Sensory perceptions in virtual reality (VR) – Design considerations of translating a personal neurodivergent experience in VR

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Keywords
sensory overloading, virtual reality, design consideration, neurodivergent, autoethnography

Format of work
Virtual Reality Interactive

DESCRIPTION OF WORK
A Highly Sensitive Experience is a first-person virtual reality prototype developed using Unity and designed for the Meta Quest 2. The player engages in the experience through an immersive first-person perspective, using the VR headset and standard controllers. By interacting with various environmental stimuli, the player encounters sensory overload from the perspective of a highly sensitive person (HSP). Set in a dark, sensory-rich environment, with carefully designed soundscapes and embodied interactions, the experience simulates the overwhelming sensations often felt by HSPs. Players are invited to engage with actions such as wearing earphones, turning off mobile notification and taking shower to navigate through the environment which reference coping techniques. This project seeks to foster greater understanding of the challenges faced by highly sensitive individuals and to offer coping strategies to those who identify with the condition.

Playthrough video of A Highly Sensitive Experience: https://youtu.be/uEqLrcvDcVk

RESEARCH STATEMENT
Neurodivergence is receiving growing attention in both academia and the virtual reality (VR) industry. (Le 2024; Mesa-Gresa et al. 2018) In VR, neurodivergence is explored through immersive simulations, fostering supportive communities, treatment tools, and visual storytelling, as seen in projects such as *Lou (Asselin and Daigneault 2023)* and Meta Quest's *Navigating Life as a Highly Sensitive Person (Quest)* , *Imaginator (Souza Rossi et al. 2018)* . In academia, scholars like Lindy Le use critical autoethnography to document their neurodivergent experiences and propose principles for accessibility in Human-Computer Interaction (HCI) (Le 2024). However, there remains a gap in integrating autoethnography with practice-based research to comprehensively address neurodivergence in VR design. Using a mixed methods approach revealed a number of design considerations that would potentially have been missed without the autoethnographic component. The game evidences a design artefact that articulates a number of new design approaches.

This VR project is based on the author's experience as a highly sensitive person (HSP) (Acevedo 2020; Aron 2010) and experimented with enacted narrative and embodied interation that immerse users in the sensation of sensory overload. By using a hybrid approach that combines autoethnography and practice-based research, the project provides design insights for VR practitioners who are interested in creating

experiences that focus on neurodivergent individuals, especially through level, sound, and interaction design.

Level Design: The project's level design is minimalistic, emphasizing sound sensitivity, a key trait of the author's HSP experience. The first-person gameplay occurs in a dark environment, with simple objects that are abstractions of an overwhelming social or physical environment. This limits visual distractions and compels players to focus on their auditory senses, thus simulating the overwhelming auditory sensitivity experienced by HSPs.

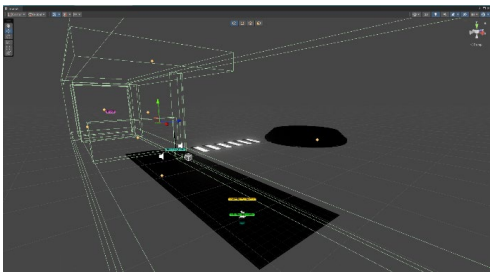

Figure 1. Level setup in the Unity game engine.

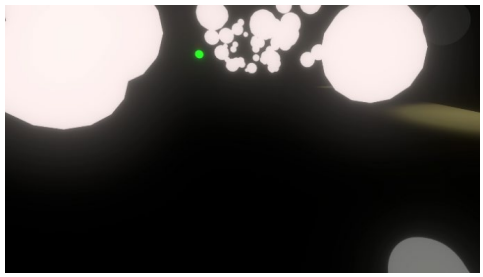

Figure 2. Pedestrians represented as emission spheres to simulate an experience of walking down a busy street.

Figure 3. Focus mode on a mobile device represented as a moon-shaped button.

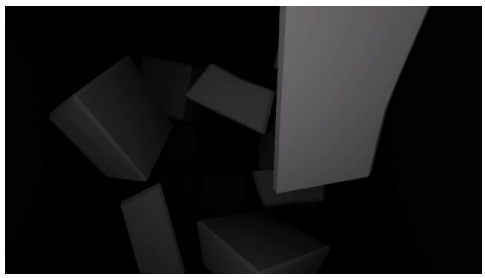

Figure 4. Enlarged flying keys symbolize the protagonist's emotions when distracted from work.

Type of sound	Sound effect
Realistic street sounds - Provide context and orientation, helping the user understand the location and ongoing activities.	Ambient environmental noise, electrical hums, shower sounds, traffic lights, and keyboard typing
Internal voice sound effects- Represent the user's inner emotional and mental state.	Heartbeats, inner thoughts, breathing, and speed-edited, overloading human conversations
Distraction sounds - Use realistic audio to simulate environmental distractions that contribute to sensory overload.	Muffled conversations, footsteps, and phone vibrations
Navigation sounds - Assist the user in navigating the virtual environment.	Traffic light sounds

Table 1: Four elements of the work's soundscape

Sound Design: Sound plays a central role in the project, with four types of sound used: realistic street sounds to provide context, internal voice effects representing emotional states, distraction sounds to simulate sensory overload, and navigation sounds to guide the player. The volume of these sounds is adjusted based on the author's personal auditory sensitivity.

Interaction Design: To manage overstimulation, the project introduces two interactive coping techniques: an embodied earphone metaphor and 3D button interaction. In the gameplay, the protagonist's right hand becomes an earphone, which the player can control through movement. Music plays when the earphone is "worn," with its volume controlled by the player's actions. A visual metaphor of distraction particles enhances the experience, illustrating how sensory overload intensifies when the earphone is removed.

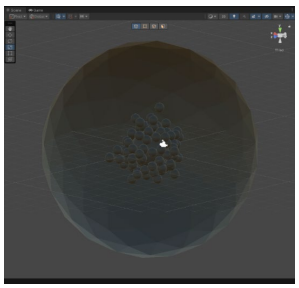

Figure 5. Prototype of distraction particles.

Figure 6. An embodied earphone replaces the character's right hand.

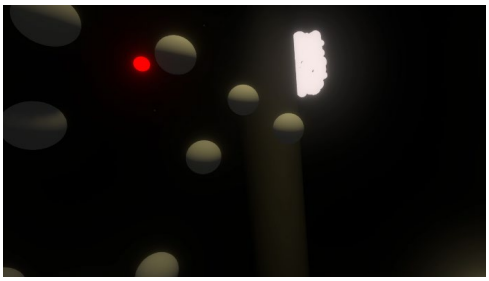

Figure 7. Distraction particles move closer when the earphone is off.

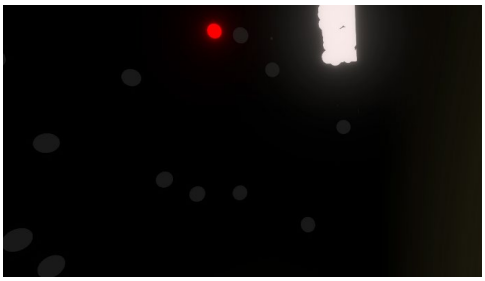

Figure 8. Distraction particles retreat when the earphone is on.

A Highly Sensitive Experience promotes empathy by offering a virtual simulation of the challenges faced by HSPs and rationalizing their use of earphones to cope with sensory overload. Through its mixed-method approach, the project contributes valuable design considerations for VR developers interested in creating sensory-related, neurodivergent-focused experiences.

EXHIBITION

The VR experience requires a simple set up with a laptop, a monitor and a VR headset on a table. The playing participant will wear the headset, and the monitor will display the experience in real-time for other attendees to observe. A table will be required for the setup, along with Wi-Fi access for connectivity during the exhibition.

BIO

Hin Long Yiu is currently pursuing a Master's degree in Animation, Games, and Interactivity (MAGI) at RMIT University, Melbourne. Driven by a deep interest in exploring the creative potential of 3D art, he engages across various mediums, including game engines and virtual reality, to craft immersive, interactive

experiences. His first VR project, *A Highly Sensitive Experience*, translates his personal experience of auditory sensitivity into a virtual interactive environment, with the aim of raising awareness and fostering understanding of the highly sensitive spectrum.

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