Exploring the Accessibility of Social Virtual Reality for People with ADHD and Autism: Preliminary Insights

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Abstract

Social virtual reality (VR) has become one of the most popular forms of VR. However, despite years of research on how VR interventions can be useful as diagnostic or therapeutic tools for neurodivergent (ND) users, there has been little examination of how accessible social VR may be for such ND individuals. In this paper, we describe an ongoing user study with participants who self-identify with both autism and ADHD (AuDHD) and also self-identify with facing frequent challenges with social interaction. So far, we have recruited four AuDHD participants; we had each participant briefly explore a world on a popular commercial social VR platform and then reflect on this experience afterward in a longer interview section. Through this process, we uncovered various accessibility challenges in social VR, such as difficulties with navigating social norms or managing certain sensory inputs. We also noted ideas on potential accommodations, like a text-based prompt system that can suggest "appropriate" conversation responses. Our work outlines opportunities to improve the accessibility of social VR for an often-overlooked user group.

CCS Concepts

• **Human-centered computing** → **Accessibility**.

Keywords

ADHD, autism, neurodivergence, VR, accessibility

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1 Introduction

Virtual reality (VR) is becoming increasingly available to the public, particularly via low-cost consumer headsets like the Meta Quest series. A popular form of VR is social VR, which allows users to embody avatars in online worlds and interact across geographical and financial barriers [21]. As one example, the social VR platform VRChat has become one of the most widely used VR applications of all time, averaging 20,000 users each month since 2022 and reaching over 50,000 active users in 2024 [30]. As the social VR user population continues to grow, we must ensure social VR platforms are accessible to all users, regardless of disability.

For many years, researchers have recognized the potential of VR to support people with certain disabilities. In particular, researchers have developed VR interventions to support people in the neurodivergent (ND) community, focusing on people with ADHD and/or autism, who find the visual and game-like nature of VR appealing. For instance, researchers have developed VR applications that teach people with ADHD and/or autism how to interpret social cues, manage their time, and recognize emotions [5, 11, 13, 31, 34]. However, this work has taken a clinical approach, where researchers aimed to diagnose conditions or "train" users to overcome symptoms of their disability [23, 26]. No research, to our knowledge, has explored the accessibility of VR platforms themselves. Since people with ADHD and/or autism often face challenges in social interactions and stimulating physical environments, it is likely they experience distinct challenges in social VR. As many users attempt to interact with each other, social VR environments can become chaotic, especially if they already contain many audio-video stimuli. People with ADHD and/or autism may have difficulties interpreting social cues and structuring speech [3, 7, 20], as well as challenges facing sensory overload from bright lights or overlapping noises [2, 8, 17]. While we anticipate such challenges based on people's experiences in the physical world, it is currently unknown how people with ADHD

and/or autism experience social VR: what specific challenges they face and accommodation strategies they desire.

We seek to address this research gap by investigating the experiences of people with ADHD and/or autism in social VR. Specifically, we pose two research questions:

- RQ1: What challenges do people with ADHD and/or autism face during social interactions in virtual reality environments?
- RQ2: What accommodations do people with ADHD and/or autism prefer to enhance their experience in social VR?

To address these questions, we are conducting a user study with people who self-identify as having ADHD and/or autism. So far we recruited four participants, all of whom have both ADHD and autism (AuDHD) and no prior experience with social VR. During the study session, participants engaged in social interactions on a popular social VR platform. We then interviewed them to reflect on the challenges they experienced and discussed possible accommodations to address these challenges.

We found that participants faced various challenges in social VR, such as becoming overwhelmed during conversation due to environmental stimuli, or struggling to maintain "socially-appropriate" distances with their avatars. Participants also suggested potential accessibility features to try to address these challenges, e.g. a text-based prompt system to provide "appropriate" responses in conversation. Importantly, the goal of such accommodations would not be to simply encourage participants to follow neurotypical social norms. Rather, we aimed to better understand our participants' experiences and their own thoughts on accommodations that could improve subsequent social VR experiences; these potential features could help them engage with, mitigate, or even abstain from the still-nascent social norms of social VR. We discuss potential challenges with incorporating these accommodations in commercial social VR platforms.

In summary, we contribute the first study that unveils the access needs of people with ADHD and/or autism in social VR. Through this work, we expand the conversation of VR accessibility to a broader audience, ensuring that the needs of a more diverse range of users are considered.

2 Related Work

Prior work has examined VR for people with ADHD and/or autism, typically as an intervention for their condition [11, 13, 22, 28, 29, 31, 34]. For instance, Rosenfield et al. designed the VR application Bob's Fish Shop to help Autistic users practice communication skills [31]. They evaluated the application with one Autistic girl and one boy with ADHD, and found the application helped both children understand and practice turn-taking and listening with social partners. Other studies have investigated using VR to build social skills for children with ADHD and/or autism. This includes Wong et al.'s simulator for children with ADHD, which presented them with three social scenarios in VR: a market, a school campus, and a restaurant [34].

However, the literature on the accessibility of social VR is relatively sparse. While there have been some attempts at working with Autistic users to design accessible VR spaces or games [4, 14, 18, 32, 33], these studies have not examined the access challenges of VR as a medium. Recent works have investigated invisibly disabled people's avatar preferences in social VR [14], or broadly examined how to make VR inclusive for users with various cognitive disabilities [9], but these works did not focus specifically on social challenges faced by neurodivergent users. Users with ADHD and/or autism may face unique challenges in social VR [16], partly due to the complex and potentially chaotic nature of social interactions present in social VR [19]. We seek to explore these unique challenges by learning how AuDHD users experience social interactions in VR.

Table 1: Demographic information of study participants, all of whom identified as having both ADHD and autism.

PID	Age	Gender	Social Challenges
P1	20	F	Easily distracted, reading tone and facial expressions, hyperfocusing on topics of interest
P2	27	M	Making friends, easily distracted, understanding social boundaries
P3	24	F	Socializing in large groups, sensory overstimulation, hyperfocusing on topics of interest
P4	26	F	Adjusting to change, easily distracted, sensory overstimulation, urges to fidget mid-conversation

3 Methods

We are conducting a study with people who identify as having ADHD and/or autism. So far, we have recruited four participants who all have both ADHD and autism. During the study, participants experienced a real social VR platform and reflected on their challenges and accommodation preferences.

3.1 Participants.

We recruited participants who fit our inclusion criteria: (1) self-identify as having ADHD and/or autism, (2) experience frequent challenges with social interaction, (3) are 18 years old or older, (4) meet Meta Quest Health and Safety guidelines [24], and (5) are able to travel for an in-person study. We recruited via a screening form which stated these criteria and asked about their experience level with social VR. So far, 4 individuals (3 females, 1 male) with ages ranging from 20 to 27 (mean = 24, SD = 2.6, see Table 1) have participated in our study. All four are novice users with no prior social VR experience (see section 5 for our discussion on limitations). Participants were compensated $50. All procedures were approved by our university's Institutional Review Board, and all participants gave informed consent.

3.2 Procedure.

We conducted this study at our university campus. Each participant's session lasted 75 minutes and contained 2 parts: a social VR experience and a semi-structured interview. One researcher facilitated the study and one joined remotely as a confederate researcher

during the social VR experience. The two parts of the study are described below:

Social VR Experience. Participants began the study by putting on a VR headset and engaging in a popular social VR environment. The purpose of this part of the study was to provide participants with a typical social VR experience upon which they could reflect. We used Meta's native platform Horizon Worlds, a popular social VR platform. Participants first completed a tutorial to learn core VR controls and functions. Afterward, the participant (and a research confederate) joined a public world in Horizon Worlds called Gatsby's Bar. Our team selected this world because it is currently one of the most populated 18+ worlds for socializing, as we wanted to increase the likelihood of interactions with other users.

While a participant was in Gatsby's Bar, we asked them to complete two tasks to induce social interactions and engagement with the environment. The first task was simply to have a conversation with someone. The second task was to perform a social activity interacting with the environment, such as ordering a drink. If the participant struggled to complete either task, the confederate stepped in to engage with them, pretending to be a friendly stranger.

Interview. After the VR experience, we conducted a 45-minute semi-structured interview with participants. **The purpose of this part of the study was to allow participants to reflect on their experience and perceptions of social VR.** We asked questions such as the following:

- "What did you find challenging about the experience?"
- "What kinds of sensory distractions did you experience?"
- "How could your social experience be improved?"

3.3 Data and Analysis

Audio and video recordings from the study were collected and transcribed. Three researchers coded the transcripts using open descriptive codes. All three researchers first coded the same two transcripts, then came together to discuss discrepancies. The group generated a codebook through discussion, then two researchers coded the remaining two transcripts. Afterward, the group conducted a thematic analysis [6] using affinity diagrams to categorize codes into themes.

4 Preliminary Findings

Participants pointed out various social VR accessibility challenges and proposed accommodations to address them. We identified views on potential accommodations, some of which could enhance participants' abilities to mask and to adhere to neurotypical social norms; others could provide spaces and resources for users to more comfortably exist as their authentic, neurodivergent selves.

4.1 Challenges in Initiating and Carrying Conversations

One significant challenge our participants faced was initiating and continuing conversations naturally. For instance, P1 stated, "I was very nervous at first about initiating conversations with people. I didn't know how to do that [and]...there was a lot going on." While she noted these were challenges she faced in the physical world, she felt they were exacerbated in VR. The sensory overload of dozens of avatars talking at once, amid other co-occurring activities, made it more difficult than usual to slow down and establish how she should act.

To address this, participants suggested features to supplement conversations in VR. P1 mentioned having a virtual pet as an icebreaker, while P3 recommended a text-based prompt system to generate conversation starters or responses based on ongoing conversation content. She mentioned it would be even more ideal if she could choose an option and have a "speech bubble" automatically voice the option in an appropriate tone. Such features would help participants initiate and continue interactions more smoothly.

4.2 Dealing with VR Controls In Conversation

Participants also had to navigate technical aspects of VR, which added to their stress during conversations. They mentioned difficulties with remembering the right controls during conversation, learning new, unfamiliar controls, and knowing whether their avatars were moving correctly. Often, the stress of dealing with VR controls exacerbated existing challenges in conversations. P3 noted, "It was especially difficult to remember what I'm supposed to say while also trying to figure out the whole VR stuff."

To help manage these VR-specific challenges, participants suggested features to reduce the mental effort of balancing conversations with managing VR controls. For instance, P4 suggested a feature to ensure she was positioning herself at an appropriate distance from others during conversation, so she didn't have to struggle with locomotion. She mentioned this could be a system dialogue about the correct distance or a third-person view of her avatar to help her gauge proximity. P3 suggested an option in her prompt system to "end" conversations, which would allow her to press a button to voice a socially-acceptable dialogue to leave a conversation at any time. Such modifications would lessen the mental effort of following social norms mid-interaction, and reduce participants' overall stress with adapting to VR.

4.3 Moderating Social Interaction

Participants also struggled with aspects of VR interactions that did not suit their AuDHD preferences. For instance, the live nature of VR made P1 and P3 uncomfortable having to adjust and respond quickly to others, while P3 felt a "pressure to engage or be engaged with." P4 preferred to avoid large groups. She felt excluded within the large groups she joined in VR because her voice was not loud enough and other users seemed tightly-knit. P1 and P3 both wanted to explore the space without talking to anyone at first, but they could not avoid being approached. Finally, P4 stated she would normally wear earplugs in real life to selectively muffle the voices of people she was not speaking to, but in VR, she could only adjust the overall volume of the application.

Our participants suggested modifications to improve their comfort and moderate interactions in VR. P3 wanted summaries of nearby conversations to give her flexibility in choosing social partners, and also wanted the option to remain invisible until she found preferred partners. P1 and P3 suggested iconography such as a social battery and communication badges [25] to communicate energy levels and openness to socializing. P1 also wanted to signal her preferred communication mode, such as by having headphones

to show she was disinterested in verbal communication but open to nonverbal interactions and shared activities. When participants found social partners, they preferred what P2 dubbed as "privacy mode"–P2 and P3 wanted to mute avatars they weren't speaking to and weren't in their field of view. Overall, participants emphasized the need for greater comfort and agency when socializing.

4.4 Social Effect of Space and Physicality in VR

Participants' spatial understanding of their surroundings influenced their social confidence in VR. The less physical nature of VR made conversations feel "fake," which P3 found beneficial since it gave her the confidence to "wander away" mid-conversation with "less repercussions," while P2 felt less invested in conversations without physical interactions like "bump[ing] into people." Participants' understanding of where they and others were also impacted how confident they felt speaking with others. P3 found it "disconcerting" when she couldn't see who was talking, and P2 felt uncertain about approaching avatars moving in and out of view. If he could not always see them, he did not know if he could talk to them.

Our participants provided a few suggestions to address spatial challenges. P2 proposed more precise locomotion controls to face others with greater ease, as well as increased amounts of haptic feedback through devices like VR treadmills. He wanted VR to be as close to reality as possible, which he believed would help ground his social experience. As mentioned earlier, P4 wanted to see her avatar from a third-person viewpoint, both to appropriately position herself in conversation, but also to improve her understanding of where users were standing, giving her a realistic sense of the crowd. These suggestions indicate a need to understand the physicality of the virtual environment in order to immerse oneself in the social environment.

5 Discussion and Future Work

While this short paper reports findings from only four participants so far, we can already observe novel emerging themes. Prior work has suggested VR accessibility features for ADHD and/or Autistic users like simplified audio or iconography to communicate energy levels, [14, 27], but we identified additional helpful features, such as prompts to aid conversation, invisible avatar modes, and third-person avatar views. We also identified challenges with social VR from the perspective of AuDHD users, including difficulties maintaining conversation and moderating social interaction.

Prior work has investigated the impact of diverse social spaces, such as remote collaboration [10], video conferencing tools [35], and social media [1], on neurodivergent individuals. For example, Das et al. focuses on the challenges faced by 36 neurodivergent adults in remote workplace settings [10]. Notably, some participants shared that the act of coordinating turn taking in conversations taking place on video conferencing platforms can lead to anxiety due to a violation of learned neurotypical social norms about interrupting others, as well as an increase in auditory stimuli making it difficult to process what others are saying. This aligns with our findings that multiple speaking avatars and seemingly disembodied voices in social VR can be disorienting for neurodivergent users. Our findings on the social effect of space and physicality in VR expand on these ideas by introducing the impact of locomotion and corporeal positioning on social confidence and the ability to invest oneself in conversations.

It is important to note that all participants were novice VR users, so some challenges may have stemmed from inexperience rather than their neurodivergence. Participants faced the stress of adapting to a new technological medium in a limited amount of time, compounded with having to follow a study design that placed them in potentially uncomfortable social situations. These factors may have drawn out or amplified many of the challenges participants listed with interaction in social VR, and future work is needed to disentangle these effects.

Some of the challenges we identified may have also been purely due to our participants' naivety with VR controls. For instance, prior work has found novice VR users often struggle with locomotion, orientation, and remembering VR controls [12], echoing some of our findings. However, these users typically remained eager to learn after facing such challenges, and were still excited to use VR due to its novelty [12, 15]. In contrast, our participants became stressed about not understanding controls, avoidant of conversations or activities, and most mentioned an unwillingness to try VR again due to their struggles (P2, P3, P4). Our findings suggest these challenges could be more severely impactful on AuDHD users than neurotypical users, even leading to self-exclusion from future VR experiences. We also uncovered challenges not reflected in literature on novice VR users, such as difficulties with sensory overload. At this time, we do not know whether the identified challenges will persist as AuDHD users become more familiar with VR. Either way, it is important to consider these to support AuDHD users.

Finally, we acknowledge that by asking participants to enter conversations in VR, they may have had to act in ways they would typically be uncomfortable with. Thus, some of their challenges with the conversations may have potentially arisen from a mismatch between their socialization style and neurotypical social norms. However, we do not mean to imply that following these norms is the correct nor the only way to socialize in VR.

As a next step, we will conduct the study with additional participants until reaching saturation. We will then incorporate the accommodation suggestions into VR environments and evaluate their effectiveness with AuDHD users. Our work presents the first exploration of social VR accessibility for AuDHD users, and opens a broad space for follow-up studies. These should include exploring the perspectives of users with a range of experience with social VR who identify with various neurodivergent conditions. In the future, we plan to conduct studies with expert neurodivergent users of social VR to determine which kinds of challenges those used to VR experience, as well as what accommodations they may already employ. We may also conduct comparison studies following the double empathy problem, where we examine social interactions between neurodivergent-neurotypical users and neurodivergent-neurodivergent users. This may help us determine which challenges may result from the social VR platform versus those that result from communication challenges across neurotypes.

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