing problems. Based on 31 interviews with women who use various social VR platforms, we focus on the following research questions:

RQ1: How do women experience harassment risks in social VR as compared to harassment targeting women in pre-existing online gaming and virtual worlds?

RQ2: What are women's strategies to manage these harassment risks in social VR, and what are the limitations of their strategies?

We are well aware that harassment is a culturally sensitive construct, meaning that harassment can be defined and experienced in various ways across different cultures [74]. As most of our participants are located in the U.S.A., we acknowledge that our investigation of harassment against women in social VR may mainly reflect women's perspectives of harassment in the U.S. culture.

Nevertheless, we make three contributions to CSCW and HCI research on online harassment and social VR. First, we contribute towards the growing body of literature on harassment in social VR (e.g., [6, 7, 27, 61]) by providing an in-depth empirical investigation that specifically focuses on how women experience and deal with harassment in social VR in comparison to harassment in pre-existing online gaming and virtual worlds. This further confirms and expands insights of women social VR users' urgent challenges with harassment as described in mass media and technology reports [53, 54, 65, 66] and calls for more research attention to understand harassment against women in social VR as fundamentally a social problem, as these emerging harassment risks (1) blur the boundary between online and offline harassment in enhanced ways, and (2) further reflect the offline structural oppression to control women's bodies and rights that women are still facing globally today. Second, we provide a critical reflection on how the strategies women use to manage harassment both empower women and further reinforce women's marginalization in social VR at times. In doing so, we shed light on the ways in which embodied identity, visibility, and offline world marginalization converge in social VR to further re-entrench marginalization and harassment harms, especially for women. Third, all of these insights inspire us to propose two important implications to rethink social VR design to better protect women and other marginalized communities in the future metaverse.

2 RELATED WORK

2.1 Online Harassment, Women, and Gaming & Virtual Worlds

Harassment against women in online spaces has a regrettably long history. Indeed, Dibble's "A Rape In Cyberspace" already detailed the horrific sexual assault of several women in one of the world's first iterations of a virtual world (LambdaMOO) as early as in 1993 [18]. Unfortunately, harassment of women in online spaces still remains a salient and pervasive issue in today's world, and is undoubtedly reflective of the systems of offline structural oppression that seek to control women's bodies and rights that plague societies globally today [5] (e.g., the recent Supreme Court decision on abortion rights in the U.S.A. [70] and the death of a young woman in police custody due to "breaking hijab rules" in Iran [13]). In fact, although both men and women can be harassed online, women are twice as likely as men in the United States to say that their most recent incident of harassment was very or extremely upsetting, and harassment behaviors targeting women such as physical threats and stalking are on the rise [73]. A considerable number of prior studies, then, have explored the harassment risks women, particularly women of color, face in various online spaces such as online gaming and virtual worlds, and their strategies to cope with said harassment.

Harassment of Women Online and in Gaming & Virtual Worlds. Despite plentiful research demonstrating that women are equally avid and passionate players of online games as men [56, 61], women are consistently viewed as "not real gamers" and are significantly marginalized in the community [55], especially amongst more competitive environments such as esports [26, 41, 42]. Research points to several variables that drive this toxic culture towards women in general in gaming, including: sexualization of women in video games blurring the boundaries between symbolic harm and real harm against women [34] and increasing men players' benevolent and hostile sexism towards women [8, 19]; the normalization of non-gendered toxic behavior [4]; and individual

differences within men who harass, such as social dominance, hostile sexism, and gamer identity [68, 69]. As a result, harassment toward women in gaming often comes in the form of sexualized comments and slurs, comments about women's lack in skills, and division of value between men and women games, avatars and characters [61]. These forms of harassment even extend into live streaming, an interactive media that offers public broadcast of high fidelity live audio and video through the Internet. Indeed, live streaming has been considered an essential component of the modern gaming culture [26, 35, 63, 71]. However, women who live stream cannot as readily hide their gender to avoid escalating violence (e.g. mask identity via username and/or avatar) [71], making it even more difficult for them to deal with potential harassment in gaming.

These varying forms of harassment have been shown to have detrimental effects on women's sense of self-efficacy and self-objectification [19], as well as their sensitivity to gendered judgement, internalization of stereotypes, loss of confidence, and loss of interest in participating in gaming and the industry [61]. In particular, women with multiple marginalized identity factors (e.g., women of color and lesbian women) face even more types of harassment that often combine the vitriol aimed towards women with the racism and homophobia often seen in gaming culture to create multi-layered harms, as both their gender and racial identities are seen as non-conforming to the white male-dominated, hegemonic culture of gaming [30, 32, 33, 51]. This multi-layer harm has additionally been seen in pre-existing text-based and avatar-based virtual worlds. For example, Lisa Nakamura pointed out how the act of temporarily embodying the identity of a marginalized person in LambdaMOO (i.e., a text-based, command-driven virtual world), termed "identity tourism," was pervasive and especially repressive when that identity exists at the axis of multiple points of marginalization (e.g., performances of Asian woman in LambdaMOO), which reinforced links between Orientalist stereotyping, virtual sex, and performance [50].

Taken together, online gaming and virtual worlds fundamentally immerse users in a social landscape that is mutually constructed with other users. This immersion thus blurs the lines between one's virtual self and one's offline self when it comes to harassment. For example, the 1993 "A Rape In Cyberspace" assault mentioned above was still felt by the victims to be emotionally damaging despite occurring in an entirely text-based and comparatively primitive environment by today's standards [18]. Beyond these early iterations of text-based virtual worlds, prior work has also linked the implicit and explicit harms of embodying one's own gender in visual, avatar-based virtual worlds, such as Second Life and Guild Wars [57], where 1) the virtual worlds are more visually immersive than text-based worlds via 3D virtual environments; and 2) one's virtual representation (i.e., avatar) is more visually tangible by the self and others.

Existing Strategies for Women to Cope with Harassment Online and in Gaming & Virtual Worlds. Existing literature has investigated different strategies women can and do employ to combat harassment in various online environments. For example, five strategies have been identified to help women prevent or mitigate harassment on social media, including withdrawal [38, 72], content management [72], acceptance/tolerance of harassment, [12, 72], vigilantism (e.g., women defend themselves against harassment in more combative and active ways [17, 72]), and limiting online interactions to people known offline to avoid uncertainty [58], although Vitak et al.'s research does point out that even familiar individuals can contribute to harassment [72].

Women additionally seek specific strategies to cope with harassment in gaming and virtual worlds, such as avoiding strangers, playing alone or anonymously, moving groups regularly [15, 45], or even withdrawing totally from the gaming environment [61]. Prior work on women of color, particularly Black lesbian gamers, has described how forming groups or "clans" of women with similar identities to play games with and to seek support from helps mitigate the effects of stereotyping, microaggressions, and other discriminatory practices by building resilience in these women [32, 33]. Still, some others choose to hide their identity as a woman through means like

gender camouflaging or gender-bending via naming and avatar creation practices [15, 16, 20] and avoiding verbal communication with other players [20, 45]. Indeed, when embodying one's identity and gender in pre-existing virtual worlds ranging from the earliest versions of virtual worlds (e.g., the 1990's text-based LambdaMOO [50]) to later 3D virtual worlds (e.g., Second Life [57]) becomes dangerous, the logic many users employ (for better or for worse) to avoid harassment is to simply stop embodying the marginalized identity [50]. Extending into the game streaming context, women streamers often have to rely on volunteer moderators or manage their own moderation on their feeds to mitigate and halt escalating harassment against them [71]. However, this method is not always effective as it requires a high level of collaboration on tasks, relationship building amongst moderators and streamers in-stream and off-stream, and collaborative standard setting amongst a group that many women do not have access to [11].

Taken in sum, it is clear that harassment against women in existing online settings (e.g., social media, gaming/live streaming, and virtual worlds) is pervasive, detrimental, and requires specific strategies for coping. The emotional harms for women stemming from harassment and problematic behavior in immersive, social worlds such as gaming and virtual worlds (e.g., [18, 50, 57]) may not be completely new but rather also evolves over time as online spaces come to facilitate increasingly immersive and embodied experiences. Therefore, how might social VR, as the more recent and comparatively immersive and embodied social technology in this proverbial timeline, contribute to the evolution of online harassment against women? Answers to this question are particularly valuable in light of the potential amplification and reinforcement of these harms as brought about by the heightened online/offline-self collapse (i.e. embodiment) that comes with greater immersion in social VR. The following section, then, delves into what is known about social VR and harassment, especially concerning harassing behaviors toward women.

2.2 Social VR and Harassment

Many social VR platforms draw upon aspects from pre-existing multiplayer online games and 3D virtual worlds where users engage in various immersive experiences, interactive activities, and choices through avatar-based representations, making them technically and experientially more comparable and relevant to these environments than other online spaces such as 2D social media sites. However, social VR also demonstrates specific nuances that extend beyond online gaming and virtual worlds by focusing on an enhanced sense of *embodiment* (i.e., how we can experience a virtual body representation as our own body within a virtual environment [64]) and immersive experiences as facilitated by the predominant use of real time voice chat, partial or full-body tracked avatars, and more customized avatar design. Compared to mediated communication on a screen in conventional online social spaces (e.g., social media sites, live streaming, online gaming, and virtual worlds), social VR offers real-time and embodied interaction similar to face to-face communication. Additionally, in almost all popular social VR platforms people can conduct and enjoy real life social activities such as walking in public spaces, playing a game, watching a movie, participating in a concert, and having a party in a highly realistic and immersive simulated 3D virtual environment.

Despite these benefits, concerns about the increasing harassment risks in social VR spaces emerge. A 2018 report has shown that 49% of women respondents reported having experienced at least one instance of sexual harassment, 30% of men respondents reported racist or homophobic comments being used against them, and 20% of men have experienced violent comments or threats in social VR [54]. A growing body of HCI and CSCW research has also collectively warned that social VR's focus on embodiment, the sense of presence, body tracking, and synchronous voice conversation may allow people to virtually "touch" (e.g., handshaking, hugging, and high-fiving) and assault others, leading to heightened harassment risks [6, 7, 27, 62].

In particular, some prior work on social VR has pinpointed that individuals who are considered marginalized in tech spaces (e.g., women, LGBTQ, and ethnic minorities) may face additional harassment risks in social VR (e.g., [6, 7, 27, 53, 54, 60, 62]). For example, the previously mentioned technology report demonstrates the gender disparity amongst victims of sexual harassment in social VR, and how harassing comments are often racist and homophobic [54]. A 2017 technology report with 13 social VR women users reveals several safety risks for women in social VR, such as sexual harassment and flirting [53]. Freeman et al. highlight that harassment in social VR may be felt as more disruptive to marginalized populations because it is easier to identify and target them as potential victims due to the combination of avatar design and voice in social VR [27]. Blackwell et al.'s works also shed light on the risks of sexual harassment and stalking these populations face in social VR [6, 7].

Although many of these works seem to be grounded in male-dominated samples (e.g., [6, 7, 27]) or small samples of women social VR users (e.g., [53]), taken together, they have provided valuable insights. First, they lay the groundwork for more research like this present study to further sharpen the focus of empirical work on understanding and mitigating harassment in social VR through intentional exploration of the perspectives of marginalized social VR users, whose experiences with harassment in this space might be shaped in unique ways by their continued online and offline marginalization. Second, they highlight the urgent need for more in-depth investigations of women's experiences and challenges in social VR to better protect them, as women represent an important and critical population in emergent social VR spaces and the metaverse paradigm, are already frequent targets for online harassment, and are clearly suffering from more embodied and physicalized harassment in social VR such as virtual groping and rape according to [6, 7, 27, 53, 54, 65, 66].

Our work thus strives to build upon these foundational studies and expand the voices of women users of social VR. We pay specific attention to how women experience harassment in social VR as compared to those in pre-existing online gaming and virtual worlds (**RQ1**), especially in terms of how harassment in social VR may modify and amplify the harassment risks we already know women face in these comparable contexts. In doing so, our work seeks to ground what mass media and technology reports have detailed about harassment of women in social VR in empirical comparative data for a more holistic picture of how harassment of women in these spaces present amplified concerns. Pushing beyond harassment types, we are also motivated to investigate how women currently protect themselves from harassment in social VR and how effective their tactics are, which are likely reflective of unique challenges posed by the platform and their gender identities (**RQ2**). Therefore, understanding how and why women employ certain strategies to navigate and manage harassment in social VR as well as potential shortcomings of their strategies may offer much needed insights for creating a safer metaverse in the future and better protecting not just its women users, but *all* users.

3 METHODS

Recruitment and Participants. This study was a part of a multi-year research project on social experiences in social VR. The University's Institutional Review Board (IRB) approved this study for research ethics prior to recruitment of participants. Since this broader project focuses on how diverse users experience social VR, especially those who are often considered marginalized in technology spaces such as women and LGBTQ individuals, we posted recruitment messages on various popular online forums for social VR users and queer gamers (e.g., r/SocialVR, r/VRchat, r/OculusQuest, r/Recroom, and r/gaymers in Reddit), and on Discord servers for queer users and social VR users (e.g. VRC LGBT on Discord) to recruit participants who self-identify as women or feminine for interviews. We also reached out to two popular social VR blogs to further distribute

the recruitment message. One research team member additionally attended LGBTQ events in AltspaceVR and VRChat and asked users at random if they were willing to participate.

We then interviewed all participants who self identify as women or feminine and agreed to participate (N=31) as part of the ongoing research project from October 2019 to March 2022. These women range in age from 18 - 45, with an average age of 26.48, and are predominantly located in the U.S.A. (84%). The majority of our participants identify as Cis Women (N=25, 80%), although 4 self identify as Trans Woman and 2 identify as non-conforming feminine or genderqueer feminine. These women are also diverse in their ethnic identities. Amongst the 30 participants who shared their ethnicity, 42% self report as White (N=13), 29% as Black (N=9), 16% as Biracial (N=5), 3% Hispanic (N=1), 3% North African/Arabic (N=1), 3% Middle Eastern (N=1), and 3% Asian (N=1). Although not all participants revealed their sexual identity, our participants also represent a large variety of sexualities, including 11 Lesbian/Gay, 3 Bisexual, 3 Straight, 3 Asexual, 2 Pansexual, and 9 Prefer Not to Answer.

All women had experienced both pre-existing online gaming and/or virtual worlds and social VR. Their years of experience with social VR varied, while their weekly use ranged from less than two hours in total all the way to 35-70 hours a week. The platform experience participants had also varied, with the vast majority of participants engaging with VR Chat (N=26), AltspaceVR (N=8), RecRoom (N=7), and Big Screen (N=3), with other social VR spaces such as Meta Horizon Worlds (N=2), SpatioVR (N=2), and High Fidelity (N=2) also represented. Omnium Space, Engage, RoomE, Immersed, and Interverse all only had 1 participant each familiar with their platforms. In all, our sample is fairly diverse in demographics and experiences, thus providing a rich set of women's perspectives on harassment in social VR. Table 1 summarizes participant demographic information.

Interviews. We conducted semi-structured in-depth interviews with the participants via text/voice chat over Discord or Zoom, or within social VR per the participants' personal preference. In the latter case, interviews were conducted in a private social VR place with only the interviewer and interviewee present to protect the participants' privacy and safety. Prior to the interviews, we provided an informed consent document via their communication preference (e.g., emails or Discord messages). We did not collect names or identifiable information from participants.

We developed our interview questions based on existing literature on women's experiences of harassment in pre-existing online gaming and virtual worlds [4, 8, 19, 68, 69], prior work on emerging forms of harassment in social VR [6, 7, 27, 53, 54, 60], and our previous work on social interaction dynamics in social VR [1, 21–24, 28, 43, 44]. Interviews began with introductions, basic demographic questions, and questions in regard to their level of experience in social VR. Then participants were asked questions about their experiences with harassment in social VR. It is important to note that we understand that harassment is a culturally sensitive construct and social VR may lead to new forms of online harassment against women that have not been extensively studied before. Therefore, in the interviews, we did not offer a specific definition of harassment but encouraged our women participants to freely recount and share as much detail as they felt comfortable and appropriate regarding how they personally experienced harassment in social VR. In doing so, participants were asked to describe how they defined and identified harassment (e.g. *Please explain to me how you define harassment in social VR?*), and to describe a time they were harassed (e.g. *How did that experience make you feel about yourself? About social VR?*). Participants were then asked if their status as a woman affected how they were treated (e.g., *How has your gender affected your ability or willingness to make friends or approach strangers in social VR?*), and how harassment they have experienced in other online contexts compares to the harassment they have faced in social VR (e.g., *How is harassment in social VR against women similar to or different from harassment in online gaming?*). Participants were also asked to describe the strategies they utilize to combat and/or prevent harassment in social VR (e.g. *Please describe strategies that you*

have used to prevent harassment or have seen other people use to prevent harassment.). Interviews lasted 102 minutes on average and participants received a \$50 Amazon digital gift card after they completed the interviews.

Data Analysis. We adopted the thematic analysis approach [9, 10] to conduct an in-depth inductive 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" [47].

We analyzed the 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 to acquire a sense of the whole picture as to how women suffered harassment in social VR [10]; (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. Non-repetitive 79 codes (e.g., personal space bubble, safety settings, and non-female avatar to avoid harassment) were generated. (3) Searching for themes: these two authors categorized codes into thematic topics

Table 1. Participant Demographics & Social VR (SVR) Usage

PID	Age	Gender Identity	Ethnicity	Sexuality	Location	Years of SVR Experience	Weekly Use in Hrs
1	30	Non-Conforming Feminine	N/A	N/A	U.S.A.	1.5	12-20
2	27	Cis Woman	White	N/A	U.S.A.	1	5-15
3	26	Trans Woman	White	N/A	U.S.A.	2	20
4	45	Cis Woman	White	N/A	UK	N/A	N/A
5	21	Trans Woman	White	N/A	Canada	2	14-21
6	27	Cis Woman	White	N/A	U.S.A.	.5	10
7	20	Cis Woman	Asian	N/A	U.S.A.	1.5	6
8	21	Cis Woman	North African/Arabic	N/A	Spain	2	20
9	23	Cis Woman	White	Bisexual	U.S.A.	3	2
10	22	Cis Woman	White	Gay	U.S.A.	3	20
11	18	Cis Woman	White	Gay	U.S.A.	2	12
12	23	Trans Woman	White	Lesbian	U.S.A.	>1	25
13	35	Cis Woman	Hispanic	Bisexual	U.S.A.	<.5	10
14	25	Cis Woman	Black	Lesbian	U.S.A.	3	N/A
15	25	Cis Woman	Black	Lesbian	U.S.A.	10	19-23
16	24	Cis Woman	Black	Straight	U.S.A.	3	<10
17	24	Cis Woman	Black	N/A	U.S.A.	5-6	3-4
18	27	Trans Woman/Non-Binary	Biracial White and Indigenous Canadian	Asexual	Canada	.5	>20
19	25	Cis Woman	Black	Lesbian	U.S.A.	5	>20
20	19	Genderqueer Feminine Presenting	Biracial White and Black	Pansexual	U.S.A.	3	2
21	26	Cis Woman	Black	Lesbian	U.S.A.	3-4	20
22	20	Cis Woman	Biracial Black and Italian	Asexual	U.S.A.	>1	14-20
23	25	Cis Woman	White	Pansexual	Germany	3	20
24	24	Cis Woman	Black	Bisexual	U.S.A.	3	24-30
25	27	Cis Woman	Black	Lesbian	U.S.A.	3	35-70
26	29	Cis Woman	Black	Lesbian	U.S.A.	5	>12
27	21	Cis Woman	Middle Eastern	Gay	U.S.A.	N/A	3-4 in total
28	44	Cis Woman	White	Straight	U.S.A.	2.5	<.5
29	40	Cis Woman	Biracial Native and Hispanic	Lesbian	U.S.A.	<.5	1-5
30	28	Cis Woman	Biracial Native and White	Straight	U.S.A.	4.5	4-5
31	30	Cis Woman	White	Asexual	U.S.A.	.5	2-5

Note: N/A: Participants prefer not to answer

related to our research questions and developed sub-themes emerging in participants' descriptions of their experiences of harassment in social VR for further analysis. For example, for RQ2, 4 themes and 9 sub-themes were developed – e.g., subthemes "set social boundaries" and "self-disguise" were developed under the theme "prevention"; and subthemes "blocking" and "reporting" were developed under the theme "mitigation/response". (4) Reviewing themes: all authors continued to discuss, integrate, and refine themes and subthemes to streamline women users' experiences with harassment in social VR to best capture and represent the data in relation to our research questions. (5) Defining and naming themes: all authors worked collaboratively to further refine 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 [10]. For instance, "leveraging platform features for harassment prevention and mitigation" and "creative inter- and intrapersonal strategies for prevention, mitigation, and coping" were finalized as the two main core themes for RQ2. (6) Producing the report: all authors discussed to select 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 [10].

Positionality Statement. It is necessary to share the context of our positionality in relation to our participants, due to the sensitive nature of our research focus (i.e., social VR harassment targeting women) and how our identities and cultural backgrounds may influence our analysis and interpretation of the data [3, 40, 59]. All authors of this paper identify as straight and cisgender women, which can be a limitation as our sample includes trans women, non-conforming or genderqueer feminine users, and women who are not straight. However, three out of the four authors are also ethnic minorities, including two Asian women and one Black woman. All authors have extensive experiences in social VR both as users and as researchers. Our own identities thus help us be aware of the unique challenges for women as a marginalized group in the sociotechnological context of social VR.

4 FINDINGS

Our findings present a picture of harassment against women and their strategies to address harassment in social VR that is multilayered and distinct. We divide our findings into two sections: (1) women's experiences of harassment risks in social VR in comparison to harassment in pre-existing online gaming and virtual worlds (RQ1); and (2) women generated strategies to manage harassment in social VR and limitations of their strategies (RQ2).

4.1 Women's Experiences of Harassment Risks in Social VR vs. Pre-Existing Online Gaming and Virtual Worlds

In this section, we present four themes emerging in women's experiences of harassment risks in social VR compared to pre-existing online gaming and virtual worlds. For each theme, this structure allows for an empirically-driven, comparative exploration of how harassment against women may be modified or amplified by social VR's unique combination of technological affordances, thus simultaneously lending credence to and extending what mass media and technology reports have preliminarily detailed [53, 54, 65, 66].

4.1.1 Experiencing Violations of Personal Physical Space and Abilities Beyond "Viewing" a 2D Screen. In pre-existing online gaming and virtual worlds, people "view" how their avatars are treated and interact with others on a screen, while social VR leverages various features to induce an enhanced level of embodiment, or the feeling that one's physical body is more closely related to one's virtual body than it otherwise would be. In this sense, social VR users are not merely "viewing" a 2D screen but physically and immersively experiencing these online behaviors **beyond** the confines of

a small flat screen. This often makes people sensitive to their proxemic experiences in social VR – i.e., the interpersonal distance between people that mediates their interactions with other people [49].

Indeed, the heightened sense of immersion and embodiment made all of our women participants feel significantly more harassed, anxious, and insecure when another user violates their personal physical space in social VR than when that same violation occurs in pre-existing online games and virtual worlds. P15 (25, Cis Woman, Black, Lesbian) explains,

"Having features like heightened feelings of the presence and embodiment, and a couple of movements that made me feel this violence and these violations of personal space."

Adding onto P15's experience, P27 (21, Cis Woman, Middle Eastern, Gay) further elaborates how the "beyond viewing a 2D screen" aspect of social VR significantly elevates the severity of such behavior (i.e., getting too close to someone's avatar) against women,

"His avatar started to get close. And I was like, 'You know, I am creating games and I should know that this is not real, but I was feeling that it's real.' It was so frustrating that he was coming forward. I was really afraid of it. And I was frozen. I believe you can't distinguish between if it is really physical or not."

P27 felt "afraid" and "was frozen" even when a male avatar was just getting closer to her without conducting any explicit harassing actions. For her, the embodied connection between one's avatar body and physical body in social VR overrides the knowledge that the experience "is not real, but I was feeling that it's real." She would otherwise not have experienced this type of connection and the level of fear such a connection can possibly create in on-screen online gaming and virtual worlds, as the latter do not provide the same kind of virtual-offline body collapse that makes users unable to "distinguish between if it is really physical or not" like in social VR.

P22 (20, Cis Woman, Biracial Black/Italian, Asexual) echoes this sentiment, underscoring her concerns that violating women's personal spaces in social VR goes beyond a flat screen, "Again, you can ignore somebody texting at you, but when somebody's actively yelling at you, getting up in your personal space and touching you, that's completely different." According to P22, the personal space of one's social VR avatar is indeed **one's own** personal physical space, rather than virtual representation of oneself on a screen. Therefore, violating women's personal space in social VR is "completely different" than the text-based or on-screen harassment against women commonly seen in online gaming and virtual worlds (e.g., "texting at you"), as one's avatar and one's physical body are so uniquely entwined in social VR.

In addition to directly violating women's personal physical spaces to harass them, our participants also point out "crashers" as a harassment risk for women that directly undermines their physical abilities in social VR. Crashers are social VR users who use various technological capabilities, typically through the manipulation of customized avatars, to hurt other users through visual (e.g. flashing lights), auditory (e.g., blaring music), and/or technical (e.g., flying particles to slow down computers) ways. In this sense, crashers not only aim to harass women through creating physical discomfort but they also do so by significantly jeopardizing how a woman can function in social VR technically. Interestingly, none of our participants have experienced any behavior similar to crashers leveraged against them in other online contexts such as gaming and virtual worlds. Although in this study it is unclear to us if crashers target women at a higher rate than other users in social VR, they have become a growing harassment risk against women in social VR by posing at least three physicalized harms (i.e., visual, auditory, and technical) on women that they may not otherwise experience in pre-existing online gaming or other virtual worlds.

First, as P3 (26, Trans Woman, White, N/A) explains, "Someone is just actively manipulating lights in a room in a way to hurt you.", i.e. crashers intentionally manipulate the social VR environment

with the sole purpose of creating physical discomfort. This manipulation represents a purposeful act intended to hurt the social VR experience for women through bodily harm (e.g., "*in a way to hurt you.*"), transcending the online world into offline world physical pain.

Second, P10 (22, Cis Woman, White, Bisexual) explains how crashers can force women to look at uncomfortable images, "*I've seen reports of people using particle systems with horrible images attached to it so it basically just floods your entire screen with these awful images.*" Unlike in pre-existing online games or virtual worlds where the screen is a flat and finite space, social VR is designed in such a way that the "screen" is a 360 degree 3D environment surrounding the users. This, in turn, makes such attacks against women uniquely immersive and hard to ignore because the image "*floods*" a woman user's entire environment (i.e., the social VR world) rather than just one part of her environment (e.g., a display monitor on a desk in an offline world room).

Third, crashers harm the overall experience of being in social VR for women by slowing down their victim's computer with their manipulations. P1 (30, Non-Conforming Feminine, N/A, N/A) explains, "*They will use avatars that are meant to mess with other people. [If] they're avatars [that] have all these shaders and colors and particles flying off of them and they make your computer slow and stuff like that.*" In this sense, crashers literally implement a physical blockade to prevent women from participating in social VR. This acts to gatekeep a space that is already dominated by men in a way that on its face does not feel discriminatory in the same way that, say, sexist comments in pre-existing online gaming spaces like esports does [42]. Instead, crashers can directly use their avatars as weapons to make social VR spaces physically and socially uncomfortable or logistically difficult to be in for women users without being explicitly verbally or sexually abusive.

4.1.2 Experiencing Embodied Sexual Harassment Due to a More Nuanced Avatar-Self Relationship.

Social VR is designed to provide immersive and embodied experiences that mimic the offline world. It thus leads to *embodied* sexual harassment against women by featuring elements more closely associated with physical sexual assaults in the offline world, such as groping, touching, grabbing, and virtual "rape" that have been described in mass media [65, 66], technology reports [53, 54], and prior work on social VR harassment [6, 7].

Unfortunately, all participants in this study also confirm that they have encountered these incidents of *embodied* sexual harassment in social VR, lending empirical credence to the aforementioned mass media and technology reports. Our participants extend beyond these works, however, by especially highlighting that the "embodied" sense of such harassment originates in a more nuanced avatar-self relationship in social VR than in pre-existing online gaming and virtual worlds, thereby making women both more visible targets for and more viscerally impacted by *embodied* sexual harassment.

On the one hand, while women can easily conceal their gender identity when in other virtual environments by simply "gender swapping" (e.g., using a male avatar) [36, 37] to avoid sexual harassment, social VR's unique combination of avatar design, ubiquitous voice use, and body language use via partial or full-body tracking make women far more visible and identifiable as targets by providing more gender identity information to other users. Recognizing how this combination of features facilitates a more nuanced avatar-body relationship, many women in this study choose to create and use avatars similar to their physical self to enhance this nuanced relationship and fully engage in social VR. For example, P17 (24, Cis Woman, Black, N/A) and P20 (19, Genderqueer Feminine, Biracial White/Black, Pansexual) explain,

"I made her [the avatar] really busty because that's how I am in reality. So I kind of made it look more like me. [One time] a guy was harassing me sexually, telling me he would love to see what's between my thighs and if I could send him a private DM later,

so we could talk about sex and all of that [...] he kept sending me this chats and it kept disturbing me." (P17)

"The avatar I was using was a smaller avatar and very cute-looking. And the way I sound and move and whenever I talk, and when I get excited, my voice gets a bit higher, so I always think that I'm probably an easy target to go against because I seem small, and nice." (P20)

Both women's efforts to accurately present themselves and enjoy a more nuanced avatar-self relationship appears to be unfairly perceived by male users to be an invitation for targeted sexual harassment. This thus drastically limits *who is safely allowed to be embodied in social VR*. In this sense, embodying one's physical self (e.g., gender) can be weaponized against women to target them for *embodied* sexual harassment.

On the other hand, this nuanced avatar-self connection also makes sexual harassment against women in social VR feel as physicalized as offline sexual harassment in comparison to harassment in pre-existing, on-screen online gaming and virtual worlds. P22 (Cis Woman, Biracial Black/Italian, Asexual) adds,

"I made my avatar look like how I do in real life, so for some reason I'm equating the fact that if you're being way too creepy towards my avatar, you're being way too creepy towards me, because it looks like me and I'm like, 'No, don't do that.'"

According to P22, the embodied nature of social VR, particularly in combination with avatar-self similarity, facilitates the sense that assaults on her avatar body *"equates"* assaults on her physical body. In particular, it appears that *anyone* in social VR, including other women, can and do sexually harass women, making the risk of embodied sexual harassment against women even more complicated. P13 (25, Cis Woman, Hispanic, Bisexual) shares,

"I was once sexually harassed by a girl. I joined a party type room. Immediately, two girl avatars near me started fawning over my Steampunk Corset, and I complimented their outfits too. Then, one of the girls declared that I was now her girlfriend because she knows that I must have a 'bootylicious pussy' lol. She asked me to come with her, away from everyone else, and I did start to follow her. I think I was so caught off guard by how quick and sudden this happened, that I just went along with it. But I got a grip and left after 30 seconds or so. I was really concerned she was underage and did not want to compromise myself in any way."

P13, a Hispanic Bisexual user, describes how sexual harassers targeting women can also be women who are interested in women, something that can feel more shocking and disorienting than if it was a man because it is often unexpected and leaves women victims unprepared to react to the harasser's physical acts. Her experience also shows how sexual harassment can be both verbally explicit and relatively easy to perform physically in social VR. This also leaves women little time to consider what actions they should take to appropriately fight back, which is especially concerning when the harms of *embodied* sexual harassment can be felt as more visceral.

4.1.3 Experiencing Harassment Based on the Comparatively Ubiquitous Use of Voice Communication. While player-player communication in many pre-existing online games and virtual worlds are still mainly text-based (e.g., through instant text chat), in social VR, synchronous voice communication is the primary interaction modality. Additionally, even in certain online games that allow voice communication through third party tools (e.g., Discord), such voice communication is often only used for team gameplay coordination (e.g., MMOs). In contrast, social VR users can hear others nearby in public spaces even if they are not directly talking to each other. As a result, many women feel that they often encounter voice-based harassment in social VR rather than text-based

harassment commonly seen in other online spaces (e.g., social media, online gaming, and virtual worlds) because they are expected to communicate with others via voice and their voice reveals their identity.

For example, P5 (21, Trans Woman, White, N/A) explains, *"I think with every single platform I've been on where someone has a woman's voice they're just so much more likely to be harassed, or just given awkward questions."* Once women are identified, harassers will then leverage the same advantage of voice use to verbally harass them: *"Especially with women, VR sadly allows some people to be extremely creepy the moment they hear a female voice"* (P23, 25, Cis Woman, White/Russian, Pansexual). While this can and does happen in pre-existing virtual environments that use some voice chat, our participants indicated feeling like these situations happened more frequently in social VR because of the expectation to use one's voice, an observation that cannot be quantified in this study but is worth noting nonetheless.

Trans women users may even face additional risks for voice-based harassment. P5 (21, Trans-woman, White, N/A) mentions people identified her as a trans woman due to her voice being incongruent with her avatar's appearance in RecRoom: *"When I've worn a character with a dress in Rec Room, 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?'"* Despite presenting herself as a woman (e.g., wearing a dress), the difference between P5's avatar appearance and her voice still seems to trigger judgements and potential harassment from those who expect traditional binary gender roles.

Such harassment can also happen to some cisgender women who do not have a voice traditionally associated with women. P13 (35, Cis Woman, Hispanic, Bisexual) shares,

"I have been accused so many times of being a boy and pretending to be a girl. I've been kicked out of rooms. [...] They'll start talking about things where I kind of do feel a need to say something and counter them, and they immediately come with that 'Oh no, you're just a dude' 'Why are you pretending to be a girl?' 'Why are you being a bitch?'"

Even though P13 is a cisgender woman, her voice did not sound as some people expected, which made her suffer misunderstandings, unfair experiences, and verbal insults. In addition to using voice to directly identify and attack a specific woman user, voice can also be used to create a hostile social atmosphere to harass women in general, as everyone nearby is able to hear others' voices in social VR. P11 (18, Cis Woman, White, Gay) and P20 (19, Genderqueer Feminine, Biracial White/Black, Pansexual) reveal,

"I heard people throwing around slurs and misogyny. They didn't actually aim towards you. They aimed towards your group and made you feel attacked." (P11)

"He started being way more aggressive and saying things like... 'Women belong in the kitchen,' and 'Why do women play games? They're not funny ha ha.'" (P20)

Their accounts reveal that P11 and P20 felt harassed not because they were personally targeted but because of how the harasser used their voice to create a hostile and unsafe environment for all women nearby. Overhearing sexist and misogynistic comments can additionally serve to alienate women in social VR by making them feel that they are not supposed to be in these public spaces. Therefore, regardless of if the harassment is targeted or general, the ubiquitous use of voice in social VR presents an emergent harassment risk against women that may have more apparent impacts on women's avatar-self gender identification compared to the often text-based harassment and even voice-based harassment in pre-existing online gaming and virtual world.

4.1.4 Experiencing Internalized Shame and Fear In and Out of Social VR Compared to Pre-Existing Online Gaming and Virtual Worlds. All our participants also express, in one way or another, that

the harassment they have experienced in social VR often leads to internalized shame and fear both in and out of social VR. These feelings of shame and fear compound the damage wrought by the aforementioned embodied physical and ubiquitous voice harassment against women in a way that amplifies the effects of these feelings beyond what they have experienced in pre-existing online gaming and virtual worlds.

First, as is often the case in other online contexts such as online gaming and virtual worlds, there seems to be a culture within social VR that normalizes harassment, which may lead to a what-did-you-expect attitude against women such as victim-blaming. Indeed, P27 (21, Cis Woman, Middle Eastern, Gay) confirms that victim blaming is already happening,

"And she said, 'This [harassment] is something that is really probable to happen in that environment [social VR]. And that create another source of blaming myself that, 'Hey, why didn't you do some research before going there?' If I was prepared, and I knew that maybe it happened. I may never get that freezes, or I may never even go there. I mean, I'm pretty sure I'm never going to go there [again]."

Here it can be seen that there is an expectation that it is somehow P27's own fault for not being "*prepared*" enough to deal with harassment, because harassment against women "*is something that is really probable to happen in that environment.*" While victim-blaming in regard to online communities is obviously not new, the expectation to "normalize" harassment against women in social VR clearly establishes toxic mindsets in which women should somehow be responsible for preparing and protecting themselves just to *simply enter* the platform, further internalizing their shame and fear if they fail to do so.

Out of social VR, the blurring boundary between the VR world and the offline world often leads to internalized shame and fear amongst women even offline. P27 (21, Cis Woman, Middle Eastern, Gay) explains how she feels ashamed in her offline life after being harassed in social VR,

"I think that's a part of that is coming from that culture that I lived in. Just being afraid of being blamed, and sometime instead of being blamed, you are blaming yourself. Because it is the way that they tell you, because this is the way that you learn. You maybe play[ed] a role in that mess [harassment] as well."

Here P27 explains how her identity and experiences as a Middle Eastern woman compound issues of shaming brought about by a culture in social VR that normalize harassment against women, even after she has left the VR platform. Indeed, many harassing behaviors in social VR may also be transferred to places outside of social VR that are dedicated to the continued exploitation and harassment of women, adding to women's internalized feelings of shame and fear. For example, stalking has been reported as a main way to harass women in social VR in previous technology reports [53, 54]. Our participants such as P30 (28, Cis Woman, Biracial Native and White, Straight) point out how such stalking behaviors can easily be extended to multiple sites for stalking outside of social VR,

"So typically for women and harassers, I've noticed is definitely if they have sexual pictures of them, they will definitely leak them to their servers [...] And if they know their real name [...] It's pretty much like doxxing almost. There's definitely been discord servers just for collecting VRChat girls' nudes before and their usernames."

The use of usernames is especially concerning because it increases the possibility of doxxing and makes it easier to track and stalk the same women both within and outside of social VR, as many of the same people tend to congregate in communities and party spaces together using the same username (e.g., in VRChat and in a Discord channel). The mixing of platforms also makes it difficult to track and identify harassment, as many people who interact with and monitor social

VR spaces might not have access to said Discord servers, and thus cannot intervene on women's behalves to prevent this more transformative form of stalking.

In this sense, it is actually more challenging to prove that one has been harassed in social VR than in other online contexts such as pre-existing online gaming and virtual worlds, compounding the harms of the internalized shame and fear inflicted on women. P24 (24, Cis Woman, Black, Bisexual) describes this particular issue:

"On social media now, if you're insulted or violated, it's out there for the entire world to see. But then for VR, currently, it's only, I don't know. Those who are plugged in at the moment that can see and be like, 'Oh, that happened.' There's no video proof. You can't make a video with your phone in VR."

Although most social VR platforms do offer video recording capabilities internally, what P24 points out is that incidents of harassment cannot *retroactively* and/or *externally* be documented or recorded for evidence after the incident (e.g., physical touching or voice-based threats) took place. Similar to many situations in the offline world, unless other people were physically close to the victim in the social VR space, or the victim just happened to be recording video via the platform at the time (which is not an automatic feature of social VR), then the victim is less able to even prove that the real-time incident actually happened than they would be in other online contexts that primarily use archivable and/or externally recordable documentation (e.g., direct messages on social media and gaming chat logs). Then the question becomes: what do women actually do in social VR to protect themselves from these harassment risks compared to other pre-existing, comparable online contexts such as gaming and virtual worlds? We thus turn to their unique strategies in the next section.

4.2 Women's Strategies to Manage Harassment in Social VR and Their Limitations

To manage harassment risks in social VR described in the previous section, our women participants depend on two types of strategies: using platform specific tools and employing creative inter- and intrapersonal strategies. What we found, however, is that these strategies are also often insufficient, either because they rely on retroactive action, prevent potential positive interactions, or create emotional and interpersonal burdens.

4.2.1 Leveraging Specific Platform Tools for Harassment Prevention and Mitigation. Our participants tend to at least in part rely on the technical features provided by social VR platforms to prevent or mitigate harassment. Our participants specifically highlight three platform features that they have used to manage harassment in social VR. However, they also clearly express that these features still show significant limitations and cannot help them prevent or mitigate harassment in social VR effectively.

Using personal space bubbles and disabling specific features to prevent physicalized harassment from happening & strategy limitations. Our participants tend to use personal space bubbles provided by certain platforms, particularly for preventing physicalized harassment. For example, P22 (20, Cis Woman, Biracial Black/Italian, Asexual) explains how it works,

"VRChat actually has this wonderful function called the personal space bubble, where if people get too close to you, you don't see them. They disappear for a second. You can still hear them, but you don't see them, which definitely will mitigate people actually touching you, so you don't feel it with phantom sense."

P22 points towards an interesting phenomenon of what she terms as "*phantom sense*" – the idea that some women can feel so embodied in their VR avatars that they feel a "phantom" sense of touch on their physical bodies when their avatar bodies are touched. Therefore, the personal space

bubble protects women in social VR from being touched even before it could potentially happen, providing comfort, reassurance, and boundaries.

Women also intentionally disable certain features in social VR to prevent crashers from undermining their physical ability to engage in the platform. P3 (26, Trans Woman, White, N/A) and P22 (20, Cis Woman, Biracial Black/Italian, Asexual) share,

"Another thing specifically in VR chat that allows you to do that [create boundaries] actually is really helpful is you can disable certain parts of people's avatars like you can disable the sound that the avatar makes, or you can disable effects." (P3)

"I usually don't get crashed, because I have my safety settings on. It's like, 'If you're not my friend, I can't see your particles or your animations'." (P22)

For both women, they are able to proactively control what avatars and avatar effects they are subjected to, thus preventing or at least leveling out the effects of malicious and unintentional crashing attempts. However, other women are also concerned about the limitations of using personal space bubbles and disabling features. For example, P31 (30, Cis Woman, White, Asexual) describes,

"The safety settings in general have been a big help to turn off particles and shaders or to avoid unwanted touching. But some people in my group go as far as to turn off all avatars by default, partly to help with performance, and partly to hide troll/room-filling avatars. This also introduces new interaction issues and hurt their experiences."

P31's statement highlights that relying on personal bubbles or turning off certain features to prevent harassment against women often *"introduces new interaction issues."* For example, it often leads to a situation in which *no one* is allowed to interact with this particular user outside of her established social VR friend group. Therefore, depending on these features to prevent harassment comes at the cost of the opportunity to interact with other people in an immersive, engaging, and embodied way. A major limitation of these features, then, is that they do not allow for much of a balance between embodied and engaging interaction and effective protection, particularly for women who are new social VR users.

Using blocking after an incident to mitigate harassment & strategy limitations. Our participants also mentioned blocking as a frequently used strategy after a harassment incident. In most social VR platforms, blocking another user makes the user's avatar disappear from a woman's view and they can no longer interact with her. Blocking, then, provides a level of control over women's own environment.

However, there are several limitations with blocking that complicate its effectiveness. P31 (30, Cis Woman, White, Asexual) describes two specific issues with blocking, *"Blocking can be a bit tedious. And once there is a need to block someone, in a way it's almost too late because by that point harassment has already happened."* On tediousness, blocking does require users to open up a menu when interacting with each individual person, thus in some ways breaking the immersive experiential flow. The second concern presented by P31 (*"it's almost too late because by that point harassment has already happened"*) encapsulates the issue with any retroactive mitigation strategy – the damage of harassment against a woman has already been done. In this sense, while blocking undoubtedly is a valuable and necessary tool, it is one that does not prevent the harm from occurring and does not prevent harassment from happening again.

Reporting as a retroactive mitigation strategy & strategy limitations. Women in this study also mention reporting as a retroactive mitigation strategy for them to "fight back" and get the harasser punished through the system, although with less frequency than other strategies. Being aware of the potential disciplinary consequences, women are hesitant to report their harassers in social VR, either because they feel bad for someone or they do not want to get people in trouble. P28 (44, Cis Woman, White, Straight) also reveals that she is even more reluctant to report harassers

if they belong to certain groups (e.g., minors): "*I don't want someone to get in trouble [...] it's not personally targeted, and they're children.*" P16 (24, Cis Woman, Black, Straight) adds that she is worried about possibly getting an innocent person punished if she reports them, especially when she "*still fail[s] to understand is this person a fraudster or is this person trying to help.*"

In addition to these concerns, women highlight several limitations of the existing reporting systems in social VR. Above all, it requires significant effort from a victim to file a report against her harasser. P25 (27, Cis Woman, Black, Lesbian) points out,

"I think that's why most people are also afraid of reporting on the platform. They need to give all the details and the name of the user as well. You need to describe what happened, and the name and the user. Without the name, I don't know how they're going to carry out necessary actions."

As we have described in section 4.1.4, it is actually quite difficult to prove that one has been harassed in social VR because interactions in social VR are mainly voice-based, embodied, and in real time. Without documented records (e.g., chat logs), women in social VR often have to put forward tremendous effort to collect necessary information, details, and evidence (e.g., witnesses) if they want to report their harasser. This thus places excessive burdens on the victims themselves in addition to the already existing emotional and psychological damage from being harassed.

Furthermore, even when women spend time and effort to collect and provide detailed information and evidence about the harassment incident, there is no guarantee that the harasser will actually be punished. P23 (25, Cis Woman, White, Pansexual) explains, "*I often wish that reports in VRChat actually worked, they don't seem to do anything and it's saddening to know that it's risky being in a public instance anymore.*" Our participants mention that, of the few times they have reported another user, they received no confirmation or indication that the report was received and were left wondering if any actions were taken against the harasser at all. This results in an increased perception that "*it's risky being in a public instance anymore,*" as women are not informed about the impacts or repercussions associated with reporting a harasser.

4.2.2 Creative Inter- and Intrapersonal Strategies for Prevention, Mitigation, and Coping. While the aforementioned platform-provided tools for preventing and mitigating harassment against women in social VR do provide value, the previous section also detailed how each of these strategies were lacking in various ways. Knowing and experiencing these deficits in protection, all of our women participants indicate ways in which they employ creative and unique inter- and intrapersonal techniques for preventing and mitigating harassment that do not rely on platform tools provided to them. However, our participants also acknowledge that these creative tactics are far from perfect and come with various limitations.

Leveraging interpersonal connections & strategy limitations. Many participants *leverage their connections to other allies*, who are often not considered marginalized in social VR (e.g., men or non-LGTBQ) to prevent and mitigate harassment. For instance, P7 (20, Cis Woman, Asian, N/A) and P11 (18, Cis Woman, White, Gay) explain,

"If I'm with one of my male friends, I'll message them on Discord and we'll talk there and we'll just talk about how I'm really uncomfortable. We should leave and my male friend will then either make a comment towards the guy telling him to stop, he needs to chill or something like that or we'll just leave without interacting with him or with the person of interest." (P7)

"Most of the time I run away to my friends who aren't LGBT and aren't female, so I kind of use them as a shield." (P11)

In P7's case, she worked within the male-dominated culture in social VR to involve an ally (her male friend) to intervene in the matter on her behalf. This helped create a scenario in which she herself did not have to initiate actions that would put her in a more vulnerable position than it would for her male friend. Inherent in both P7 and P11's statements is the belief that interpersonal connections and "allies" can be their "shield" against harassment.

Unfortunately, this strategy also shows serious limitations: (1) women users have to have friends or allies who are often not considered marginalized or easy targets for harassment in social VR; and (2) this friend or ally has to be present or accessible at the time of a harassment incident. An additional underlying concern is that, to some degree, this strategy may introduce a dangerous expectation that women have to rely on men to protect them from being harassed. This may in fact reinforce the male-dominated culture and women's marginalization in social VR, rather than serving to empower and protect women.

Another interpersonal strategy that women often use to prevent and mitigate harassment is to *hang out in a group of people when in social VR*. The rationale here is similar to how people approach socialization in the offline world – the more people there are in a group, the more increased safety and security there is. For example, P20 (19, Genderqueer Feminine, Biracial White/Black, Pansexual) prefers to stick to groups when in social VR because, just as in the offline world, harassers in social VR feel more confident to harass when women are alone and do not have witnesses or allies (*"because then people are less likely to go up to you and mess with you like that"*).

In fact, some women even choose to only engage in communities of similarly marginalized individuals and disengage with public spaces altogether. On this matter, P18 (27, Trans Woman, White/Indigenous Canadian, Asexual) points out,

"Same reason we have areas in the physical world meant for only women, or only black people, or only LGBTQ people. It's safer. And it feels like every other space that is technically for everyone feels more directed at that cis straight white man."

P18's powerful statement underscores the importance of community support for women to deal with harassment in social VR. First, the social norms brought into and fostered by social VR mimic what she terms the *"physical world"*, and that same mimicking extends to some of the strategies women use to keep themselves safe, such as keeping within spaces and social circles for people similar to themselves because *"it's safer."* Second, her statement highlights what the vast majority of our women participants feel that *"it feels like every other space that is technically for everyone feels more directed at that cis straight white man."* This sentiment especially brings attention to the fact that women with intersectional identities (e.g., non-cis gendered, non-White, and non-straight) face even greater risks of harassment and feelings of marginalization within social VR because other parts of their identity are targeted *in addition to* being a woman. Therefore, deliberately choosing to limit their interactions to groups and spaces that make them feel understood and supported is even more vital for women with multiple intersections of marginalization.

Unfortunately, again, hanging out in a group or only within a community has its limitations. Just as is the case for relying on allies, sticking within safe social circles heavily relies on having knowledge, awareness, and access to said social circles, something that most new or newer social VR users likely do not have. This strategy also ultimately limits the spaces that women - particularly those with intersectional identities - inhabit. This puts an unfair burden on women to avoid valuable social VR spaces that they might otherwise benefit from or want to spend time in.

Implementing intrapersonal tactics & strategy limitations. Our participants also implement a multitude of intrapersonal tactics for dealing with harassment in social VR, including a mix of (1) crafting avatar design and voice to disguise one's gender; (2) using non-confrontational strategies to deal with harassment; and (3) performing personal resilience when facing harassment.

For **(1) self-disguise**, some of our participants choose to *intentionally self-disguise their identities as women to avoid visibility and attention*, either through crafting avatars or through hiding their voice. For example, P13 (35, Cis Woman, Hispanic, Bisexual) believes that customizing her avatar to present as a man in Bigscreen can help lessen the possibility of getting harassed.

"This stupid fool was following [me] around and trying to talk to me. It's so stupid. And that's why now I just randomize my avatar in Bigscreen. I don't care. I just make it like some big, like fat dude with a mustache."

Self-disguise can also serve to alleviate the possibility of offline-world-like attention on women's bodies. P31 (30, Cis Woman, White, Asexual) mentions, *"I get unwanted attention for my body IRL. I don't want more of that in VR. So [I'm] purposefully choosing de-sexualized avatars and either not talking or talking in a very deep voice."* For participants like P13 and P31, the ability to inhabit bodies and/or voices that are not explicitly tied to their gender helps mitigate potential harassment risks in social VR.

This technique for harassment prevention, though, comes at a cost that many women users are not willing to pay: a relinquishing of one's preferred identity. This can be especially problematic for trans women such as P18 (27, Trans Woman/Non-Binary, Biracial White and Indigenous Canadian, Asexual) who value social VR for its unique gender-affirming qualities when embodying a feminine avatar (e.g., *"My primary purpose for social VR is a way to reduce gender dysphoria"* - P18). For them, the embodied avatars in social VR is what makes it more powerful as a gender reaffirming tool than other online contexts because *"the whole body [in social VR] feels like it is mine"* (P18). Therefore, this strategy of obscuring one's gender is simply not an option for individuals whose mental well-being is greatly impacted by inhabiting a woman's body in social VR. It also further re-entrenches the idea that only certain users (e.g., white, man, or cisgender) have the privilege to fully engage in embodied experiences in social VR.

For **(2) avoiding head-on confrontation**, more than half of the participants clearly state that they utilize *non-confrontational strategies to deal with harassment*, such as leaving the world, room, or situation where they encountered the harassment. To these women, there seems little point in confronting harassers. In particular, P20 (19, Genderqueer/Feminine Presenting, Biracial White/Black, Pansexual) explains that confrontation can quickly backfire and escalate a situation whether a woman has to stand up for herself or others, *"You try to stand up to that person and stuff like that, but then it comes back to you. And the only thing you can do is leave that room and go find another one that's not going to have those type of people."* According to P20, not directly confronting a harasser is in itself a protection strategy for women, which can prevent the harassment from coming back to them and prolonging the uncomfortable experience.

However, this strategy also comes with a cultural cost for women in social VR. P18 (Trans Woman/Non-Binary, Biracial White/Indigenous Canadian, Asexual) provides a poignant insight on the fundamental problem with not only leaving a situation, but also with almost every other strategy detailed in our findings – *"being on my own, the main issue is that it doesn't reinforce any social standards. Instead of people learning to respect others, it's putting the responsibility on the victim to keep themselves safe."* P18's sentiments point towards a frustration on the part of many women with having to constantly be vigilant, especially when other users who are often not considered marginalized in social VR (e.g., white, straight, cis men) can fully engage in social VR without fear.

Additionally, some participants indicate that they tend to **(3) "perform personal resilience"** (P29, 40, Cis Woman, Native/Hispanic, Lesbian) when facing harassment, whether it is in the form of refusing to let harassment get to them or confronting/harassing the harasser right back. Unlike participants who resort to non-confrontational strategies mentioned above, these women feel that they are empowered to confront harassers retroactively or preemptively in various ways, as social

VR is still a virtual environment where they are safe from the repercussions of confrontation in the offline world. P12 (23, Trans Woman, White, Lesbian) explains, "*it's virtual, it's the Internet, I got nothing to lose by doing that [confronting] so it's safe for me to try and help out.*" P19 (25, Cis Woman, Black, Lesbian) also shares that she directly messages harassers to sternly reprimand them for their behaviors, particularly when her identity as a Black Lesbian woman is targeted: "*Sending a direct message to the person saying, hey, I actually don't like what you said. I actually don't like the fact that you talked down on me because I'm a sexual minority.*" In this case, private messaging allows for a type of confrontation that is not necessarily public and attention-grabbing, but still provides a means for women users like P19 to make their voice heard when facing harassment.

Moreover, some participants build a "thick skin" in social VR to confront and push back against harassers in their own unique ways:

"He's making comments about my avatar and I'm screaming back as well." (P2, 27, Cis Woman, White, N/A)

"I have rolled up my sleeves. I'm an absolute maniac, and people don't like being around me because of it. Most of the harassment type of guys are like, 'Oh no, I don't want to hang around this woman. She's not easy. She'll definitely fight.'" (P22, 20, Cis Woman, Biracial Black/Italian, Asexual)

Both P2 and P22 actively display their strong side (e.g. "*screaming*", "*I'm a absolute maniac*") to "scare away" potential harassers. Some women users even fight harassers back by treating them in the same creepy way as how those people treat women,

"I have this friend. She is amazing. She wears avatars that are purposely suggestive and flirty. And whenever guys are really, really creepy, she'll pull out the whole praying mantis thing where she'll be creepy right the frick back. So basically, if a guy is trying to touch her, she'll get all handsy with him and be like, 'Oh, you like that big boy?' And they'll be like, 'Okay, little too much there.'" (P12, 23, Trans Woman, White, Lesbian)

P12's friend employs a different strategy, taking "an eye for an eye" approach by not only trying to protect herself in the moment but also trying to make the harassers experience the suffering of their women victims. While it is certainly great that women like P12's friend can and do feel that they have the personal resilience to directly confront harassers in social VR, this does not mean that this strategy can work for every woman or in every situation. Women who do not feel comfortable confronting their harassers are not weaker, nor does it mean that confrontation is always advised. Indeed, all prevention and mitigation strategies used on an individual basis by women, despite being creative and effective to some, have their flaws. The most prominent limitation is that all of these strategies place the excessive burden to prevent and mitigate harassment in social VR on the potential victims themselves (i.e., women). This is an important highlight for discussing women's unique strategies to manage harassment in social VR, and for those who are concerned with designing future social VR systems to better protect women.

5 DISCUSSION

In answering our research questions, Table 2 summarizes our main findings regarding women's experiences of harassment risks in social VR compared to pre-existing online gaming and virtual worlds, their response strategies, and limitations of their strategies. In this section, we first discuss how our findings extend existing CSCW and HCI literature on online harassment and social VR by shedding light on social VR harassment as an evolving and urgent challenge for women's online safety that builds upon and extends beyond pre-existing online gaming and virtual worlds contexts. We then offer a critical reflection on women's own strategies to manage these harassment risks in social VR and why they are at times insufficient or ineffective. Based on our findings and our

Table 2. Women’s experiences of harassment risks in social VR compared to online gaming and virtual worlds and their response strategies.

Women’s Strategies	Harassment Risks Being Addressed	Limitations of Strategies
Use personal space bubbles and disable specific features to prevent physicalized harassment from happening	Experiencing violating personal physical space and abilities Experiencing embodied sexual harassment	These features do not allow for much of a balance between embodied and engaging interaction and effective protection, particularly for women who are new social VR users.
Block after an incident	Experiencing violating personal physical space and abilities Experiencing embodied sexual harassment Experiencing harassment based on the ubiquitous voice communication Experiencing internalized shame and fear in and out of social VR	1) The process of calling out a menu to block is tedious. 2) It does not prevent the harm from occurring.
Report	Experiencing violating personal physical space and abilities Experiencing embodied sexual harassment Experiencing harassment based on the ubiquitous voice communication Experiencing internalized shame and fear in and out of social VR	1) It requires significant effort to file a report against the harasser. 2) No guarantee that the harasser will actually be punished.
Leverage connections to other allies who are often not considered marginalized in social VR	Experiencing embodied sexual harassment	1) Women users have to have allies who are often not considered marginalized in social VR. 2) This ally has to be present at the time of a harassment.
Hang out in a group of people	Experiencing embodied sexual harassment Experiencing internalized shame and fear in and out of social VR	1) It is hard to have knowledge, awareness, and access to said social circles for new social VR users. 2) It limits the spaces that women or those with intersectional identities inhabit.
Craft avatar design and voice	Experiencing embodied sexual harassment	Women cannot fully engage in embodied experiences in social VR
Avoid head-on confrontation	Experiencing violating personal physical space and abilities Experiencing embodied sexual harassment Experiencing harassment based on the ubiquitous voice communication Experiencing internalized shame and fear in and out of social VR	Women users have to constantly be vigilant and cannot fully engage in social VR without fear.
Perform personal resilience	Experiencing embodied sexual harassment Experiencing harassment based on the ubiquitous voice communication Experiencing internalized shame and fear in and out of social VR	The strategy places the excessive burden to prevent and mitigate harassment in social VR on the potential victims themselves.

critical reflection, we also identify implications for rethinking social VR design to better protect women and other marginalized users in the future metaverse.

5.1 Social VR Harassment as an Evolving and Urgent Challenge for Women’s Online Safety Built Upon and Beyond Online Gaming and Virtual Worlds

Our work acknowledges that many harassment risks women face in social VR are not novel in their conceptual basis. For example, women have been severely harmed by sexual harassment and assault online for decades across various mediums and landscapes (e.g., [8, 14, 18]). Instead, researchers such as Lisa Nakamura [52] believe the embodied immersiveness of VR may not necessarily create new forms of problematic behavior, but rather serves to amplify and reinforce existing harms. Our in-depth empirical investigation first provides evidence to further confirm and elaborate various forms of harassment against women in social VR reported in mass media [65, 66], technology reports [53, 54], and existing literature on social VR [6, 7, 27, 62], such as embodied sexual harassment, stalking, voice-based harassment, and violating personal physical space. Our findings then explain how social VR’s use of a unique combination of technological features serves to modify and amplify the harassment risks women face in the comparably relevant and notoriously toxic online contexts of online gaming and virtual worlds.

5.1.1 Social VR Harassment Centers on Women's Physical Bodies in Comparatively Heightened Ways.

In pre-existing, on-screen online gaming and virtual worlds, women's physical (i.e., offline) bodies are made largely absent via 2D screen-mediated experiences, and their offline identities can more readily be concealed if willing [36, 37]. Although this is not always the case (e.g., Black women and Black lesbian women being racially and sexually profiled and harassed when having to use their voice for coordination in X-Box Live [30–33]), our findings show that harassment in social VR uniquely targets and attacks women's physical bodies beyond the capacities of pre-existing on-screen online gaming and virtual worlds in numerous ways, including through (1) enhanced avatar embodiment; (2) ubiquitous voice use in conjunction with physical embodiment; and (3) a particular focus on rendering women as sexualized objects for free consumption.

Regarding (1), compared to online gaming and virtual worlds where harassment to one's avatar can to a greater extent be separated and disembodied from one's physical body via a screen [55, 56], our findings reveal that all harassment risks in social VR focus on women's physical bodies or elements associated with their bodies via an enhanced sense of avatar embodiment, particularly when many women users create avatars that resemble themselves. In addition to more directly attacking women's physical bodies through their avatar bodies, our findings empirically show that crashers - harassers that have been mentioned in previous technology reports [53, 54] - also directly represent a physicalized threat to women's offline bodies in social VR through their ability to manipulate and weaponize their avatars to physical hurt (e.g., piercing sounds, flashing lights), disturb (e.g., filling a screen with disturbing pictures), and disable (e.g., overload and crash their devices) women users. This more intimate avatar-body relationship in social VR compared to pre-existing online spaces thus makes women feel even more vulnerable - despite being in a virtual online environment, they do not feel that their physical body is absent, but rather directly connected to their virtual body.

When it comes to (2), the ubiquitous use of voice communication in social VR in combination with avatar embodiment makes targeting and attacking women's physical bodies even easier. While voice has often been used to target and harass women in live streaming contexts [26, 71] and gaming contexts [30–32], most pre-existing online gaming and virtual world contexts do not *require and/or inherently expect* voice communication the way that social VR does. This, in turn, creates situations in which women are made to feel that they must use voice communication to engage with others in a community-approved way, yet are then directly identified and harassed based on an important attribute of their physical bodies - voice (e.g., too girly or too deep). This especially harms trans women in social VR, who are often harassed for having voices that are perceived as incongruent with their bodies, virtual or otherwise.

About (3), our study highlights that our women social VR users perceive themselves to be especially sexualized for harassment in social VR compared to their experiences with pre-existing online gaming and virtual worlds. It is well understood that sexual harassment against women is already notorious in the gaming culture [15, 20, 69]. Our women participants further confirm that sexual harassment in social VR goes far beyond comments and threats by actually facilitating embodied assaults (e.g., touching, grabbing, and groping) [6, 7, 27, 53, 54, 65, 66]. The psychological and emotional damage of such embodied sexual harassment are also extremely heightened by the direct connections between one's virtual body and physical body, thus modifying and amplifying the still-traumatic experiences seen in pre-existing online gaming and virtual worlds (e.g., "A Rape in Cyberspace" [18]). While embodied sexual harassment *can absolutely happen to anyone*, the prevalence with which it happens to women in social VR makes it a particularly salient and prominent issue for women. Indeed, all participants in our study reported that they have been sexually harassed in various ways in social VR by men and even by other women, which is reflective of technical reports detailing a higher percentage of women being sexually harassed in social VR

than men [54]. Although not necessarily the focus of this paper, it is interesting to note that women can and do harass other women in social VR, arguably representing something of a cultural betrayal - i.e., when an individual who is marginalized is harmed by another similarly-marginalized individual [29]. This also raises new concerns about the underlying power dynamics in social VR, such as why and how women are particularly sexualized and objectified in this space.

5.1.2 Social VR Harassment Reflects Complex Power Dynamics Against Women in a Cisnormative and Male-Dominated Online Social Space. On the one hand, our findings show that the existing power dynamics in traditional cisnormative and male-dominated gaming contexts [4, 8, 41, 42, 55] have undoubtedly bled into social VR. Our women participants, who represent cis, trans, and non-conforming feminine or genderqueer feminine users and diverse sexualities (Lesbian/Gay, Bisexual, Straight, Asexual, and Pansexual), all feel that social VR seems to already build a cisnormative and male-dominated culture where women are made to feel that they do not belong in this space. This is also reflected in expectations of women's specific behaviors in social VR, which align with traditional cisnormative and male-dominated gender roles.

On the other hand, new power dynamics that are unique to social VR seem to also emerge, such as who is allowed to safely embody their gender and sexuality in the enhanced ways only afforded by social VR's technological features. Our participants describe an unfortunate fact: that women who embody their gender and sexuality in this unique environment do so at the risk of increasing their visibility, thus setting up a power dynamic in which *only certain users (e.g., white, cis, straight men) are allowed to safely be embodied and visible.*

While prior research has shed light on the benefits of such identity work and practices in social VR [24, 25, 28] (e.g., how trans users may experiment and affirm their identity), our findings add that embodying a woman, especially a woman with intersectional racial or sexual identities (e.g., a Black Lesbian), can make a user more visible and identifiable for potential harassment in social VR. This is perhaps made bitterly ironic by the "virtuous VR" movement that gives (White) users the opportunity to embody globally marginalized women of color for the pleasure of their pain, as problematized by Lisa Nakamura [52]. Therefore, women often face a difficult choice, especially compared to cisgender men: choose to embody one's gender and sexuality to fully engage in social VR and its identity-affirming benefits at the risk of becoming an "easy" target for harassment; or choose not to embody one's gender and sexuality to better prevent harassment at the cost of being able to fully engage in social VR and its associated benefits.

In summary, these highlights in 5.1.1 and 5.1.2 demonstrate how social VR leads to harassment risks toward women that *blur the boundary between online and offline harassment and combine the worst of both.* This seems to further reflect and reinforce offline structural oppression to control women's bodies and rights, which are closely related to gender expressions and sexuality, even in an online social space. As we have shown, social VR harassment mimics the physical and realistic experiences of offline harassment through body movement matching, voice conversations, and simulated offline-world spaces and activities. This translates the traditional expectations for gender roles (e.g., women should be sexy or women should have women's voices), shame, and fear women face in the offline world to social VR (e.g., victim blame or self-blame), and may also lead to potential offline harassment (e.g., stalking out of social VR). Thus, more research on mitigating the transformative and severe harm of social VR harassment both targeting women's virtual bodies and physical bodies, who are already often (sexually) objectified in male-dominated societies, is urgently needed. In the next section we tend to the lessons we have learned from how women do handle harassment, and how their strategies simultaneously help and marginalize women in social VR.

5.2 A Reflection on Women's Own Strategies: Why They Work Or Not

In this section we critically interrogate women's strategies and their effectiveness, and why some strategies empower women in social VR to some extent while others seem to further marginalize them.

What Strategies Empower Women to Combat Social VR Harassment, and Why? Our findings reveal several strategies that effectively empower women to combat harassment risks in social VR. For instance, in online gaming contexts, playing alone or anonymously and moving groups regularly is a common strategy for women to avoid harassment [15, 45]. In contrast, women in our study described how sticking within a social circle that makes them feel supported and accepted with a "safety-in-numbers" mentality (i.e. a social circle aligned with their marginalized identities) empowers them to engage in social VR with a sense of safety and companionship. Women in our study also seem to build unique "personal resilience" rather than simply withdrawing from the platform entirely as many women do in gaming [61] and other online contexts [38, 72] to empower themselves to combat and manage harassment. This personal resilience empowerment strategy has many facets, including directly calling out harassers' behavior and acting creepy back to make harassers equally uncomfortable. The latter is particularly interesting, as it subverts the typical cishnormative, male-dominated power dynamic in social VR by forcing harassers to experience their own behavior in unexpected ways (e.g., through taunting and sexualizing them right back). Social VR additionally provides women with more nuanced tools (e.g., space bubbles and feature-disabling controls) that are better suited to the embodied and immersive interaction of social VR. Overall, these strategies appear to empower women to some extent by 1) taking care of a harassment situation quickly and stopping the incident from escalating (e.g., through blocking); 2) providing some sense of recourse via reporting; and 3) preemptively putting the power in women's hands to dictate who can hear them and who is allowed in their circle (e.g., via space bubbles). Therefore, these tools help women to build a sense of control over their experiences and interactions more so than simple message filtering or moderating mechanisms commonly used in pre-existing online gaming and virtual worlds contexts.

What Strategies Seem to Reinforce Women's Marginalization Online, and Why? We also found that many strategies in fact introduce limitations and potential harms that may further marginalize women in social VR spaces. For example, social bubbles limit the intimacy of interactions that individuals can have, which is a key benefit of social VR as explained by previous research [2, 23, 25, 67]. Blocking can often be exceedingly tedious and only acts as a retroactive action that does not prevent harassment from happening in the first place. Similar to other voice-based online communities, it is challenging to moderate real-time voice-based communication in social VR due to its ephemeral nature [39, 60], making detecting and preventing voice-based harassment towards women difficult. This is especially concerning for women of color, whose voices are often used to identify, stereotype, and mock them [30–32]. Proving that harassment has happened via reporting also puts the burden on the victim to shoulder the responsibility of gathering information on their harasser and obtaining proof of the harassment.

In particular, strategies such as gender-camouflaging and solely relying on friends who are often not considered marginalized in social VR (e.g., cis straight men) for protection may further reinforce the marginalized status of women in social VR. On the former, self-disguising one's gender through username and avatar gender-bending is a common strategy used in pre-existing online gaming and virtual worlds [15, 16, 20]. Yet, social VR's emphasis on embodiment and voice chat means such strategies, while preventing harassment to some degree, come at a large cost to women users' abilities to fully embody their identities (an oft-touted benefit of social VR [24, 28]). In this sense,

women in social VR have to choose between embodiment and safety, setting up a system in which certain users (e.g., cis men) may have the *privilege* to be embodied safely.

On the latter, what is equally concerning is that some women participants described essentially using their friends who are often not considered marginalized in social VR (e.g., man, hetero-normative, and cis-gender) as "shields" to protect and defend them in cases of harassment. Unfortunately, this strategy seems to reinforce an already harmful ideology that women must rely on men - their credibility, their power, and their acceptance in social VR - in order to be safe and protected. This strategy also unfortunately relies on the assumption that individual women users always have access to said friends, which puts extra burdens on women to find and maintain such friendships in case they encounter harassment in social VR. Thus, although both strategies may work on an individual level to prevent and mitigate harassment in some ways, the larger consequences of their use include reducing the visibility of women as frequent legitimate users in social VR, limiting women users' abilities to embody their gender and sexuality, and further reinforcing the power dynamic of women needing men to protect and legitimize them in social VR.

5.3 Rethinking Social VR Design to Protect Women and Other Marginalized Users in the Future Metaverse

As mentioned earlier in this paper, prior literature has pointed out at least two main challenges to prevent and mitigate harassment in social VR: the difficulty to define social VR harassment, and the difficulty to employ traditional harassment prevention methods [7, 27]. Our study has additionally highlighted how social VR harassment both targets women's virtual bodies and physical bodies and reflects complex online and offline cismnormative, male-dominated power dynamics against women, forcing them to decide if giving up identity embodiment and personal empowerment for the sake of safety is preferred. Indeed, as detailed in the previous section, by utilizing strategies that might protect them, women in this study seem to unfortunately inadvertently further reinforce their marginalization in social VR. These findings and our reflection thus serve as the breeding ground for understanding ways in which we should rethink social VR design to better protect marginalized users, such as women. Rather than focusing on proposing generic new design features, we posit that our findings push us to rethink approaches in social VR design and the emerging metaverse paradigm on a higher level, as these challenges women face are unlikely to be addressed by simply adding new technical features. Specifically, we propose two important implications for re-approaching social VR and metaverse design.

First, our findings show that harassment against women in social VR is fundamentally a social problem, as it uniquely blurs the boundary between online and offline harassment in ways that ultimately serve to de-power women and privilege cisgender men in social VR. We thus argue that addressing such social issues will go beyond technology design, as views on women - their place in the world, the rights they hold over their own bodily autonomy, etc. - are exceedingly culturally dependent. It seems to be crucial to foster an overall inclusive culture and atmosphere both in and out of social VR. Such a culture will support women's specific prevention and mitigation needs and build necessary mechanisms to educate all users on the unique experiences of women in social VR. Whether such education comes in the form of governing bodies, organizations, and/or user activist groups, it will be crucial for social VR designers and researchers to understand and investigate views on women and women's experiences globally to achieve an inclusive and supportive future metaverse for women and other marginalized communities.

Second, our findings further call for the urgent need for social VR design and development to actively shift focus towards investigating the specific experiences and strategies of people with marginalized identities. These individuals' experiences and strategies are often informed by and intimately tied to their unique offline marginalization in ways that non-marginalized users do

not have to face. Therefore, there is unlikely to be a "one-size-fits-all" generic strategy or design feature to effectively prevent and mitigate harassment in social VR for all. Instead, it is crucial to investigate how the harassment women and other marginalized communities face due to their gender, sexuality, and race (e.g., non-binary users, LGBTQ individuals, and minorities), especially when those identities are intersectional, in the offline world are also reflected and recreated in social VR in increasingly disturbing and embodied ways. Just as women's perceptions, reactions, and feelings about their experiences with harassment in social VR reflect the offline structural oppression they face and are informed by their offline marginalization, so too are their strategies informed by strategies they might use in the offline world to protect themselves. Therefore, having an in-depth understanding of marginalized individuals' viewpoints will also help design more customized techniques, methods, and strategies to better protect people with specific marginalized identities, rather than creating a metaverse where only the most privileged users (e.g., White, hetero-normative, cis-gendered men) feel safe, welcomed, and engaged.

5.4 Limitations

Despite our efforts to recruit women social VR users across various countries and cultures and having a highly diverse sample regarding ethnicity, most participants are located in the U.S.A (84%). Therefore, our investigation may mainly reflect the perspective of harassment in the U.S. culture. As harassment is a culturally contextualized construct [74], it is important to recruit participants who speak other languages or are from non-Western cultures in future studies to better understand the sociocultural specifics of how women experience and manage harassment in social VR. In addition, while our sample represents diverse sexualities, not many trans women participants were involved in this study; only 4 out of 31 self identify as trans woman and 3 of them are White. Trans women, non-binary feminine individuals, and women with intersectional identities (e.g., Black trans women) could potentially have different challenges or face more intense violations compared to cis straight women, which requires more attention and future research.

6 CONCLUSION

In this study, we elevate the voices of women to further elaborate women users' experiences of harassment risks in social VR and their responding strategies, especially in comparison to pre-existing online gaming and virtual worlds. In doing so, we explain how social VR harassment both targets women's virtual bodies and physical bodies and reflects complex online and offline cishnormative, male-dominated power dynamics against women. Additionally, we have outlined the unfortunate fact that many of women's existing strategies to manage social VR harassment put heavy burdens on women to bear the responsibility for protecting themselves and may even reinforce their marginalization in social VR. We hope that our findings shed light on the ways in which social VR harassment is weaponized against women to marginalize them by further blurring the boundary between online and offline life in ways that are modified and amplified by social VR's unique technological features. We also hope that these insights can bring attention to how we should re-think and re-approach social VR design to better protect women and other marginalized users, and can therefor guide our future efforts to design for a safer and more inclusive metaverse.

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