

Stay Connected in An Immersive World: Why Teenagers Engage in Social Virtual Reality

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ABSTRACT

Social virtual reality (VR) has emerged as a popular online space for teenagers to interact and socialize. It attracts teens due to the broad range of immersive activities and social engagement opportunities, along with diverse users in terms of age and interest. Yet, little is known about teenagers' experiences and understandings of this emerging online social space, especially regarding what aspects may attract or dissuade them to social VR. To explore this question, we conducted in-depth interviews with 20 teenagers (e.g., ages 13-18) and reported findings regarding what attracted them to engage in social VR and challenges with social VR that may dissuade them from using it. Our findings contribute to the growing body of scholarship on teenagers' experiences in emerging, novel online social spaces and highlight potential design implications for creating safer and more fulfilling social VR experiences for teenagers.

CCS CONCEPTS

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

KEYWORDS

social VR, social virtual reality, teenagers, social interaction, virtual reality, social dynamics, virtual worlds

ACM Reference Format:

Divine Maloney, Guo Freeman, and Andrew Robb. 2021. Stay Connected in An Immersive World: Why Teenagers Engage in Social Virtual Reality. In *Interaction Design and Children (IDC '21)*, June 24–30, 2021, Athens, Greece. ACM, New York, NY, USA, 11 pages. <https://doi.org/10.1145/3459990.3460703>

1 INTRODUCTION

In the recent years, social virtual reality (VR) has emerged as a popular modality for social engagement among teenagers [Maloney et al. 2020a,b]. Social VR refers to 3D virtual spaces where users can interact with one another through VR head-mounted displays [McVeigh-Schultz et al. 2019, 2018]. New phenomenas emerging in social VR such as the popularity of non-verbal communication [Maloney et al. 2020c], important privacy concerns [Maloney et al.

2020e], novel explorations of self-representation [Freeman and Maloney 2020; Freeman et al. 2020], and potential risks of harassment [Blackwell et al. 2019] have led to an emerging research agenda in HCI.

In particular, these popular immersive spaces have attracted teenagers in a variety of ways, for example, enjoying immersive gaming, building virtual intimacy, and creating stronger emotional connections [Maloney et al. 2020a,b]. Yet, they also expose these users to a variety of harassing and bullying behaviors [Maloney et al. 2020a,b]. This demonstrates the great potential for social VR for rich social engagement and simultaneously potentially more significant risks towards teenagers. Furthermore, many questions still remain regarding teenagers and social VR, as the majority of scholarship on younger users is still in its infancy [Maloney et al. 2020a,b]. For example, little to no work has been done to empirically explore how teenagers experience and understand social VR and what aspects of social VR especially attract them based on their own perspectives. Therefore, we believe that an in-depth empirical investigation of teenagers' understanding of social VR's main attractions is critical to unpack these younger users' unique engagement in novel online social spaces. Specifically, in this paper we report our findings of an interview study of 20 teen social VR users (e.g., age 13-18) who use social VR to explore the following research question: **RQ:** *what attributes contribute towards attracting and/or dissuading teenagers towards social VR?*

We thus make several contributions to HCI, IDC, and VR scholarship. First, our focus on understanding teenagers' engagement in a novel emerging online social space expands current HCI literature on adolescents' social experiences online. Second, our first-hand empirical data on what attract or dissuade teenagers towards social VR contributes to a research area that has not been widely studied in HCI and VR scholarship. To the best of our knowledge, this is the first study to interview teenagers regarding their own unique experiences in social VR. This contributes to prior scholarship on children's VR experiences and child-computer interaction. Third, we also highlight design implications that aim at creating safer and more fulfilling social VR spaces for teenagers, which may inform the design of future social VR and broader online social spaces.

2 RELATED WORK

2.1 Younger Users in Traditional Virtual Worlds

Children and Teenagers have used virtual worlds since the earliest forms of these virtual spaces, including but not limited to Multi-User Domain Object Oriented (MOOs), Massive Multiplayer Role Playing Games (MMORPGs), and other open-ended virtual worlds

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IDC '21, June 24–30, 2021, Athens, Greece

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ACM ISBN 978-1-4503-8452-0/21/06...\$15.00

<https://doi.org/10.1145/3459990.3460703>

[Bruckman 1997]. Though these spaces were not originally created for younger users, they have since adapted towards more playful designs and child-centric themes, including make-believe virtual artifacts (e.g. swords, and make-believe situations (e.g., space travel)[Di Blas and Poggi 2008; Kafai et al. 2017; Kolodner et al. 2017; Marsh 2010]. Some notable examples of youth-centered virtual worlds include *Habbo Hotel*, *Neopets*, *Barbie Girls*, and *Club Penguin*.

In particular, Marsh highlighted that these virtual spaces might be appealing to younger users because these spaces provide the opportunity to construct, re-construct, and learn how to perceive themselves (e.g., younger users) and others in an online world [Marsh 2010]. This exploration process may not be all positive as unwanted interactions such as harassment, cyberbullying, and sexual misconduct [Reeves 2013] may still occur in these virtual worlds, which raises safety concerns for children and may discourage them from engaging in these worlds. Nonetheless, these child-centric virtual worlds have been generally perceived as safer and preferred by parents opposed to traditional online gaming (e.g., *World of Warcraft*). For example, Marsh mentioned parents saying, “I let my kids use *Club Penguin* and i think its perfectly safe” [Marsh 2010]. One reason why *Club Penguin* was perceived as a safer environment compared to other platforms where adults are present such as *Second Life* [Reeves 2013] could be the *Ultimate Safe Chat* feature, which is designed to protect children from predators. Yet, it dramatically reduces the players’ abilities to meaningfully engage and connect with others in the space [Wohlwend and Kargin 2013]. Therefore, questions remain about how best to design safe and fulfilling virtual spaces for younger users without limiting their experience.

A particular area of focus also involved focusing on teenagers in virtual worlds. For example, *Habbo Hotel* is regarded as one of the largest social virtual worlds for teenagers (e.g., 10 times more users than *Second Life*) [Mäntymäki and Riemer 2011]. Mäntymäki and Riemer note that this platform appeals to teen users due to three main attractions [Mäntymäki and Riemer 2012]. The first attraction is the ability to co-create social context. Users did not have to rely upon in-game interactivity but could spontaneously create interactivity among one another. The second attraction is using the virtual world as a digital artifact, including artifacts such as avatars, items, and experiences such as escapism, voyeurism, and self-image. Third, the virtual environment’s anonymity and safety allow for freedom of self-expression and experimentation with various avatar skins and social events involving identity. These attractions demonstrate that teenagers perceive virtual worlds as spaces for rich social interactivity beyond game-play. These attractions demonstrate that teenagers perceive virtual worlds as spaces for rich social interactivity beyond game-play. Yet, questions remain regarding what specific activities and engagements draw teens to these spaces.

2.2 Younger Users and Virtual Reality

Scholarship surrounding youths and VR has mainly revolved around two areas: educational and medical. Regarding education, VR has emerged as a tool to help children develop cognitive skills and abilities. For example, Loiacono et al. created a game to enhance social skills with children with neurological disorders [Loiacono et al.

2018], Vogel et al. developed an application to teach the hearing-impaired [Vogel et al. 2004], and Roussos et al. demonstrated how effective VR educational simulations could be conducted [Roussos et al. 1999]. Additionally, regarding medical studies, VR has been a promising tool for children to manage pain management through gamification in healthcare [Arane et al. 2017; Gershon et al. 2004; Shahrbanian et al. 2012; Won et al. 2017]. Additionally, another line of scholarship has explored children’s use of VR in an experimental setting. In these studies, Bailey et al. [Bailey et al. 2019] and Schmitz et al. [Schmitz et al. 2020] demonstrated that minors respond differently to VR compared to traditional media.

A small body of scholarship has investigated the use of teenagers and VR, mainly focusing on teenagers with disabilities. For example, Wade and colleagues demonstrated VR was a suitable case for improving the driving of teenagers with ASD [Wade et al. 2014], and Passig et al. shown that using VR improved teenagers’ perception as compared to the teenagers in the control group [Passig 2009]. Other research by Passig demonstrated that VR can simulate emotional and social experiences with intensified teenagers’ emotional and social awareness [Passig et al. 2007]. Regarding younger users and VR, the above-mentioned studies have either been conducted in an experimental or medical setting. In particular, little to no VR work has investigated why teenagers and children choose to engage in VR.

2.3 Social VR An Emerging Online Spaces For All

Over the past five years, social VR has risen as the next generation of VR, becoming increasingly popular digital social spaces where people meet, interact, and socialize in new and more immersive ways. Prior work highlighted three main sociotechnical characteristics of social VR. First, it affords full-body movements and gestures in real-time, high-fidelity 3D immersive virtual spaces with 360-degree content. Second, it supports vivid spatial and temporal experiences and a range of emotional states that is similar to face-to-face interaction. Third, it mediates aspects of both the online world and offline world and affords a broad range of social activities via embodied social interaction [Maloney and Freeman 2020; Maloney et al. 2020b; McVeigh-Schultz et al. 2019, 2018; Moustafa and Steed 2018; Sra et al. 2018; Zamanifard and Freeman 2019]. In particular, in most social VR applications, users can create, craft, and customize their avatars to enter the virtual spaces and interact with others. Their avatars can support full-body tracked avatars or partially tracked avatars (e.g., upper-body) rather than merely being controlled by mouse, keyboard, or joystick on a computer screen. In these spaces, users can also create and craft *experiences* such as making mini-games, in-game content (e.g., items, avatar skins), or even designing interactive maps or user-generated virtual spaces. These spaces also afford a broad range of activities such as playing a game, watching a movie, participating in a concert, and having a party or flying to the moon. Examples of popular social VR platforms include *AltSpaceVR*, *VR Chat*, *Rec Room*, *Facebook Horizons*, and *High Fidelity VR*.

Social VR platforms have attracted users of diverse demographics and ages. Despite social VR being perceived as a generally positive

experience, a few studies have raised concerns regarding potential threats towards safety and mental well-being of users, such as harassment [Blackwell et al. 2019], inappropriate behavior and concerns towards children [Maloney et al. 2020a,b], and privacy trade offs for users [Maloney et al. 2020e]. Regarding the area of younger users, little work has been done to investigate this age group. To the best of our knowledge, only two studies have been conducted to focus on younger users in these spaces. In one study, Maloney et al. demonstrated that adults had concerns for younger users in social VR due to the prominent harassment and risks towards sharing private and intimate behavior [Maloney et al. 2020a]. In another study, Maloney and colleagues also pointed out that younger users can be exposed to inappropriate content such as talks of sex and alcohol and even an instance of virtual sexual assault [Maloney et al. 2020b]. Though both studies shed light on the risks and potential harms towards younger users in social VR, both studies also reveal the ways in which social VR enhances younger users' social lives and family relationships and allows for unique immersive experiences not found in another medium (e.g. 2D) or in the offline world [Maloney et al. 2020a,b]. However, these two studies drew conclusion based on observations of younger users and interviews with adults on their perceptions of younger users. They did not gain direct empirical evidence from the younger users' themselves.

In summary, previous literature has revealed several key limitations of studying younger users in social VR. First, little is known as to what extent the experiences of younger users in traditional virtual worlds can, if at all, apply to social VR. Another limitation is that the majority of research involving teenagers in VR has focused on traditional research settings such as experiments or medical settings, which may or may not reflect teenagers' natural behaviors when they are not aware of being observed. Finally, many questions still remain as to how teenagers are using social VR and if social VR introduces new challenges and risks towards teenagers. Therefore, we propose the following research question **RQ**: *what attributes contribute towards attracting and/or dissuading teenagers towards social VR?*

3 METHODOLOGY

Recruitment and Procedure. This study was approved by the Clemson University's Institutional Review Board (IRB) for research ethics. We posted a recruitment message on three popular online forums for social VR (e.g., Reddit-RecRoom, Reddit-AltspaceVR, and Reddit-Oculus) to recruit teenagers aged 13-18 who engaged in social VR weekly. In the recruitment message, we also included a link to a google form that provided a brief overview of the study. After completing a google form to express their interest in the study, participants were sent an email that provided more details of this study and a consent form. After confirming their interest in the study and acknowledging that they had read the consent form, participants filled out initial demographic questions and were sent a Calendly link to select a time for interview. Complying with IRB requirements, we did not conduct interviews through voice or video chat to better protect participants' privacy (i.e., no voice or facial data will be collected). Rather, we conducted interviews via synchronous text chat through an open collaborative co-edited

google document. For each interview, the interviewer typed interview questions in the document and participants typed their responses. The interviewer then typed to ask follow up questions. Sample Questions include: *"How did you first learn about social VR platforms?, What do you normally do in social VR? (entertainment, learning, hanging out, etc), Have you ever had negative, awkward, or unpleasant interactions with people in social VR? How do you deal with it?"* The average interview lasted 65 minutes and participants were given a \$20 gift card after completing the interview. We acknowledge that this is an unconventional method and may have limitations such as the depth of responses written, however, as this is an open-ended research questions we believe this method is both appropriate and responsible for first protecting the youth and responsibly collecting data. Additionally, this research follows the guidelines outlined for conducting ethical research in social VR [Maloney et al. 2021].

Participants. As of writing this paper, we conducted 20 interviews, 15 are cis-male, four are cis-female, and one person identified as non-binary. Among the 17 participants who shared their ethnicity, nine are white, four are Hispanic/Latino, and four are Asian. Of those who shared their geographic location, 17 are located in North American, two are in Europe, and one is in Africa. The average age of the participants was 15, ranging from 13-18. The average weekly time spent in social VR platforms was 23 hours. Participants used a wide variety of VR devices to access social VR, including HTC VIVE, Oculus Quest 1 & 2, Oculus Rift, PSVR, and Valve Index. They also engaged in various social VR platforms, including RecRoom, AltspaceVR, VRchat, Bigscreen, and Facebook Horizons.

Data Analysis. We used an empirical, in-depth qualitative analysis [Strauss 1987] of the collected data to explore teenagers experiences in social VR. Based on McDonald et al.' [McDonald et al. 2019] guidelines for qualitative analysis in HCI studies, our analytical procedures focused on eventually yielding concepts and themes (recurrent topics or meanings that represent a phenomena) rather than agreement – because even if coders agreed on codes, they may interpret the meaning of those codes differently [McDonald et al. 2019]. Therefore, we did not seek inter-rater reliability in our analysis but endeavored to identify recurring themes of interest, detect relationships among them, and organize them into clusters of more complex and broader themes. Our coding and analytical procedures were: 1) the first author closely read through the collected data to acquire a sense of the whole picture as regards to what motivated and dissuaded teenagers to engage in social VR; 2) the first author then identified thematic topics and common features in the data for further analysis; 3) the first author also carefully examined and reviewed the thematic topics and developed sub-themes; and 4) all three authors collaborated in an iterative process to discuss, combine, and refine themes and features to generate a rich description synthesizing how and why teenagers are motivated to engage (or not) in social VR.

4 FINDINGS

Using quotes from participants' own accounts, in this section we present our findings as three parts. First, we identify the common ways in which teens were introduced to social VR. Second, we explore popular engagement activities that draw teenagers into

social VR. Third, we highlight risks and challenges that teenagers encounter from using social VR that may dissuade their engagement in social VR.

4.1 Introduction to Social VR via Youtube, Friends, & Low Barriers to Entry

Of the teenagers we interviewed, most were introduced to social VR within the last two years. This is largely due to the explosive growth in popularity of social VR. For example, VRchat is featured as one of the most popular games on steam game engine (since 2018) and currently (December 2020) and RecRoom is the number one downloaded application on Xbox ahead of Rocket League, Warzone, Fortnite, and Roblox[Rec 2020]. The immense popularity of social VR has amassed interest of a wide variety of teenagers ranging from ages 13 to 18. The majority of our participants were attracted to social VR via Youtube channels, personal friends, or due to the fact that most social VR platforms are free to use.

4.1.1 The Youtube Effect. Similar to the current teen gaming trends such as watching streamed video games on Twitch, Youtube or Mixer, watching social VR seemed to be a common entry point for teenagers to learn about and become excited about potentially engaging in social VR. For example, P4 (15, Male, ethnicity not reported) and P11 (14, Male, White) mentioned that they both first learned about Social VR via Youtube: "I watched youtube videos that were on VR Chat" (P4) and "I learned on youtube with games like vr chat and rec room" (P11). It seems as though youtube is a popular means for learning about social VR platforms and as a general tool for keeping up to date with popular trends on such platforms. Some teenagers also mentioned that they were introduced through channels especially catered towards VR related content. For example, P3 (16, Male, White) said: "Youtube and friends is how I first learned [about social VR], the channels I watched were 'Your Narrator' and 'tfmjhonny.'" For P3, watching videos from both of these channels allowed him to learn about what social VR was from other users. Both *tfmjhonny* and *Your Narrator* are popular Youtube channels featuring VR videos on various topics including entertainment, crude entertainment, jokes, anime, and adventure.

The youthful spirit of these channels seems to be what attracts teenagers to social VR, as P19 (18, Male, Hispanic) shared: "I first learned about social VR platforms from Youtube. It wasn't someone I was subscribed to or watched regularly, so I may get their name wrong. I believe it was VRtrapman, and they were using voicemods to prank people in VRchat." According to P19, YouTube channels are a common way to not only learn about social VR but also leads to the urge to participate in social VR by simply watching someone engage in social VR as entertainment. This is also how P5 (Female, Asian) was attracted to social VR: "I watched a YouTuber DanTDM play one of the games (Rec Room) so when I finally got VR that's one of the first games I downloaded, especially since it was free." For P5, regularly watching DanTDM's channel gave her the exposure to social VR, specifically RecRoom. Though DanTDM's channel features a variety of gaming not solely VR, it made P5 willing to experience RecRoom. In general, these quotes demonstrate the powerful effect Youtube can have on attracting teenagers to social VR.

4.1.2 Influenced by Offline Friends. Many participants also mentioned that their offline friends attracted them to social VR. For example, P10 (16, Female, ethnicity not reported) explained, "It was around over a year ago when I watched youtubers play vr. Then my friends told me about it even more." For P10, the videos in addition to the interest from her friends was what attracted her to social VR. The experience of friends introducing other friends to social VR seemed to be a popular phenomenon, P1 (16, Nonbinary, White), P20 (15, Male, Hispanic), and P2 (14, Male, White) all detailed similar experiences: "Some of my friends convinced me to buy a VR headset to play with them 2 years ago, and one of the first games they showed me was Rec Room. Since then I've been playing the game fairly frequently" (P1), "Well once my friend had convinced me to buy the quest he showed me RecRoom and it took me a few weeks to like it" (P20), "I saw Rec Room on my friends oculus and wanted to look into it, and ended up getting hooked" (P2). In all three examples, friends played an influential role in introducing newcomers into social VR, which led P1, P20, and P2 to enjoy and regularly participate in social VR. These quotes demonstrate the process by which teens' offline friends heighten the appeal and attraction towards social VR and in some ways, lower barriers to entry into the space.

4.1.3 Lowest Barrier of Entry. Some teenagers we spoke to were introduced to social VR platforms due to the low barriers of entry. P14 (17, Male, White) and P7 (18, Male, White) explain their experiences: "Buying a PSVR left me a bit drained on money so I started looking for free games. RecRoom was the first one that appealed to me" (P14) and "I started using social VR since it was among the free VR apps available. After checking out some gameplay on YouTube, I decided to download Rec Room" (P7). Both P14 and P7 mention the relatively high barriers of entry to use VR: most VR headsets cost anywhere from \$299 upwards of \$1000 leaving little monetary room left for the actual engagement into games and other experiences. This is why most, if not all, of the top social VR platforms are free-to-play, giving users like P14 and P7 the ability to still experience social VR without having to pay-to-play.

Additionally, some VR devices like the Oculus Quest (owned by Facebook) have unique app stores built into the headset. This was another way in which teenagers found their way onto social VR platforms. P9 (15, Male, ethnicity not reported) and P12 (15, Female, White) mentioned how they were attracted to various social VR platforms in this way: "I found it in the oculus store and I wasn't sure what it was but I decided to give it a try" (P12) and "Through the Oculus store, they are typically free games so they were an easy thing to get into" (P9). According to them, learning about social VR via the Oculus store and other free applications are quite common among teenagers as it is an easy way to have immersive experiences without barriers such as payment. In summary, these quotes highlight three ways which initially attracted teenagers onto social VR platforms: browsing YouTube channels and videos, personal offline friends, and the free-to-play business model.

4.2 Immersive Engagement Opportunities As Main Attractions to Teens

Our participants further highlighted that the plethora of immersive engagement activities afforded by social VR was the main attraction for them to engage and stay in social VR. Social VR differs

from traditional gameplay because it both affords aspects of the offline world (e.g., full body movements) and aspects of traditional gameplay (e.g., limitless in-game artifacts). For example, mundane activities such as sleeping have been considered fun and engaging in social VR like sleeping seem very normal [Maloney and Freeman 2020]. In this sense, social VR attracts teenagers based on the unique affordances and the immersive interactivity it provides. Our participants' enjoyed using social VR as a popular social hub, engaged in the plethora of building and crafting opportunities, and appreciated the ability to still remain connected during the COVID-19 global pandemic.

4.2.1 An Immersive Social Hub. One of the notable points of attraction to social VR for teenagers is the wide variety of games and opportunities designed for *play* offered by those platforms. For example, RecRoom is famous for providing a wide variety of popular gaming experiences. P1 (16, Non-Binary, White) mentioned his experience with RecRoom: *"Rec Room has a lot of games that you can play with other people, so usually when I'm playing with my friends we go into a game and just have a good time playing it together."* In this case, the games in RecRoom act as a social lubricant to help P1 and friends connect and play. Many social VR platforms are also designed as social hubs that attract teenagers. For example, in AltspaceVR, there is the campfire and in RecRoom, there is the Rec Center. These spaces are designed as social gathering-hubs where users can come together. P4 (15, Male, ethnicity not reported) mentioned, *"I like to play test parkour and mess around in the rec centre."* According to P4, he enjoyed the Rec Center because it was an open place that facilitated socialization - it offered virtual places to chat, a basketball hoop, a ping-pong table, a vending machine, and sports equipment. The Rec Center is also a relatively large open space with many structural objects. That is why P4 enjoyed parkour there. Furthermore, the rich gaming experiences in social VR specifically RecRoom allow and facilitate a variety of social experiences. P5 (Female, Asian) detailed her experience with gaming and socializing in RecRoom: *"I think I do a mixture of both, since usually we talk and stuff while playing the games. I like to do the quests, especially Golden Trophy since it's easy enough where we can talk while not worrying about dying."* For P5, the casual socialization during gameplay with her friends was in a more laid-back manner and invited conversation and socialization rather than focusing solely on gameplay.

In general, most teenagers we talked to enjoyed the unstructured mix of socializing and gaming in social VR. This was particularly true for P3 (16, White, Male): *"I usually see what servers are active and just mess around in the places I find, I normally start for entertainment and it usually branches off into talking with people. Sometimes, I play some of the minigames within the games like VR-Chat and see what other people are messing around with."* For P3, he enjoyed adventuring onto different servers (as rooms) in VR-chat. For him, his choice in social VR activity depended on both the social atmosphere of the server (e.g. room) and the particular facet (e.g., talking/gaming) that appealed to him more at the current time. Other teens were attracted to social VR simply for talking to and connecting with people. For example, P18 (13, Male, White) detailed his social VR use: *"I spend a good chunk of my time just hanging out and talking to people and sharing experiences, etc. I'd say I spend a*

good 80% of my time in VR just talking to people. The other 20% is playing competitive VR games." For P18, one of the key attractions of social VR for him was the ability to connect with others – social VR allowed him to meet new people and share experiences that he may not have already had but was able to experience in social VR.

4.2.2 Immersive Building and Crafting Digital Artifacts. In our study, many teenagers did not only participate in a single activity such as gaming or purely socializing but rather a mixture of activities dependent on the social context. One activity that attracted them was to build and create artifacts within the environment. For example, P12 (15, White, Female) mentioned, *"I hangout with friends, play games, and design my own stuff. There are a few things I do. I either play games with other people, or we just go to custom rooms to hangout, or I design my own room or props."* For P12, the variety of activities available was what drew her to social VR and the ability to have unique experiences such as creating her own prop, room, or artifact was what anchored her to the platform.

In RecRoom, teens are able to create customized rooms and objects which they can share with friends and sell to others. P7 (18, Male, White) detailed what he liked to create: *"I create fictional weapons and occasionally some art, my art varies from abstract to a monochromatic style."* For him, the ability to have a variety of creative experiences ranging from crafting weapons to artwork demonstrates the broad use cases of social VR and key points of attraction for teenagers.

Additionally, some social VR platforms allow for the creation and customization of user-generated games. This feature was one of the highlights for a few of our participants. P9 explained, *"I also like to create in social VR applications. For example, Rec Room offers an in game 'Maker pen' that allows you to create your own environments and games. So far I have created a hangout room that takes place on a beach, A small adventure game where you travel space, and a wacky boxing game."* P9's account detailed the broad range of creative affordances available in social VR. In this way, teens could have more control over creating a pleasantly unique experience.

The notion of building and creating games is also quite a common phenomenon in RecRoom. For example, P16 (13, Male, Asian) and P10 (16, Female) shared their experiences: *"I play and make games in rec room I'm usually with friends in the rec center which is the 'hub' for rec room"* (P16) and *"Mostly I build things and hangout. Sometimes we play pvp games or play other people's games. There's also competitions that we do too. Horror games are always a go to! And visually appealing games too, more like art rooms. Well, if it's for a contest then there's a specific build theme. Most times we just build for fun like memes or to mess around"* (P10). For both P16 and P10, building, creating, and crafting in social VR was a relatively common phenomenon and very enjoyable experience. They also highlighted that they not only enjoyed building objects but also playing user-generated games, which demonstrates the community aspect of their social VR engagement.

4.2.3 Socially Connected During COVID-19/Global Pandemic. As the data collected for this research project was conducted in 2020, the ramifications of the COVID-19 virus brought the world to a halt. This included shutting down local businesses, and shifting the world towards remote learning and remote socialization. It should be noted that our teenage participants were from different

geographic regions (e.g., North America, Africa, and Europe). Most of them mentioned how COVID-19 impacted their VR use. VR use in general became very popular during the pandemic. For example, the Oculus Quest 2 at the time one of the newest VR headsets was sold out for the majority of 2020. Teenagers were no exception to the excitement towards social VR. In fact, all 20 of the participants we interviewed were very grateful for the fact that they could use social VR to stay connected and communicate with others.

Our participants particularly highlighted how social VR significantly helped them through isolation despite the lack of regular in-person social activities and challenges for keeping in touch with their offline due to quarantine from COVID-19. P12 (15, Female, White), P9 (15, Male), and P13 (15, Female, Hispanic) all explained how they used social VR during the pandemic: *"I think the pandemic helped a ton because I think a lot more people got involved with VR since the pandemic as an easy way to socialize"* (P12), *"When COVID-19 shut down schools, I didn't have very many people to talk to or hang out with. I used social VR as a substitute for that. I would find people around my age and just simply, talk to them"* (P9), and *"it helped me with the isolation of staying home"* (P13). Given the inherent sociability of social VR, P12, P9, and P13 seemed to all view social VR as a positive means of social connection and engagement during the pandemic as it mitigated the feeling of isolation and "left behind" when people of their age were often under quarantine.

Regarding safety during the pandemic, P1 (16, Non-Binary, White) and P11 (14, Male, White) both made comments on using social VR from a personal safety standpoint: *"I do think that having a safe outlet [social VR] to socialize with people has helped me through not being able to see my friends and extended family as much"* (P1) and *"I find a lot of my lockdown time in social vr has helped me a lot. I can still talk to people and be social while being completely safe from a health related standpoint"* (P11). In P1's and P11's case, the use of social VR seemed even more beneficial as it did not place either user at any additional health risk of contracting the virus, yet still allowed them to socialize in a rather natural way.

P6 (16, Male, Hispanic) also thought that social VR was ideal for the quarantine situation: *"I think VR is perfect for the type of situation we're in now because since we're not able to interact in real life, we can still interact in the virtual world without any repercussions. My friends aren't very social outside of VR anyways. It makes me feel productive and more in touch with the world, especially since we're all stuck on lockdown during this pandemic."* P6 used social VR as a means of normalizing himself and his engagement with others during the global pandemic. For him, engaging in social VR allowed him to feel more connected to the world although he was "lockdown" in his home.

Likewise, P19 (18, Male, Hispanic) shared: *"I haven't really hung out with any real life friends since the start of the pandemic, so VR has kinda been my only outlet for that sort of experience. I feel like because I have my vr and I'm able to hang out with my friends in that sort of realistic-ish way, I'm dealing with the pandemic better than others. Or at least easier."* This quote stresses why social VR is an attractive means of social engagement specifically for teens. For P19 and others, it provides the ability to simulate experiences of "hanging out" in a *"realistic-ish way,"* which helps them cope with the heightened sense of isolation during the pandemic. P20 (15, Male, Hispanic) had similar sentiments: *"It helps me stay in touch*

with my friends that we can't talk to in person anymore, its with with friends I can't see even though they live less than 10 minutes away." For P20, the isolated lockdown was especially frustrating due to the difficulty to meet up with friends who were geographically close. Fortunately, social VR provided him with an outlet with more in-depth forms of communication compared to phone calls or video chat.

Some teenagers even mentioned that socializing in social VR helped them facilitate new social connections and friendships. P12 (15, Female, White) and P14 (17, Male, White) mentioned: *"It has helped me make so many new friends, especially since the pandemic started. Recroom has become so much more popular since the start of the pandemic and some of my friends only joined because of the pandemic as a way to socialize"* (P12) and *"Not being in school has giving so much free time. I've used that time to both make friends and make maps in RecRoom"* (P14). According to P12 and P14, in some ways the global pandemic positively impacted their social VR experience because it allowed them to make new friends whom they may not have encountered. This also grew the user base of social VR, specifically RecRoom in this case, due to the fact that other teenagers were also in isolation and were seeking new means of social connection.

In some instances, social VR even strengthen pre-existing relationships for teens. For example, P8 (16, Male, Asian) shared: *"Especially during COVID times, I have stayed connected with my friend that plays VRChat way more than my other friends. Lockdown gets boring so hopping into VR with my friend definitely helps us remain connected and I believe it strengthens our friendship. I use social VR way more often due to COVID-19 lockdown as it is a way to keep me socially active. Without social VR, I would definitely feel a lot less lonely. Although you can speak to friends in a discord call, there's nothing like being able to see their movements and interact with them in a world."* P8 believed that social VR helped him and his friends strengthen their relationships since they were able to remain socially present in one another's lives versus those who did not have VR or actively communicate using social VR. For P8, social VR was the best possible outlet for social communication – it was much better in terms of being able to perceive body language, gestures, and other facets of offline face-to-face communication. In addition to immersive socialization as a means of coping with COVID-19, one participant mentioned using social VR to attend an event that would traditionally be conducted by his school. P17 (15, Male, White) explained, *"One fun experience i had in vr was when someone hosted a virtual homecoming dance since real life ones can't happen due to covid. It was really fun and i had a great time."*

In summary, social VR facilitates a wide variety of engagement experiences ranging from normally socializing by talking to attending a virtual homecoming dance with classmates and friends. Our data demonstrate that social VR is a popular and attractive form of immersive social engagement for teens, which include engagement in immersive social spaces, playing games and quests, building player content and user-generated games, while also maintaining friendships and making new friends despite being physically apart or isolated. All of these engagement and activities, therefore, make social VR especially appealing to teenagers.

4.3 Notable Pitfalls of Social VR to Dissuade Teens

Our participants also mentioned two facets of social VR that seemed to dissuade their use: the normalcy of harassment and the unique tensions between social VR and the offline world.

4.3.1 Harassment & Bullying. Social VR platforms attract a broad range of demographics of users ranging from age, race, and geography. Often times this is a benefit of social VR. However, the mixture of demographics can sometimes create unique tensions and frustrations towards users, particularly regarding age discrepancies and maturity. In fact, most teenagers that we spoke to noted varying forms of harassment from either explicit harassment such as bullying and naming calling to forms of harassment unique to social VR such as physically stalking someone through rooms/worlds. All 20 of the teens we interviewed were aware of platform specific ways to combat harassment such as blocking and/or reporting the harasser.

Our participants noted the various array of harassment in their experiences, ranging from slurs to sexual comments. P1 (16, non-binary, white) and P4 (15, male, ethnicity not reported) shared their experience: *"Sometimes people just start saying slurs or being rude to other people, and I think there's always going to be people like that. In Rec Room its really easy to just report and block these kinds of people though, so it's never really an issue"* (P1), and *"Just sexual comments, i just walk away. That's all"* (P4). In these cases, P1 and P4 mentioned the seemingly normal occurrence of harassment in RecRoom, which they seemed to think would never change. Fortunately, P1 felt confident with the tools available to combat harassment in social VR, whereas P4 preferred to remove themselves from the physical vicinity. The differences in approaches for dealing with harassment may stem from the variations in tools on platforms or the governance of the platform. For example, common tools for combating harassment in social VR are blocking, personal space bubble, muting, and reporting players. However, these features can be manipulated and misused by other users. For example, P7 (18, Male, White) talked about an instance he witnessed: *"I have interacted with a person who was being homophobic to a person after finding out their sexuality, repeatedly using slurs and not leaving that person alone. They also falsely reported that player for being rude to others, despite that player being quiet until this interaction started."* P7 alluded to the fact that offline forms of harassment can creep into social VR. This quote further demonstrates the untrustworthiness of the system tools for dealing with harassment as P7 believed that people in social VR can be wrongly reported. Other teens felt that the platforms sometimes were misguided when it came to implementing punishment based on harassment. P12 (15, Female, White) detailed her opinion: *Yes I have [dealt with harassment], but that's kind of expected, because in the real world people are the same too. Some are nice and some are not so nice, and some are just straight up evil. If its not that bad then I will just deal with it because there is no point to do anything about it, but if its really bad, then I just report them, block them, and leave the server. Unfortunately the recroom staff is not good with banning the right people, unless they have been mass reported or there is video proof."* In this quote, P12 first depicted that harassment in social VR was similar to traditional harassment in the offline world. She also explained the varying degrees of harassment which

can occur in social VR, ranging from minimal to severe. Finally, P12 talked about the unique role of enforcement that platforms have, which can be an extremely difficult role when distinguishing between sometimes subjective comments and interpretations of harassment.

Another particular issue regarding bullying and harassment in social VR is that the harassers are often perceived to be relatively young. P6 (16, Male, Hispanic), P10 (16, Female), and P2 (14, Male, White) mentioned: *"I've experienced harassment in VR. The people who bully are my age I'd presume. I deal with it by blocking them"* (P6), *"people my age it's normally just them trying to get reactions, so I simply laugh and use the report button"* (P10), and *"Really the only people who mess with me a lot are kids who aren't even old enough to play"* (P2). These quotes demonstrate that harassment in social VR from younger users may stem from a lack of maturity rather than malicious intent. According to P10 and P2, these behaviors were conducted to provoke and agitate. Though these agitators are blocked, it may not solve the problem or correct their behavior, especially since often times harassment in social VR is a grey area. P18 (13, Male, White) explained: *"Not really, but sometimes people in social VR apps just chase me around, and it's kind of annoying, but I don't block them, I just go to another lobby. Sometimes people just want to be funny or something, most of the time people dont chase others around as harassment, they do it as a joke, for example they play meme songs through their microphones and run after people."* According to P18, funny behavior in social VR should not be taken with any offense and he preferred not to block or report these users. It should also be noted that based on P18's age (13), he most likely uses "junior accounts" which are specific to the youngest of social VR users (normally aged 13-14). This may explain why he normalizes this type of behavior.

Additionally, P19 (18, Male, Hispanic) shared his uncertainty with harassment in social VR: *"There's lots of times where people give weird complements, or do some weird actions, or get a little too touchy. I just usually block them or get out of there. Maybe if it seems accidental or harmless ill just try to talk through it. I have been told many times i have a 'cute, gay sounding voice' which combined with my flashy outfits and stuff in game are probably going to attract some people. It's weird, but sometimes its innocent. I only really mind when its creepy."* P19 explained that he was not always able to perceive someone's intentions and that the interactions often came off as "weird," which created interesting dynamics of harassment – for example, one user did not perceive the action as harassment while the other did. Additionally, P19 briefly mentioned one facet of harassment in social VR that may place teenagers at additional risk – the harassment of the avatar body. This type of interaction has been observed in prior literature with adolescents [Maloney et al. 2020b]. In summary, harassment in social VR draw similarities of the offline world and traditional forms of harassment in the online world. Yet, in social VR it can sometimes be difficult to decipher, predict, and discipline teens' harassing behaviors, which may discourage some teens to engage in social VR or drive them away. However, most if not all teenagers use the platform tools available and have strategies for combating harassment.

4.3.2 Tensions with the Offline World. Social VR is entirely immersive, meaning everything the user sees and hears is computer

generated. As noted earlier in the paper, this can create quite compelling engagement activities. However, teens in our study noted a few tensions between their social VR use and their offline lives, which sometimes discouraged them from engaging in social VR. For example, a few participants mentioned that spending ample amounts of time in social VR may not be beneficial. P17 (15, Male, White) said, *"I mean, I spend less time in the real world"* and P10 (16, Female, ethnicity not reported) said social VR use normally *"takes up my time and school time."* As P17 and P10 are still in the developing years, their time management skills may not be as adequately refined as they may hope. The overuse of social VR may have an effect on the normalcy of their offline lives. Social VR and VR in general for adolescents are still understudied. Therefore, it is unclear how using social VR may impact teens in their offline lives. One of the teenagers acknowledged this point as well, P8 (16, Male, Asian) said, *"As virtual reality is very new, we are still not 100% sure of the health effects, but that doesn't worry me personally. One main disadvantage is it sometimes distracts me from homework and forces me to procrastinate more. However, I would say that I am very good at procrastinating so it isn't the biggest deal."* As a sixteen year old, P8 was more concerned about the high level of appeal social VR has that distracts him from his homework compared to the potential health effects. Another participant echoed this sentiment: *"I feel like the main disadvantage is that I end up ignoring the real world for like six hours a day. I usually end up skipping things like drawing and practice such just to play"* P19 (18, Male, Hispanic). This quote demonstrates the potential of social VR to fall into the category of addiction because P19 chose to ignore his offline commitments.

P7 (18, Male, White) and P4 (15, Male, ethnicity not reported) also mentioned that social VR disconnected them from their family and friends: *"It annoys my family members, as they feel as if using a VR disconnects me from them."* (P7) and *"Potential disconnects me from my real world friends"* (P4). These teenagers allude to the fact that actively engaging in social VR creates challenges in their offline interactions and relationships. Likewise, P15 (16, Male, Asian) worried that his offline social skills may be affected by social VR use: *"I always worry that my real life social skills might get worse haha. Also I don't want it to replace my real life interactions."* P15 made the clear distinction between social VR and the offline world and in some ways which he prefers. For him, the more he engaged in social VR, the more he may potentially harm his offline life and real world skills. In summary, some teens may be dissuaded from using social VR due to the risks of new and familiar forms of harassment, disconnection with the offline world, potentially addictive behavior, unique challenges with loved ones and friends from social VR use, and the fear of losing offline social skills.

5 DISCUSSION

In summary, our findings have the following highlights relating to the attributes that contribute towards attracting and/or dissuading teenagers towards social VR? First, teenagers first were introduced and attracted to social VR by way of their friends, watching videos on Youtube, and the low barriers of entry after acquiring the VR headset. In particular, teens were mainly drawn to social VR because of the immersive activities social VR can afford and support, such as engaging in popular immersive social activities, a plethora

of building and crafting opportunities, and the ability to remain connected during the 2020 COVID-19 global pandemic. We also report findings on some challenges perceived by teenagers of social VR, which may dissuade them from engaging in social VR, including harassment and the unique tensions it creates related to the offline world. Now we attend to how these findings shed light on adolescents' new trends of online social engagement and discuss potential design implications for supporting safe and fulfilling social VR for teens.

5.1 Adolescents' New Trends of Online Social Engagement

Our findings extend existing scholarship involving teenagers in online digital spaces. Specifically, we observed a few similarities and differences between teenage experiences in traditional online spaces (e.g. games/virtual worlds) and prior social VR scholarship. One similarity we observed is the interactions observed in our study and in traditional virtual worlds regarding interactions [Marsh 2010; Seok and DaCosta 2014] and the ability to create virtual possessions [Lehdonvirta 2008; Mäntymäki and Riemer 2012; Odom et al. 2011]. However, our study demonstrates that virtual possession includes not only artifacts but can extend to user-generated games and rooms. This is likely due to the variety of affordances available in social VR such as the ability to design from a more naturalistic and 360-degree viewpoint. Additionally, our finding relating to user induced activity is concurrent with previous scholarship, specifically that younger users enjoy the ability to spontaneously create social interactivity amongst one another and not solely relying on the game. The consistency of our finding with previous work on traditional virtual worlds highlight that creativity, explorations, and the freedom to generate their own content and artifacts are always the main attractions to adolescents in online digital spaces. Therefore, new systems and platforms that better afford and support such activities would be more appealing to these users.

In addition, to the best of our knowledge, little to no work has interviewed teenagers on their use of social VR. Therefore, this study presents one of the first studies that investigates teenagers' use of social VR from their own perspectives. Our findings do confirm previous scholarship by Maloney et al. on adolescents in social VR [Maloney et al. 2020a,b], including rich interpersonal interactions between teens beyond gameplay, such as crafting and building in these environments. Maloney et al.'s study also briefly mentioned the use of social VR to cope with COVID-19. Our study expands the reasons as to why and how teens engaged in social VR during the pandemic such as the ability to *still* remain connected and sociable with friends and family members. Our study also confirms previous findings from Maloney and Freeman [Maloney and Freeman 2020] regarding VR specific and mundane activities conducted in social VR, as teens also enjoyed those mundane activities of just hanging out with people. However, our findings further highlight that teenagers enjoyed the community aspect of not only playing but building their own games in social VR. Regarding the unique forms of harassment our participants mentioned in social VR, this has been noted by Blackwell et al. [Blackwell et al. 2019] and Maloney et al. [Maloney et al. 2020c]. In our study, teenagers seemed to consider the platform specific tools to combat harassment generally

effective. Yet they still noted that the entire reporting process can be improved.

One uniqueness of our findings is how teens recognized the tensions between their social VR use and offline lives. In previous studies [Blackwell et al. 2019; Freeman and Maloney 2020; Maloney and Freeman 2020; Maloney et al. 2020a,c, 020e; Zamanifard and Freeman 2019], users did not mention the unique tensions and feelings of uneasiness or social constraints caused by the daily use of social VR. This phenomenon has been observed before in the context of mobile technologies [Oduor et al. 2016]. Blackwell and colleagues also mentioned the *technology tensions* between teenagers and their parents where parents generally underestimated their children's use [Blackwell et al. 2016]. However, our study demonstrates the self-reflection of teenagers who recognize the potential harm from potential overuse of social VR and the lack of connection with the offline world. One reason that could explain why teenagers felt disconnected from the offline world may be because social VR creates a sense of *occupied* state, where teens are not readily perceiving information from the offline world. This sense of connection or "availability", is defined as the sociotechnical state of being constantly connected and accessible to others [Mazmanian and Erickson 2014]. Yet, this would mean that the current state of social VR allows teenagers to connect to the online immersive world but distinctly disconnect from the offline world. How these tensions evolve is an important question towards understanding the evolution of teenagers in digital social spaces.

5.2 Social VR As A Promising Application for Teens in the Changing World

In the current state (December 2020), social VR is in the early stages, with the most popular platforms being created in the past seven years and only in the most recent years gaining in immense popularity due to the decrease in barriers of obtaining a VR headset (e.g. price and equipment). However, this study along with previous studies involving adolescents [Maloney et al. 2020a,b], demonstrate the immense opportunity and consequent challenges for the future of social VR. In particular, our study highlights the opportunity for connection in an ever changing online world where social VR affords the opportunity for rich and in the current context (e.g., COVID-19 global pandemic), safe socialization. For example, our findings show that teenagers were able to keep in touch with friends and family members with normalcy despite the isolation and health risks during the pandemic.

Our findings also suggest that the daily and weekly use of social VR demonstrates a shift in in-home technologies where VR use is being normalized similar to video games [Parry et al. 2014], TV's, and media centers [Heath and Bell 2006]. This normalization may create opportunity for familiar and unfamiliar dynamics in interpersonal relationships and offline relationship dynamics. Such familiar dynamics may include more discussion regarding autonomy vs regulation, how to establishing a common ground for parental regulation and teen self-regulation [Ghosh et al. 2018; Wisniewski et al. 2017a], and encouraging conversations about harassment and other risks in social VR [Wisniewski et al. 2017b]. Also, unforeseen relationship dynamics may emerge, such as the ability to develop nearly normal connections and relationships

with others from around the world and the ability to develop and sustain meaningful relationships beyond gaming and entertainment. In this sense, social VR presents a promising opportunity for teenagers in the changing world. Yet, we do not fully understand the effects of prolonged VR use, especially involving teenagers. Additionally, YouTube streamers seem to significantly control and affect the narrative as to how teenagers may first interpret and experience social VR. This presents a challenging balancing act, where parents, guardians, and educators must encourage curiosity while cautioning possible misinterpreted information from online sources.

Finally, regarding the harassment noted in our study and prior studies involving younger users [Maloney and Freeman 2020; Maloney et al. 2020a], it is important for HCI and VR researchers to continuously explore more effective tools to combat online harassment in social VR beyond just blocking. In our study, most if not all teenagers were aware of platform specific tools and had different strategies for dealing with harassment. Of those mentioned *blocking* and *reporting* were popular features. However, teens in our study also noted that these tools were not always effective and sometimes poorly governed by the platforms. Additionally, some participants mentioned the varying perceptions of harassment in social VR. Some noted it as joking behavior while other noted as more serious forms of harassment. As teenagers are still developing, there may be cases where one teen perceives inappropriate behavior while another one believes the behavior is entirely a joke. This dynamic should instead be treated as an opportunity for *civil & equitable mediation* and learning rather "than out of sight out of mind", which does not inform the potential harasser of their potential harassment or provide room for mutual understanding. We are not asserting that blocking is ineffective tool as we believe many circumstances are necessary for blocking harassers in social VR. However, we also want to highlight that the process of quickly blocking someone may promote the *cancel culture* among teenagers.

5.3 Designing Social VR for Teens

Grounded in our findings, we identify three potential design implications for further supporting teenagers' engagement in social VR. The implications are neither complete or exhaustive as they are mainly directions emerging from our participants' accounts. However, we believe that they may benefit teenagers, parents/guardians, educators, designers, and developers who endeavor to improve and maintain the well-being of teenagers and overall social VR.

Tools to Create In-Game Interactivity. One of the key highlights in our findings is how teens enjoyed and engaged in various creative activities in social VR. By engaging in designing an in-game artifact (e.g., art, items), building a mini-game, or creating a custom room this drew *social interactivity* towards the user and other users. In this sense, the process of creation and design yielded social currency with other users. This could be due to the uniqueness of their design style and their imagination which is not featured elsewhere in the platform. To encourage rich social engagement for teens, future social VR platforms must implement and provide a variety of creative tools and activities for their users.

Increased Outside Connection within Social VR. Our users mentioned that the daily use of social VR created tensions with themselves and their offline relationships. One way to lower tensions and support family and friend engagement is to create tools that allow users from the offline world to actively participate in the social VR environment. This could include tools which actively streaming content to another device and the ability to collaboratively build and play games with one person who is currently experiencing social VR and the other person not wearing the VR HMD.

Civil & Equitable Mediation to Combat Continued Harassment. Social VR platforms have unique roles in governing harassment, including providing features of blocking and reporting. However, our participants noticed some flaws in the process, which led to lack of trust and feelings of unfair treatment and discouraged them from engaging in social VR. Our participants also mentioned the varying viewpoints on what is perceived as harassment. Therefore, to design safer social VR spaces for teens, we suggest a *civil & equitable mediation*, which would allow both parties involved in an altercation to explain what happened from their point of view. This civil discourse may offer mutual understanding, this would be conducted by an "on call" platform specific moderator who would mediate the discussion between the two parties. To encourage this form of mediation, platforms could provide in-game currency to encourage and promote discussion, which would in turn foster a more understanding and empathetic community base.

6 CONCLUSIONS

Social VR has become an appealing online social space for teenagers to interact, socialize, and connect with one another in an immersive way. In this paper, we investigated common experiences of 20 teenagers that attracted or dissuaded them to and from social VR. Our findings show that teenagers were first attracted to social VR by way of their friends, watching videos on YouTube, or the particularly low barriers of entry (e.g., cost). Additionally, social activities, immersive building opportunities, and the ability to remain connected during the 2020 COVID-19 global pandemic were key attractions of social VR for them to engage in such a novel online social space. We also discovered a few challenges of social VR such as nuances of harassment in an immersive space and the unique tensions created by using social VR with themselves, friends, and/or family members, which may have driven teenage users away. Our focus on first-hand empirical data from teenagers' own point of view contributes to the growing scholarship on younger users in social VR. We hope that our findings contribute to better understanding the unique experiences of teenagers in social VR and point to designing safer more fulfilling experiences in social VR for teenagers.

7 SELECTION AND PARTICIPATION OF CHILDREN

This study was approved by the University's Institutional Review Board (IRB) for research ethics. When conducting this study, we complied with all the IRB guidelines to protect teens' privacy (e.g. no audio or video data were collected) and ensuring that they could leave the study at any time. To recruit participants, we posted recruitment messages on popular social VR forums (e.g. reddit). All teenagers who participated provided written consent via email and

again at the start of the interview. On the day of the interview (via google docs), all participants were asked again if they would like to participate and reminded that we would not ask any personally identifiable information. All participants were compensated \$20 for their time.

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