Virtual Reality in Relation to Psychological Fears: Game Design Study

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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ABSTRACT

With the rise in popularity of Augmented Reality (AR) and Virtual Reality (VR) technologies in recent years, VR headsets have become a popular commodity in households for entertainment purposes. However, because of the newness of these gadgets, there are currently little content warnings being advertised to potential users about how the realness of these VR applications can induce feelings of discomfort or psychological phobias in users. In this study, conducted under faculty, PhD, and undergraduate students from the UVA Department of Computer Science and Department of Psychology, I helped investigate and analyze how potentially fear-inducing scenarios in VR game scenes affect users. We are conducting this study over the course of several semesters, and as of writing this report we have currently collected data with over 100 participants of their reactions during a height-related VR game scene. From the results of this study, we hope to help VR game engineers develop more specific and unified guidelines of proper content warnings to users with potential fears.

INTRODUCTION

Because of the strive for VR companies to mimic their devices to real life experiences as much as possible, VR experiences can often be very immersive for the user and sometimes hard for them to just snap out of. This is exemplified with VR headset interfaces such as the display screen that spans the user's entire field of vision, sound systems inside the headset that create an all-surrounding effect, and haptic feedback in the handheld controllers which further the immersion by mimicking real life tactile stimuli. However, this closeness to reality can also be translated for negative emotions from real life such as fear and anxiety. Moreover, VR applications currently do not have many appropriate content warnings attached to them before the users start the game, and for games that are exclusively VR, there is not a unified game rating system like those in the traditional video game market. These factors can all cause the users to be quite unaware of potential fear-inducing scenes that can be present in a VR game and be surprised by a scenario or experience. VR's ability to immerse users in an alternate reality can also induce physical discomfort such as dizziness, nausea, etc. which traditional video games are less likely to induce.

RELATED WORKS

VR abilities have been utilized in the field of psychology as a possible clinical treatment for specific phobias. In a 2021 study done by psychology researchers from the Norwegian University of Science and Technology, the usage of VR scenarios was shown to both induce participant's fear of heights and reduce their discomfort with heights with repeated exposure. The study also had 74 clinicians participate in the VR scenarios, while the range of responses from the clinicians varied in their opinions of whether VR could be used as a viable option for treating phobias or not [1]. Similarly, in another study where researchers developed a smartphone-based VR application for participants with reported fear of heights, after repeated usage of the app at home, participants scored significantly lower on

avoidance tests, and had less avoidance towards heights in real life [2]. This showed that VR applications were successful in replicating a fear scenario and could potentially be used to treat psychological fears.

DESIGN

Our study recruited participants from the UVA psychology students pool, as students taking certain psychology courses at UVA are required to participate in a number of studies inside the department. Before the study, participants answered a screening survey that screened out anyone with physical preexisting conditions that could be dangerous if they became overly anxious, such as heart disease, anxiety disorders, etc. Participants were also informed of the nature of the study and provided their consent for us to collect anonymized biometric data of their heart rate, motion, and recording of their in-game movements during the experiments. Lastly, the participants answered a pre-study survey that asked about their fear rating of the phobias tested in our study (fear of heights, sharp objects, confined spaces, and trypophobia), as well as any prior experience they might have had with VR tools. The current phase of our study is conducting trials solely with height scenarios. For this scenario, participants were instructed to wear a VR headset and heart rate monitor. They could use their handheld controllers or physically walk around the room to navigate the VR scene. They were instructed to explore the scene by walking to different points in the scene, which were designated by numbers from 1-7. These points mimicked real life height situations such as a plank at the edge of a cliff, or an overlook on the top of a building. When the participant reached a random number, the ground in the scene would fall through, making the participant fall in the VR scene.

This process would repeat three times for three trials of each participant, but the number at which the participant will fall is randomized at every trial so that there is an element of surprise to the participants of when they might fall, to simulate a discomfort or mild anxiousness about falling from heights as best as possible. The height of the platform is also random for each trial, with a lowest, middle, and highest height. After each trial, the participant would also fill out a post-trial survey that asked them to rate how fearful they felt each time, in the range of 1-7. After three trials were done, the participants filled out an overall post-study survey in which we gathered their opinions of any VR applications they might have used, and what improvements they might suggest for them.

For the data collected in this study, we mapped the heart rate progression of each participant to the timestamps of when they were experiencing a fall during the experiment, to analyze if the fall in height was inducing any reaction in a participant, which in turn tells us if the VR simulation was truly similar enough to a real-life experience that it requires additional warnings from the developers.

RESULTS & FUTURE WORK

This study is still currently ongoing, and the data for all of our height scene trials are still in the collection process before they can be aggregated and analyzed in a meaningful way. We expect all trials of this study to be done in the next few semesters, as there is a limit to how many participants we can accept from the UVA students pool each semester. The results from our study will help us make suggestions to VR game developers on how they should design their games to be less harmful in terms of inducing fears in common users, or new users unfamiliar with VR. For games with elements that might trigger common fears, we will also be able to advise on what proper warnings should be included prior to a user starting a game, and how to structure those warnings to be concise while still safeguarding users.

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