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<https://www.usenix.org/conference/soups2023/presentation/deldari>

**This paper is included in the Proceedings of the
Nineteenth Symposium on Usable Privacy and Security.**

August 7-8, 2023 • Anaheim, CA, USA

978-1-939133-36-6

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on Usable Privacy and Security
is sponsored by USENIX.**

An Investigation of Teenager Experiences in Social Virtual Reality from Teenagers’, Parents’, and Bystanders’ Perspectives

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Abstract

The recent rise of social virtual reality (VR) platforms has introduced new technology characteristics and user experiences, which may lead to new forms of online harassment, particularly among teenagers (aged 13-17). In this paper, we took a multi-stakeholder approach and investigate teenagers’ experiences and safety threats in social VR from three perspectives (teenagers, parents, and bystanders) to cover complementary perspectives. Through an interview study with 24 participants (8 teenagers, 7 parents, and 9 bystanders), we found several safety threats that teenagers may face, such as virtual grooming, ability-based discrimination, unforeseeable threats in privacy rooms, etc. We highlight new forms of harassment in the social VR context, such as erotic role-play and abuse through phantom sense, as well as the discrepancies among teenagers, parents, and bystanders regarding their perceptions of such threats. We draw design implications to better support safer social VR environments for teenagers.

1 Introduction

Social virtual reality, also referred to as social VR, is a 3D virtual environment where users can interact with others through VR devices (e.g., VR headsets and controllers) [22, 41]. Social VR experiences are unique compared to those offered by other online spaces such as social media because of the fully immersive experience through voice, touching, and grabbing features using full-body or half-body tracking avatars [33]. Among all users, teenagers (between 13 and 17 years old) have become one of the largest user groups in social VR.

Technology companies such as Meta are increasing their efforts to bring more teenagers to their social VR platforms as they represent the future of their user base [12].

Prior research has shown that teenagers face significant safety and privacy risks in social VR. For example, teenagers are exposed to violence, abuse, sexually explicit content, age-inappropriate content, voice trolling, and scaring, among others [35, 35, 48]. They are also exposed to traditional forms of bullying and name-calling, as well as unique forms of harassment that are specific to social VR, such as stalking individuals across rooms or worlds [36].

Despite the risks noted in prior literature, our understanding of teenagers’ experiences with social VR and how to protect their safety, security, and privacy is still not comprehensive. We add to the literature by filling two significant gaps. First, prior research has been focused on a single perspective in social VR (e.g., users, teenagers, etc.). However, as a complex social environment, a typical social VR scene often involves multiple stakeholders, such as teenagers themselves and other adult users. This multi-stakeholder perspective has not yet been addressed. These stakeholders co-exist and may interact with each other in social VR. They may have different, even conflicting perspectives on their social VR experiences. Such perspectives may also have an impact on how they behave themselves and respond to other risks and threats. Second, unlike adult users who can purchase VR devices by themselves, most teenagers receive VR devices as a gift from their parents. A clearer understanding of whether the parents are aware of the potential threats and risks their children may encounter when using VR devices is much needed.

In this project, we take a multi-stakeholder approach to study teenagers’ experiences in social VR from the perspectives of three distinct stakeholder groups: teenagers, bystanders, and parents. *Teenagers* include youth who are between 13 and 17 years old. *Bystanders* encompasses users in social VR who are not teenagers. *Parents* refers to parents of teenagers who are social VR users. We aim to study the following three research questions:

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USENIX Symposium on Usable Privacy and Security (SOUPS) 2023.
August 6–8, 2023, Anaheim, CA, United States.

- RQ1: What threats are teenagers exposed to in social VR from the perspectives of teenagers, bystanders, and parents?
- RQ2: What are the similar perspectives and tensions among teenagers, bystanders, and parents regarding social VR threats?
- RQ3: What features do teenagers, bystanders, and parents desire to combat safety threats in social VR?

To answer these research questions, we conducted an interview study with 8 teenagers, 9 bystanders, and 7 parents. The interviews focused on participants' experiences in social VR, their perceptions and perspectives of the safety threats, and their mitigation strategies when facing these threats. Our analysis shows that some activities, such as Erotic Role Play (ERP, a type of role-playing activity that includes users decorating their avatars with components that have sexual orientation), are present among teenagers, yet many teenagers seem to have normalized such activities, and did not consider them as threats. On the other hand, most bystander participants evaluate the activities in social VR using the norms from our physical world and identified many types of risks that may jeopardize teenagers' mental and physical health. Parents generally showed a limited understanding of the threats that their teenagers may face in social VR, with many being aware of only a few potential risks. Our results highlight the discrepancies among the perspectives of three stakeholders, which may lead to conflicting social norms in social VR and possibly more significant risks for teenagers.

Our paper makes two contributions. First, we explored teenagers' experiences and safety threats from the perspective of teenagers, bystanders, and parents. This multi-stakeholder approach allows us to comprehensively examine our research questions with complementary opinions and experiences. To the best of our knowledge, this is the first study to conduct interviews with three distinct groups with a particular focus on their interactions with others and the identification of potential threats in social VR. Second, this study provides insights and design implications that aim to create safer and more fulfilling social VR spaces for teenagers. By drawing from the perspectives of parents, bystanders, and teenagers themselves, these implications can inform the design of future social VR platforms and other online social spaces.

2 Related Work

2.1 Social VR: Benefits and Drawbacks

In social VR, users can create avatars that represent them in virtual spaces, then interact with others using their body gestures through full-body tracking (i.e., the body movement of a user's avatar corresponds to the body movement of the user in real-time) [7, 9, 57, 61]. This real-time embodiment

allows users not only to customize their avatars but also pilot them with real-time gestures and motions [24]. In addition, social VR allows users to connect with each other and gather with friends from anywhere around the world and share experiences and activities that would never be possible in person [38, 42]. For example, they can watch movies in Bigscreen or play and/or create games in Rec Room. Another platform called AltspaceVR, which shut down in March 2023, offered varied activities such as interacting with people, attending events, etc. [3].

On the other hand, previous studies have highlighted that users of social VR platforms have experienced unpleasant experiences or have seen inappropriate behavior in virtual spaces. For instance, Blackwell et al. conducted an interview study with bystanders and reported that embodiment and presence in VR spaces make harassment feel more intense, and some features such as synchronous voice chat or avatar movements could trigger the risk of potential harassment in social VR [8]. Also, the results of Shriram and Schwartz's quantitative survey indicate that harassment was occasional in social VR platforms and that those in female avatars reported experiencing it more [55]. Also, scholars have studied marginalized users and how verbal and non-verbal communication could lead to potential risks of online harassment [37].

Moreover, prior work has suggested that, among all users of social VR, children and teenagers are the most vulnerable [8]. This is due to the fact that interaction dynamics between adults and children in social VR introduce barriers, tensions, and frustrations due to the co-existence of mixed ages in this social space [35, 36]. Some adults have expressed concerns for younger users in social VR because of the prominent harassment risks [35]. Researchers have also observed incidents in which young people were exposed to inappropriate content such as sex, alcohol, and virtual sexual assault [34].

2.2 Technology-Facilitated Harassment

Among all issues teenagers may face in social VR, harassment is the one rising the quickest [14, 30, 49]. Abusive sexual behavior could have a profound impact on young people's mental and physical health (e.g., anxiety, distress) as well as on the development of their sexuality and social functioning, both in the short term and long term [10]. With the development of digital technologies, harassment and sexual abuse have also raised significant legal issues such as viewing or uploading indecent images of children or teenagers on the Internet or consuming of other child sexual abuse materials (e.g., text, images, child pornography, etc.) [27, 30, 63], cyber-bullying [20, 56, 60], and cyber-grooming [19, 32, 47]. Moreover, technologies may make it easier to initiate, escalate, and maintain abuse in various contexts [29, 45, 54], such as mobile devices [39], social media [45, 50], gaming [11, 29], etc.

Numerous efforts have been made to combat online harass-

ment in order to promote a safe environment for young users. For instance, some technology companies have designed and implemented various mechanisms to detect, prevent, and report sexual harassment [6, 26, 44, 58]. Research has also highlighted the opportunity to use automated computational approaches for risk detection to support children’s online safety based on machine learning models [1, 2, 4, 15, 25, 46, 53]. Additionally, educational materials primarily targeted at parents have been developed to keep them informed about how their teens can stay safe when using social VR [43, 52]. Researchers have also been studying other ways to encourage teens to take action when experiencing harassment, like seeking peer support [31].

In this study, we build on prior work and focus on understanding teenagers’ experiences and safety threats from the perspective of teenagers, bystanders, and parents. These complementary perspectives uncover nuances around teenagers’ threats and point at opportunities for designing safety features and ensuring a safer and healthier virtual environment.

3 Methodology

To answer our research questions, we conducted a semi-structured interview study with teenagers, bystanders, and parents. We detail the study methodology in the following sections. This study is approved by our university’s IRB.

3.1 Participant Recruitment

We focused on recruiting three groups of users: teenagers (ages 13 - 17) who have experienced social VR, parents whose teenagers have used social VR, and bystanders (ages 18+) who actively engage on social VR platforms. In the context of this study, we use “bystanders” to denote individuals who are neither teenagers nor parents but may have witnessed other teenagers’ interactions with others in social VR (similar to [16]). We do not consider bystanders in the physical world who may stand next to users who use VR devices. In total, we recruited 24 participants, including 8 teenagers (T), 7 parents (P), and 9 bystanders (B). Table 1 includes participant demographic information and their social VR experience. Overall, our participants represent diverse backgrounds in terms of their age, occupation, and location.

We posted our recruitment flyer on popular online forums (e.g., Reddit subforums such as r/VRchat, r/RecRoom, and r/Oculus), online communities (e.g., Discord), and interest groups on social media sites (e.g., Twitter and Facebook). Before posting it to these sites, we sent our flyer and IRB approval letter to the corresponding platform/group moderators for their review. We only posted the flyer after obtaining the moderator’s approval.

Candidates who were older than 13 years and were interested in our study were invited to fill in a screening survey through the link provided in our flyer. In the screening survey,

we asked about their social VR experiences, the VR headset devices they have used, their frequency of using social VR, their ages, whether they have children, and if so, their children’s ages.

Candidates with stable access to a VR headset and social VR experience were eligible to participate as either teenagers or bystanders. Teenagers were those who were aged between 13 and 17. Bystanders were general users in social VR who are 18+ (we used “bystanders” rather than “users” as we were interested in their experiences as bystanders of teenagers’ activities). Candidates who had both access to a VR headset and teenagers in their household who used social VR were assigned to the “Parents” group. Although not required, all parents in our study had at least one year of social VR experience.

We did not limit our recruitment to certain geographic areas, as most social VR applications provide public places that can be accessed by users from any region in the world. We required participants to be able to communicate in English.

3.2 Interview Protocol

To accommodate the three participant groups, we framed the same interview protocol differently to account for the three different perspectives. Below, we describe the interview flow using the teenager version as an example.

The interview protocol consists of three parts. The first part focuses on the participants’ background information (age, gender, etc.), their general VR experience, and their perceptions on social VR including their perceived benefits and concerns. The second part focuses on participants’ behaviors and activities in social VR. We ask about their interactions with other users in social VR and how they approached/were approached by them. We then ask participants why they interact with other users and what their criteria are when they chose friends in social VR. In the next section, we focused on the risks and harms of social VR. We ask participants to share any negative experiences they encountered. Based on the participant’s responses, we would either follow up with questions asking for more details or, if they did not have any negative experiences or could not think of any, we would ask whether they have encountered or witnessed any negative incidents, their opinions, and their reaction or strategies to navigate through those experiences. In the last section, we ask them whether they would like to see any features on existing social VR platforms.

3.3 Data Collection and Analysis

We conducted remote interviews via Zoom. The average interview length was 60 minutes and participants who completed the study received monetary compensation of USD \$20 (or the equivalent value in their local currency). All interviews were

Group	ID	Gender	Age	Occupation	Location	Num. Kids	Usage Experience	Used Social VR Platforms
Teenager	T1	Female	17	Student	USA	0	2 years	VRChat, Rec Room Horizon Worlds
	T2	Male	14	Student	USA	0	2 years	VRChat, Rec Room
	T3	Male	17	Student	USA	0	1 year	VRChat, Rec Room
	T4	Male	14	Student	USA	0	2 years	Rec Room
	T5	Male	15	Student	Lithuania	0	2 years	Rec Room, EchoVR
	T6	Male	13	Student	USA	0	1 year	Rec Room
	T7	Male	13	Student	USA	0	1.5 years	VRChat
	T8	Female	17	Student	Belgium	0	2 years	VRChat, Rec Room
Bystanders	B9	Non-binary	47	Full-time employee	USA	0	1 year	AltspaceVR
	B10	Female	20	Caretaker	USA	0	2.5 years	VRChat, Rec Room
	B11	Male	21	Student	USA	0	1 year	VRChat, Rec Room
	B12	Female	22	Student	USA	0	1.5 years	VRChat, Rec Room Horizon Worlds, ChilloutVR
	B13	Male	23	Music instructor	Canada	0	5 years	VRChat
	B14	Female	21	Dance teacher	Canada	0	3 years	VRChat, Rec Room ChilloutVR
	B15	Male	20	Student	Japan	0	3 years	VRChat, Rec Room, Horizon Worlds, ChilloutVR
	B16	Female	NA	ASL teacher	USA	0	3 years	VRChat
Parents	B17	Male	23	IT engineer	Brazil	0	1.5 years	VRChat, ChilloutVR
	P18	Female	29	Lab manager	USA	1	1 year	AltspaceVR
	P19	Female	37	Housewife	USA	8	1 year	Rec Room
	P20	Male	41	Teacher	USA	1	1 year	VRChat, Rec Room
	P21	Male	35	Software engineer	Hungary	2	5 years	VRChat, Rec Room
	P22	Male	45	Architecture	Germany	2	2 years	VRChat
	P23	Male	53	IT project manager	UK	2	2 years	AltspaceVR, Bigscreen
	P24	Male	35	Pharmacist/ASL teacher	USA	1	3 years	VRChat, AltspaceVR

Table 1: Participants’ demographics and social VR experience

audio-recorded upon participant consent and were then transcribed using Zoom’s live transcription feature. We stopped the interviews when we did not observe new findings across all participant groups. As our study specifically focused on gathering teenagers’ experiences from various perspectives, we reached saturation with a relatively small number of participants.

Next, one researcher manually cleaned all transcriptions by correcting all mistakes generated. We then conducted a thematic analysis to identify repetitive patterns and themes in the interviews. Three researchers first selected one random transcription from our teenager participants as a sample. They closely read through the sample data several times to

immerse themselves in the data, and then coded the sample independently at the sentence level using open coding. Upon completion, the three researchers discussed the coding results together and generated an initial codebook. They then repeated the same process on two additional samples, one from the bystander participants and the other from the parent participants. Through this process, the research team generated 3 separate codebooks, one for each participant group.

Following this initial coding, three researchers separately coded the remaining data using the agreed codebook. New codes that emerged from the data were added. In this process, the research team met frequently to discuss the coding results, and updated the codebook as needed. This process was done

iteratively until all data was coded and full agreement was reached on the data from all three participant groups. All researchers then discussed and identified the themes for each user group.

Since our coding process involved multiple iterations and discussions and reached a full agreement, intercoder reliability was not necessary [40]. Upon completing the thematic analysis, the research team further compared the themes across all three participant groups.

3.4 Ethical Considerations

Since our study involved teenager participants, we took extra caution to ensure research ethics throughout the project, as described in detail below.

First, we asked all teenagers to obtain a parent’s written consent before they could participate in our study. When we identified a qualified teenager from the screening survey, we sent them an assent form to sign together with a consent form for their parent to sign. To ensure that their parent was aware of their child’s participation, teenagers were permitted to participate in the interview study only if they returned both signed assent and consent forms.

Second, before an interview with a teenager started, we always asked for separate oral consent from their parent. This is to verify that the teenager participants had indeed obtained their parent’s permission to participate in our study.

Third, similar to the work done by Cranor et al. [13], when a teenager and their parents all reached out to us, we deliberately selected either the teenager or one of the parents to participate in our study (i.e., we only selected one participant from each household, thus the teenager participant and parent participant were not in pairs). This intentional setup was to 1) respect the teenager’s right to privacy, especially if they did not want to share their experiences/opinions with their parents; and 2) avoid potential embarrassment or conflicts among family members after participating in our study. 3) When the participants shared their experiences in social VR, especially those that were deemed to be sensitive (e.g., experiences related to harassment), we reassured them that their responses would be kept anonymous. We also instructed participants that they could skip any questions if they preferred and doing that did not influence their compensation.

3.5 Limitations

Our study has various limitations. For instance, we only interviewed 8 teenagers, 7 parents, and 9 bystanders who are English speakers. While we believe that our sample size is sufficient for our study, we recognize that there may be other types of safety incidents experienced by teenagers in social VR that are yet to be discovered. Additionally, we did not interview parents and children from the same family together

to understand family dynamics. As mentioned above, we intentionally chose not to do so for ethical considerations.

4 Results

In this section, we present our findings on teenagers’ social VR experiences. We focus on teenagers’ experiences and potential safety threats from three perspectives: teenagers, bystanders, and parents. This section follows the four major themes we identified in our data analysis, including participants’ general perceptions of social VR, teenagers’ relationship-building practices in social VR, teenagers’ safety threats, and desired features. Given the qualitative nature of our study, when reporting the results, we used the terms “a few”, “some”, “several”, “many”, and “nearly all” to convey the relative sense of frequency rather than using specific numbers, similar to prior work [18, 28, 62].

4.1 Participants’ General Perceptions of Social VR

Our participants from the three user groups demonstrated a consistent perception of social VR. Nearly all participants used social VR apps as a leisure activity to socialize, play games, and have intimate relationships in an immersive environment. Rec Room, VRChat, and AltspaceVR remain the most popular platforms among our participants. They were particularly drawn by several unique features of social VR platforms, such as real-time interaction, facilitating multi-modal communications (e.g., through voice, tone, body movement, facial expression, etc.), and the lifelike social environment. Additionally, many participants indicated that the full-body movement and the ability to support fluid non-verbal communication alongside verbal communication contribute to the unique experiences and made it more genuine to engage in various activities. These results echoed the findings from several prior work [21, 22, 36, 37], thus we only summarize them briefly. In the following sections, we focus on the nuances of this study and show teenagers’ experiences from the perspectives of teenagers, bystanders, and parents.

4.2 Building and Maintaining Relationships in Social VR

Compared to traditional 2D social networks, social VR provides a unique yet complex social environment, making it more challenging for teenagers to navigate through it. One common and fundamental activity relates to relationship building in social VR. Many teenager participants discussed how they have built and maintained relationships with other users in social VR, while many bystander and parent participants provided their observations to further uncover teenagers’ practices.

In particular, while half of the teenager participants were able to bring their real-life friends into social VR for fun and interactive activities, the rest of them sought connections with new people. As a result, these teenagers were constantly involved in frequent and spontaneous interactions with strangers (i.e., people they have never met in real life). In this section, we present teenagers' strategies to develop and maintain relationships as well as their strategies to protect their own safety.

4.2.1 Various Strategies to Make Friends

Being in a complex social environment in social VR, teenagers have developed their own strategies for building connections with strangers. When approached by other users, teenagers relied on several signals to decide whether to respond or not.

Appropriate avatar behaviors as a positive sign. With limited information available to judge other users' characteristics, their behaviors became the primary factor in determining whether one would be accepted as a friend in a virtual world. The majority of the teenager participants reported that they preferred to make friends with those who exhibit decent and appropriate behavior. For example, T6 (13, male) mentioned that he may look for individuals who appeared to be respectful, kind, helpful, and avoid engaging in inappropriate or offensive behavior:

"I talked to them if they helped me with something, but if they're rude, I normally try to stay away from them, and most of the time in Gorilla tag, there's this button where you can mute people so that you don't have to listen to them." T6 (13, male)

As T6's example highlights, interacting with others in social VR could be a complex and challenging experience. He developed strategies for interacting with others that prioritize his own comfort and safety. Furthermore, T6 took proactive measures to protect his own well-being such as muting rude people in social VR to create a safe environment for himself. In general, our teenager participants selected who they talk with and chose to engage with people who are respectful and not prone to use rude or offensive language.

Many bystanders and parents in our study agreed that teenagers' safety should be the top priority. Yet, as adult users, bystanders and parents often focused more on engaging in interesting conversations when they themselves were users.

Seeking peers from the same age group. Furthermore, nearly all teenagers preferred to interact with a certain age group in social VR. As most teenagers often felt a greater sense of safety and comfort in forming friendships with users of the same age due to their shared experiences, common interests, and mutual understanding that come with being at a similar developmental stage.

"I feel like it's just easier to talk to my age. Because they just usually play for fun portion and then the older group I feel like it's just harder to talk to. Because they're just not

the same age, so they can't relate to the things I do." T5 (15, male)

This perspective was further confirmed by many parents and bystander participants. For example, several parents mentioned that it is safer for their kids to interact with their own age group and peers. For example, P19 (37, female) commented:

"I want my kids to kick it with their peers in virtual reality, keep them safe and happy, by encouraging our children to become friends with individuals who are their own age or who they already know, we can provide them with a greater sense of security and comfort in these virtual environments." P19 (37, female)

In this quote, she emphasized the importance of parental involvement in keeping children safe and happy in social VR and she suggested that parents encourage their children to form friendships with individuals who are of their own age. By doing so, children could establish clear boundaries for communication and minimize the potential risks associated with strangers interacting online. However, it should be noted, that judging a user's age through their avatar is very challenging, as in most cases, there is no reliable indicator of a user's age in their avatar. A user's voice can be a reference, although mistakes can still occur. We will further unpack this point in the discussion.

Migration to cross-platforms to extend friendship. As social VR remains a synchronous platform, maintaining relationships becomes more difficult if the other users were not online. Thus, among many teenager participants, it was very common to migrate their interaction from social VR to other platforms (e.g., Discord), as they believed Discord offers a more convenient way to communicate with friends and sustain their relationships outside of the virtual environment. Furthermore, Discord's features to allow users to hide their identity and personal information, as well as the option to block individuals who make them feel uncomfortable or unsafe, provided a sense of control and security that is highly valued by many teenagers. T7 (13, male) commented on his experience with Discord:

"I decided to get Discord because it was what my Rec Room friends were using, and I just got it. And then I was like, hey I like this. Now I spend a lot of time talking to my friends about this. I'll never give them my number or email. Because that's, like personal. But Discord, I feel like you can still hide your identity." T7 (13, male)

On the contrary, a few parents believed that using Discord may cause additional risks to teenagers' safety since they believed that teenagers tend to share their personal information more easily on Discord, which could potentially lead to further risks. P20 commented:

"I was worried about my kid using Discord. I heard about these predators on the internet that try to get kids to give them

their personal information. And I thought, what if my kid gets caught up in that.” P20 (41, male)

It is important to highlight that many other parent participants were not aware of the extended communication through these external platforms. This discrepancy made it challenging to maintain teenagers’ safety. While most teenagers preferred to use other platforms to continue engaging with the people they met in social VR and believed it would be safe to do so, there was a lack of attention to these platforms from the parent’s perspective. We will further discuss this phenomenon in the discussion section.

4.2.2 Casual Activities to Enhance Relationships

Social VR offers a unique and immersive experience that makes many seemingly unlikely social interactions possible in a virtual world. Nearly all teenagers in our study discussed their experiences of many different activities, such as playing games, dancing, sleeping, etc. Among these activities, some teenagers believed that casual activities (e.g., watching movies, having virtual parties, etc.) were effective ways to enhance the relationship among different users.

One popular activity that has been witnessed or experienced by multiple bystanders and parents is virtual drinking. To engage in this activity, one would enter a virtual bar that simulated the experience of a real-life bar, allowing them to socialize and spend time with their friends in a simulated bar environment. Essentially, virtual drinking events inherently serve as a social gathering that facilitates connections among users. However, some of the bystander and parent participants have expressed concerns about the involvement of teenagers in these events, as these drinking events were open to all ages and may nudge teenagers to drink in real life. Even though they have not yet seen such incidents happening to their teenagers, their concerns still exist. For example, P24 (35, male) stated the appropriateness of the situation, especially in the context of teenagers potentially being exposed to adults getting drunk in social VR:

“I see a lot of adults in a lot of the drinking worlds, for example, like the party drinking worlds, a lot of people seem to have a really really hard problem with either alcoholism or addiction [...] I worry about kids, as well, you know, because kids are impressionable, and this game is filled with predators. There are plenty of people who will take advantage of kids while they are drunk, just in general.” P24 (35, male)

Furthermore, some parents further commented that those who got drunk in social VR environments may engage in behaviors that would be dangerous or intolerable in the real world, such as harassment, which could be especially harmful to teenagers. They may engage in inappropriate behaviors that could harm or exploit children, such as sharing inappropriate or explicit content or asking for personal information.

4.2.3 Safety Measures

As some teenagers appeared to be aware of the risks of connecting with virtual strangers, they have developed and adopted some measures to ensure their safety.

Use alternative identifications. One safety measure that several teenagers reported employing was being cautious about sharing their personal information. For example, in T1’s (17, female) example, her approach of not sharing her name with strangers was an effective way to protect her personal information and maintain distance from individuals she did not know:

“I feel like I can trust strangers to a certain level, but I’m not fully trusting. I’m not gonna tell my name. I’ll normally just have my friends call me by my first initial when I’m online. That is a common thing.” T1 (17, female)

From some parents’ perspective, they were concerned that teenagers might not be able to properly manage the distance with strangers and would possibly reveal personal information, which may further lead to great risks. Some parents confirmed such risks when interacting with strangers. P21 (35, male) shared his daughter’s experience when she interacted with a stranger (an adult) who tried to communicate with her. In this case, he referred to the stranger as a “predator”:

“My daughter was in the VRChat and people asked her for her address and if she has Facebook or Instagram. I don’t want to judge anything, but at that moment, I thought there may be a pedophile, preying on children. Like what grown men ask like a child for Instagram and addresses just for friendship?” P21 (35, male)

Using avatars for anonymity. Most of the social VR platforms provide a variety of avatar options, including humanoid avatar (e.g., AltspaceVR, VRChat, Bigscreen) or non-humanoid avatar like an animal, superhero, or historical figure, or customized avatars from third-party platforms (only supported in VRChat), etc. [61]. This is, for the most part, designed for users to represent themselves in social VR. Some teenager participants agreed that social VR avatars could facilitate friendships by creating a visual representation of users that can be interacted with, allowing for greater immersion, social presence, and connection between users. Additionally, avatars facilitated nonverbal communication, such as gestures and body language. This is particularly important for conveying emotions, which are an essential aspect of human communication and are often difficult to express through text-based interactions.

Interestingly, using avatars may also create a sense of safety for some teenagers. In our dataset, several teenagers mentioned that avatars could provide people with a degree of anonymity and allow them to express themselves freely without revealing their real identities. This sense of anonymity made them feel more comfortable and less self-conscious, enabling them to build relationships with others more easily.

As T1 (17, female) mentioned, using avatars made her feel safer:

“I feel safer because it’s not really a high risk. You don’t really know who I am, you don’t know where I live. You don’t know what it looks like, it just feels safer having those cool avatars to represent you!” T1 (17, female)

4.3 Teenagers’ Safety Threats

Prior work has suggested various types of threats in social VR, such as sexualized language, hate speech, visible sexual gestures, and so on [8, 23]. We continue to explore the safety threats that teenagers may face. In particular, our multi-stakeholder approach allowed us to explore not only teenagers’ experiences but also the observed incidents from bystanders’ and parents’ perspectives. As a result, some of the following threats were reported by teenagers directly while others were observed by either bystanders or parents.

4.3.1 Sexual Harassment Through Erotic Role-Playing

Erotic Role-Play, or ERP, is a type of role-playing activity performed mostly or exclusively for sexual behavior and intentions. To do this, users would customize their avatars and decorate their avatars with symbols or components that have a sexual connotation.

Our teenager participants did not report their own experiences with ERP. However, some bystanders and parents repeatedly reported examples of ERP based on their experiences and how teenagers were engaged in ERP-related activities in social VR. They raised concerns about teenagers’ access to adult-only ERP chats and content, such as virtual sex, lap dancing, etc. These activities were designed only for adults and would need to be accessed through private links on external channels (e.g., on Discord). However, these external channels were not associated with social VR applications and thus, were not restricted by the policies on social VR apps. As a result, teenagers were able to access such content easily.

For example, B11 (21, male) shared that while ERP activities were not published in public rooms, teenagers could still access them through quick searches in Discord channels or similar platforms, after which they would then ask for an invitation. He shared the time when he learned a teenager who got involved in ERP from a report :

“I follow some reports. I think he was just a 15-year-old who reached out to someone who did ERP [through Discord], and he released his age to the person in the ERP but still went through it. They allowed him to have some sort of ERP, even knowing his age.” B11 (21, male)

Another example further suggested an alarming fact that even though the harassment activities happened in social VR, they started from places other than social VR. The safety measures and policies in the social VR platforms, regardless of

their effectiveness, did not cover these external spaces, which may cause invisible threats to teenagers. Another bystander commented on this point:

“I think that it’s accessible because it’s as easy as a click of a button. If a teenager found out that there’s a community for ERP or lap dancing, they could join the discord and figure out how to get in or something.” B12 (22, female)

Relatedly, to enable erotic role-playing (ERP), one would need to have customized avatars through third-party platforms/software (e.g., Blender, Unity), and then import their avatars to social VR platforms (e.g., VRChat). Users are not obligated to adhere to any specific rules regarding the appearance of their personalized avatar on third-party software unless they need to meet certain technical requirements (e.g., rigging, polycount, textures, materials, and model format). Thus they are free to use any design, such as sexual components, insulting language, etc. These avatars may be inappropriate for teenagers to be exposed to.

4.3.2 “Feel” Virtual Harassment Through Phantom Sense

Phantom sense is a phenomenon caused by immersion in a VR environment where a user’s brain tricks their physical body into feeling touch sensations on their virtual body in virtual environments. This phenomenon arises from the mind’s confusion between reality and the virtual world. For example, when a user gets close to a fire in VR, their body will feel the heat. Usually, users can trick their minds to believe it is real and gain the ability to actually “feel” things in VR. Generally, there are different types of phantom senses - touch, smell, warmth, pain, etc., and every user can feel them, but some are more susceptible than others. It should be noted that with proper training, a user can make their phantom sense stronger and start feeling things and objects inside virtual reality.

While phantom sense can be used to intensify the emotion and joy of social VR activities, it may be misused by some malicious users for their own advantage. In our study, some teenager and bystander participants reported their experience of being harassed through phantom sense. T8 (17, female) shared her example:

“I have phantom sense on my arm, forehead, and nose too. It’s not good to have it though. I regret mentioning I had it. If people know about it, a lot of them will abuse me. It feels like someone is scratching me, it’s itchy ... I took off my headset like it makes me feel uncomfortable when they get close.” T8 (17, female)

Relatedly, a few bystander participants reported an alarming fact: they reported that some teenagers took advantage of phantom sense and harassed other users without knowing the real consequences of it. For example, B10 (20, female) observed that when a female user talked about her phantom sense, a few other teenage boys in Rec Room started to touch

her body. This particular incident becomes alarming since teenagers, without proper guidance and rules in social VR, may flip their role from victims to predators without realizing it. She explained:

“I know quite a few people whose phantom sense becomes second nature to them to feel the things that they see happening to them. And don’t ever say that you have phantom sense, because teenagers will do things to you against your will. I’ve seen it happen so many times in Rec Room that someone’s talking about her phantom sense and as soon as you hear that everyone flocks to that person trying to find out who has it. They start touching her boobs, they start trying to rub her down there. They try kissing her or touching her neck.” B10 (20, female)

In B10’s example, she highlighted that teenagers may not have the maturity to regulate their behaviors in social VR, which could cause a risk for others who have a phantom sense to feel hurt in the physical world.

4.3.3 Physical Aggression

Virtual physical aggression. Physical aggression is behavior causing or threatening physical harm toward others. It includes hitting, kicking, biting, using weapons, and breaking toys or other possessions [17]. In our study, some teenagers reported various cases in which they were involved in physical aggression. For example, T5 (15, male) explained his experience with a team-based game in social VR:

“It’s a team-based game where four people versus the other four people and I’m on one team and I kill one of their teammates, and the teammate starts being toxic and stuff, and the whole team just targets me, and hits my avatar, only because I killed their teammate.” T5 (15, male)

In this case, neither our participant nor the other players in the game were physically hurt. However, the experience that our participant went through was disturbing. Such incidents became even more concerning considering the interconnection between physical aggression and violent behaviors, as research has shown that exposure to violent VR content could lead to elevated levels of aggression [51], posing long-term impacts on teenagers’ mental health.

Parents normalize physical aggression. Interestingly, some parent participants held a different opinion regarding such physical aggression. They seemed to have normalized physical aggression and considered it as a normal aspect of playing virtual games. For example, P22 (45, male) mentioned that such behavior should be accepted as part of the gaming experience:

“So far, the only thing they [my kids] told me is that their thought on somebody who destroyed their house in Minecraft. Stuff like that happens in gaming. So somebody beat them in a game all the time and they were angry, but that’s normal.” P22 (45, male)

P22 later suggested that he was also aware of the potential negative impacts of aggression and was taking steps to address it by asking his kids to share their experiences with him. As researchers, we believe that more active actions are needed to stop aggression from happening, as exposure to aggression in video games can have negative effects on children’s behavior and social development [5]. We will further unpack this point in the discussion section.

4.3.4 Virtual Grooming Using Avatars

Grooming is one particular type of threat that can be difficult to identify by teenagers, as they are typically the victims without realizing it. Grooming refers to the situation in which an adult manipulates or abuses children or teenagers through building relationships and trust [19,32,47]. In our study, some bystanders shared their observations which they considered as grooming. For example, B10 (20, female) shared an example in which she unsuccessfully tried to help a 6-year-old boy:

“[PlayerID] admitted that he was looking for younger girls to be friends with, and he was 35. He had this 6-year-old, eating out of his hand. He groomed her into thinking that he was her friend and that she could only trust him, and I tried to help her. I tried to tell her this guy is a predator but she didn’t believe me, she was too far gone.” B10 (20, female)

This was an alarming example. Existing social VR platforms generally have a suggested age limit for their users (e.g., the age requirement for VRChat is 13 years or older [59]). Yet, children younger than 13 still accounted for a large percentage of the user base. Thus, users with malicious intentions may easily take advantage of them through grooming. Furthermore, avatars hide the real identity of the people behind them, making it difficult to identify the adults and their intention. As a result, trust can be built through some innovative ways, such as using a child’s favorite avatar. P18 (29, female) provided an example:

“I just feel in a virtual reality setting, kids are more susceptible to manipulation. You can make that avatar something similar to a character that the younger kids would love. I would expect that to happen in VR, and any form of that, I would consider abuse and manipulation.” P18 (29, female)

4.3.5 Potential Threats in a Private Room

In social VR, users can create or join private rooms, which are invitation-only spaces. The purpose of these private rooms is to provide a more controlled environment for users to interact and engage in activities. To understand the dynamics in private rooms, it is necessary to talk to people who have experiences in these rooms. In our study, several teenagers, parents, and bystanders have been invited to join private rooms, and their experiences pointed to potential threats to teenagers’ safety. For example, P23 (53, male) shared a case in which

teenagers were invited to watch adult content in a private room in Bigscreen (a social VR app that supports movie sharing) and faced unforeseeable risks:

“I’ve seen it [adult content] quite a few times on Bigscreen. Adults will ask a child to join them in a private room and send a link to it. Or they’ll open a room, then make it private when you’re in there [...] I’ve seen porn movies in open rooms in Bigscreen. They’re supposed to be safe so children don’t see them. But they’re not.” P23 (53, male)

When facing threats in private rooms, some teenagers were able to identify, then responded proactively to combat the threats. For instance, T5 (15, male) witnessed a situation in which an adult user tried to lure a teenager into a private room in Echo VR. He quickly recognized the threat and took immediate action by reporting this adult user:

“I was chatting with a guy in Echo VR and an older man teleported in and talked to another player who was a boy. When I got closer to them, the older guy went quiet, he was trying to take the young kid to the private lobby to keep talking to him after I confronted him, I reported him.” T5 (15, male)

As suggested by these examples, in private rooms, teenagers’ threats and possible mitigation strategies may not be obvious to users and remain ineffective. We will discuss the implications in the discussion section.

4.3.6 Ability-Based Discrimination

Occasionally, the social VR environment was lacking inclusiveness, as reported by our participants. A few teenagers reported that they have witnessed incidents in which other users discriminated against some teenagers with disabilities. They highlighted the possibility that those users may not recognize the challenges that teenagers with disabilities may experience in social VR, and their seemingly joking behaviors may lead to discrimination, which negatively impacted the experiences of teenagers with disabilities. For example, a teenager described an incident in which another teenager with a speech disorder was discriminated against by other users:

“I’ve seen a kid that had speech disorders or speaking disabilities, he did speak weirdly, like he did not spell some word properly and they would go up to him and would make fun of him and ask why he has it.” T7 (13, male)

4.4 Desired Safety Features in Social VR

Similar to previous studies that have focused on marginalized users (e.g., members of the LGBTQ community or women) who have used nonverbal communication (e.g., specific gestures) to protect themselves from potential harassment, [37, 48], our study explored several safety practices commonly used by our participants, such as reporting to the platforms, banning/muting/blocking other users, making other

users invisible (e.g., using Personal Space Bubble), and assessing other users’ trustworthiness before interacting with them (e.g., through Trust Rank). In this section, we present some nuances regarding participants’ desired safety features.

Age matching mechanism. Many teenagers and bystanders often preferred to interact with others from a similar age group, while some parents preferred their teenagers to do the same. Our participants believe that matching players in public games based on their age may have a very positive impact on the social VR community by reducing undesired safety risks and harassment. As a teenager illustrated:

“I would probably try to separate it, like having two dedicated games, one for children and then one for adults. I think that would help mitigate harassment or even make it even easier to track who’s harassing who and maybe make the discipline.” T6 (13, male)

This age matching system was one of the most favored safety features by the majority of participants, yet it is important to acknowledge that implementing such features could inadvertently provide opportunities for predators. For example, predators could potentially exploit the system by reporting to be a kid, gaining approval from the platform, and then accessing a kid-only environment.

Age verification. To facilitate the age-matching process, another relevant safety feature is age verification. Some participants were looking for a feature in social VR platforms to ensure that a predator could not fake their age to access children’s rooms and vice versa. For example, P24 (35, male) suggested that the platforms should ask for photo ID to confirm the identity and the age of the users:

“I’m hoping for a way to verify your age. So like a passport or something to verify that you’re actually over the age of 13, so that minors don’t get targeted by older audiences. I feel like kids should play with other kids and then everybody should play with their own age group.” P24 (35, male)

Sexual harassment history indicator. As mentioned above, a banned user may create a new account and continue using the service. One safety feature that could remediate this issue would be to have an indicator on users’ avatars regarding their harassment history. For example, P23 (53, male) suggested that the avatar of a previously banned user may include an indicator (e.g., a badge) to show their prior harassment record in the platform as a warning to other users:

“I feel like those who have been banned for sexual assault, or sexual behavior in a public area, should have some kind of mark on them [their avatars]. Like a sexual predator predictor. I feel like that would definitely help the community and maybe even discourage sexual assault.” P23 (53, male)

This feature was highlighted by a few participants as a potential strategy to identify predators. While it may initially appear to be a promising approach, it is crucial to recognize that its implementation could inadvertently raise new forms

of harassment within the platform. For instance, users may specifically target or launch attacks against individuals who display this indicator, resulting in unpredictable consequences.

Parental control and involvement. Some participants highlighted that a significant part of child safety lies with their parents. Thus, some participants recognized the importance of having parental controls, such as limiting children’s playing time, limiting the number of social VR platforms used by their children, etc. Our participants also suggested that parents need to be more engaged in their children’s activities and be aware of the people they socialize with in social VR.

5 Discussion

As we move into an increasingly digital world, the realm of virtual reality (VR) has become an important area of focus for Human-Computer Interaction (HCI) studies. The rise of social VR presents new and unique challenges, particularly regarding the potential risks associated with its use. While previous HCI studies have explored these risks, it has been noted that most of these studies have only focused on a single group of users, such as young adults or bystanders [8, 23, 55].

Our study endeavors to explore teenagers’ social VR experiences from the perspectives of teenagers, bystanders, and parents, who are all essential stakeholders in social VR ecosystems. This multi-stakeholder approach takes advantage of the unique experiences and perspectives of each stakeholder and provides different yet complementary angles to understand teenagers’ experiences and identify potential threats in social VR. Our results revealed a number of threats that teenagers may face in social VR. Some of the threats came from teenagers’ experiences while others were observed by bystanders and parents. In this section, we reflect on our findings and further discuss how these findings shed light on nuanced forms of threats and social norms. Based on these findings, we also discuss the implications of designing safe and healthy social VR platforms as safe spaces.

5.1 Categorizing the Sources of Teenagers’ Safety Threats

Our results suggested different types of safety threats that teenagers may face in social VR. Upon further examining these threats, we started to note the causes of these threats and grouped them into the following categories.

Discrepancies among the perceptions and experiences of teenagers, bystanders, and parents. Our data suggested teenagers, bystanders, and parents constantly held different opinions and/or experiences towards the same activities. Such mismatch may have led to some hidden threats which may not be obvious otherwise. For example, in the case of building connections with strangers in social VR, most of our teenager participants have normalized this action to be a fundamental

aspect of social VR, yet parents and bystanders pointed out cases in which teenagers may face privacy and security risks due to the interaction with strangers. In the example of virtual grooming, our teenager participant built trust with the predator easily, yet bystanders who observed the situation tried to help the teenager but were refused, leading to greater risks of being harassed by the predator. In the example of physical aggression, our teenager participant who experienced physical aggression had disturbing feelings, yet their parent believed that it was an integral part of the game experience in social VR. When these discrepancies exist, teenagers would either not accept the help offered by others (since they believed that risks did not exist) or not ask for help when needed (since other stakeholders may not care about it). It became difficult to convince others to take proactive action and mitigate the potential risks.

Lack of social norms in social VR. Social norms, behaviors, and values in the physical world are shaped by socialization processes, cultural contexts, laws and policies, and broadly-acknowledged values. Similar to our physical world, social VR also represents a complicated social space that includes different types of users, events, and activities. Yet, the norms in our physical world may not necessarily translate to social VR environments. In fact, social VR did not seem to have established social norms that users follow to maintain a proper environment. For example, in the case of drinking alcohol in a bar, teenagers would not have access to an actual bar due to the age restriction. Yet, the lack of social norms in social VR made it possible for them to access the virtual bar and participate in activities, some of which might be inappropriate for teenagers (e.g., some teenagers were nudged to drink alcohol in real life). In the case of ERP, teenagers may also be exposed to sexual content (e.g., avatars with sexual symbols or signifies), which was against the established social norms in the physical world yet remained popular in social VR. We consider these types of threats as “hidden threats”, which could be easily overlooked otherwise.

A challenge in identifying and defining social norms within social VR lies in its inherent anonymity. When users embody themselves through avatars, specific identity information (e.g., gender, age, and preferences) may be lost. However, the norms users are used to in the physical world are largely based on users’ identity, and thus, are no longer effective in social VR. Future work should investigate human behaviors in social VR and help establish/identify appropriate social norms to ensure a healthy VR environment for teenagers.

Technological limitations and barriers. As social VR is evolving and not sufficiently mature, it also creates some technical limitations for users. For instance, moderators play an essential role in social VR, particularly in case users need help. However, moderators were not readily available in private rooms where safety threats were quite common. Instead, the responsibility of moderation is often left to the owner or creator of the private room who may not have the experience

to effectively manage the dynamic of the environment. As a result, these private rooms can inadvertently become safe havens for predators to engage in harmful activities, such as grooming, bullying, or exploitation of teenagers.

Additionally, VR devices also introduce limitations by providing an enclosed first-person experience only to the user. As such, our parent participants generally lacked participation in their children's VR activities. In fact, only a few parents in our study stated that they regularly played in VR with their children. Currently, social VR platforms do not support ad-hoc recording or checking history functions, making it difficult for teenagers to document their experiences and for parents to learn about these incidents. As such, this limitation further deepens the perception gap between teenagers and parents and may potentially cause more harm in the long run.

Finally, the immaturity of social VR ecosystems also contributes to teenagers' safety threats. For example, the process of avatar creation and customization also introduced further limitations. In our study, participants who wanted to customize their avatars needed to turn to third-party software or platforms (e.g., Unity, Blender). However, those platforms did not have proper guidelines or validation mechanisms to regulate the process. Social VR platforms also did not have power over these third-party platforms nor provided mechanisms to filter customized avatars other than some technical limitations (e.g., customized avatars cannot exceed certain sizes). As a result, users can freely create and utilize avatars to meet their individual needs which could potentially turn their avatars into vehicles of harassment (e.g., ERP).

5.2 Design Implications

Designing age-specific matching mechanisms for social VR. We propose the implementation of an age-matching system for social VR platforms, considering the significant usage of these platforms by teenagers and children. As highlighted in section 4.4, our participants expressed a strong preference for interacting with peers of a similar age. While some platforms offer junior accounts, the existing age verification system falls short of ensuring the accuracy of users' real age. We suggest that platforms consider implementing parental consent as a means of age verification. For instance, during the account creation process, the platform could send a link to the parents' phone that when clicked can allow them to sign a consent form. Moreover, while we acknowledge the possibility of users attempting to fake their age, additional ongoing monitoring measures can be put in place. These monitoring measures could involve the use of algorithms to detect suspicious behavior or inconsistencies in user profiles such as being reported multiple times or sending many unnecessary messages. By flagging potential discrepancies or anomalies in user activity, the platform can prompt further verification checks to ensure the accuracy of the user's age information.

Enable recording in social VR. We believe that it would

be beneficial to incorporate a feature that allows users to share evidence with social VR moderators in case of unsafe and/or uncomfortable experiences. We propose the implementation of an "emergency button," similar to the screen recording functionality in the Zoom video conferencing software, to assist teenagers to request help when experiencing harassment, aggression, or other unsafe incidents in social VR. Activating this button would initiate the automatic audio and video recording of all activities within the user's vicinity, providing valuable evidence for future reference. It should be noted that to avoid abusing such a feature, the recorded media must be securely stored (ideally locally in VR headsets) by the social VR platforms and should be made exclusively accessible to the system moderators who can review them and take appropriate actions. Furthermore, the platforms should promptly notify moderators and parents when a user uses this feature to ensure their well-being.

Supporting non-tech-savvy parents and guiding children's social VR experiences. Concerns over the safety of teenagers in social VR have prompted many parents to seek further education in this field given their limited familiarity with the platform. To this end, one effective approach to address this need would involve updating existing safety education resources to include a dedicated VR component highlighting the potential risks and threats. Such materials could help raise awareness of harassment and sexual abuse issues in social VR among parents and their children and the same time equip children with the necessary knowledge to safely use social VR.

6 Conclusion

Social VR platforms have become increasingly popular in recent years among teenagers, yet safety issues such as harassment and sexual abuse continue to be significant concerns. This paper aims to investigate teenagers' experiences in social VR through three different perspectives, with a specific focus on harassment issues. Through an interview study with 8 teenagers, 9 bystanders, and 7 parents, we identified several threats for teenagers in social VR, including grooming and manipulation in private worlds. We also highlight new forms of harassment in social VR, such as Erotic Role-Playing and through phantom sense. Our findings provide a better understanding of the risks faced by teenagers in social VR and offer insights to design safer and more fulfilling experiences for them. We hope that our study contributes to the ongoing efforts to create safer social VR environments for teenagers.

7 Acknowledgment

We thank the anonymous reviewers and the shepherd for their invaluable feedback and participants for sharing their insights. This work is partially supported by a research gift from Meta.

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8 Appendix

8.1 Interview Protocol (Parent and Bystander)

8.1.1 Demographics

1. What gender do you identify yourself as?
2. How old are you?
3. What do you do for a living?
4. How many children do you have?
5. How old are they?
6. What types of devices do they have?
7. Which child(ren) uses VR?

8.1.2 Background

8. When did you buy your VR headset? Why?
 - (a) What are the things you consider when buying a headset?
 - (b) Have you ever tried it yourself?
 - (c) Can you describe your experience?
9. Do your kids use VR? What do you think your child generally uses VR for?
 - (a) How often do they use VR?
 - (b) When was the last time your child used VR?
 - (c) Do you know what they did?
10. In general, what do you think of VR?
 - (a) Do you see any benefits of VR?
 - (b) Do you have concerns about VR?
 - (c) Have you ever heard of or experienced anything in VR that makes you frustrated?

8.1.3 Behaviors in VR

11. Have you ever heard of/used any social VR applications?
 - (a) Can you provide some examples?
 - (b) When was the last time you used *** (social VR apps)?
 - (c) Can you walk us through what you did?
 - (d) (Specifically, we want to follow up to see if they have ever interacted with anyone, like chat, talk, or other types of interaction) Did you interact with anyone?
 - (e) If so, how? Did you approach them or the other way around?
 - (f) What did you do? Why?
 - (g) In this case, do you think the person you talked to is someone that can be trusted? Why?
12. (For parents) Do you know whether your child uses social VR or not?
13. What do you think about the idea of having your child (or teenagers) interact with other people in a virtual space? Would you support that?
14. From your perspective, what would be the reason why your child (teenagers) would like to interact with others in social VR?
15. In general, do you feel social VR is a safe place for your child? Why or why not?

8.1.4 Risks and Harms

16. (For parents) Do you know whether your child has any friends in social VR?
 - (a) How did that start?
 - (b) Are you supportive of these?
 - (c) In fact, related to the last question, have you ever talked to your child regarding how to decide whether to interact with someone in social VR or not?
 - (d) Do you have any rules or guidelines you follow?
17. (For parents) Has your child ever encountered any risks or harms when they use social VR?
 - (a) How did you find out about it?
 - (b) (If yes) Can you tell us a little bit about what happened? What did you do?
 - (c) (If no) Have you ever seen any negative experiences happen to other people, like other kids or from other parents, or from the news?

(d) Are there any signals you are looking for?

18. Have you ever encountered any negative experiences yourself or have you ever seen anything when you use it?

8.1.5 Safety by Design

19. Are you aware of any features or functions in social VR apps that can help ensure your safety when you are playing?
20. From your perspective, is there anything to be done to ensure the safety of the social VR space?
21. Now, imagine that you have a superpower that can be used to do anything. What changes would you make to the social VR apps you have used? (prompt: think from policy, technology, feature, design, etc.)

8.1.6 Wrap Up

22. Is there anything else you'd like to share?

8.2 Interview Protocol (Teenager)

8.2.1 Demographics

1. What gender do you identify yourself as?
2. How old are you?
3. What grade are you? Out of school? Working/college? (Depending on the age of the participant)

8.2.2 Background

4. Do you own any VR headsets?
5. What do you generally use VR for?
6. How often do you use VR?
 - (a) When was the last time you used VR?
 - (b) Can you tell us what you do?
7. In general, what do you think of VR?
 - (a) Are there any cool factors?
 - (b) Do you have any concerns?
8. Have you ever gone through anything in VR that makes you frustrated?

8.2.3 Behaviors in VR

9. Have you ever used any social VR applications?
 - (a) Can you provide some examples?
 - (b) When was the last time you used *** (social VR apps)?
 - (c) Can you walk us through what you do?
 - (d) (Specifically, we want to follow up to see if they have ever interacted with anyone, like chat, talk, or other types of interaction) Did you interact with anyone?
 - (e) If so, how? Did you approach them or the other way around?
 - (f) What did you do?
10. In general, why do you talk to other people in Social VR?
 - (a) (If they have done that before in the prior case) So you mentioned that last time you talked to someone, is that for the same reason?
11. How did you decide who you can talk to and who you don't want to talk to?
 - (a) (If they have done that before in the prior case) In that case, do you think the person you talked to is someone that can be trusted? Why?
12. In general, do you feel safe in social VR? Why or why not?

8.2.4 Risks and Harms

13. Have you ever encountered any negative experiences when you use social VR?
 - (a) (If yes) Can you tell us a little bit about your experience, if you are comfortable? Please be assured that no one beyond our research team can hear what you said.

- (b) What did you do?
- (c) (If no) Have you ever seen any negative experiences happen to other people, like your friend or someone else in the social VR apps?
- (d) (If yes) Can you tell us a little bit about what happened?

14. Have you ever been approached by some other people in social VR apps, especially those you don't know?
 - (a) (If yes) What did you approach you for? Can you talk a little bit about the scenario?
 - (b) What did you do? Why did you do that?
 - (c) How do you decide whether to respond to this person or not?
15. In fact, related to the last question, how do you decide whether to interact with someone in social VR or not?
 - (a) Do you have any rules or guidelines you follow?
 - (b) Are there any signals you are looking for?

8.2.5 Safety by Design

16. Are you aware of any features or functions in social VR apps that can help ensure your safety when you are playing?
17. From your perspective, is there anything to be done to ensure the safety of the social VR space?
18. Now, imagine that you have a superpower that can be used to do anything. What changes would you make to the social VR apps you have used? (Think from policy, technology, feature, design, etc.)

8.2.6 Wrap Up

19. Is there anything else you'd like to share with us?