

Virtual Reality Translation of Filipino Perspectives on Selected Depressive Social Context

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The Asian Conference on the Social Sciences 2023
Official Conference Proceedings

Abstract

An estimated count of 154 million Filipinos are suffering from depression and it is considered to be one of the mental health concerns in the Philippines. It is a mental disorder that can be seen in various social contexts that display its level of functioning specially when exposed or triggered in a specific environment. Depression can be treated, and it is beneficial for it to be diagnosed at an early onset. Currently, virtual reality technologies have been utilized in the medical field to simulate real-life depressive situations and scenarios in the virtual space. Modern technologies like the virtual reality systems are simulations of environments and objects that seem to be real as they provide an opportunity for the user to have similar real experiences. Locally, there are few studies which tackle the design of culturally adapted environments for Filipinos where depressive social contexts can be identified. In this study, virtual spaces were developed based on real-life depressive social contexts in the Philippine setting. The inputs were obtained from typical layouts and designs of local social contexts based on literature reviews. Results show various designs of proposed virtual reality environment where therapy simulations could possibly take place.

Keywords: Depression, Virtual Reality, Virtual Environment

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Introduction

The COVID-19 pandemic has placed the world to an unprecedented psychological burden including the Philippines (Acob, Arifi & Dewi, 2021). There were around 3.6 million Filipinos who are battling mental disorders, according to a 2020 survey from the Department of Health (Mendoza, 2022). Depression is a leading cause of psychological disability globally and is expected to be a burden by 2030 (Kwong, López-López, Hammerton, Manley, Timpson, Leckie & Pearson, 2019). According to Acob *et al.* (2021) it contains nine symptoms that include physiological, behavioral, cognitive, and psychological symptoms. It is a condition of disinterest and extreme sadness. People with depressive disorders have difficulties in their ability to operate physically and socially that are just as severe or worse than those brought on by other medical diseases. There are significant efforts made to increase access to mental healthcare services to many (Reyes, 2020).

To narrow the therapeutic gap, technology is increasingly being used as a supplement to or a means of delivering mental health treatments. Moreover, virtual reality is initially introduced as a technology that simulates a virtual environment where users can be immersed and provide similar objects and scenes that appear to be real. The market for VR technology has increased with its rapid development (Wohlgenannt, Simons, & Stieglitz, 2020) in which it reached its purpose to be utilized in the purpose of understanding mental health. The virtual environment developed from the current study replicates the design, objects, and selected social contexts of classroom, household, and workplace in which possible episodes of depressive behaviors or symptoms arise. Other mental health conditions are now being treated with virtual reality in addition to phobic diseases. Given its potential to offer clinically pertinent information related to the assessment and treatment of individuals suffering from mental illness, this technique is crucial for future practice. Studies examining the use of virtual reality treatment for depression are encouraging given the mounting evidence that it is useful in treating post-traumatic stress disorder and anxiety disorders (Emmelkamp & Meyerbröker 2021).

Related Studies

Depression disorder is a major concern around the world. There has been several research conducted towards this disorder from across contexts, subjects, and methodology. In general, people with depression reported some level of functional impairment as a result of their depressive symptoms. Academics is one of the top reasons for depressive behaviors (Porillo & Tungol, 2021). Thus, the current study has collected the results of various research that covers the affective symptoms, cognitive concerns, behavioral challenges, physiological concerns, and social concerns. The affective symptom refers to the emotional vulnerability and difficulty of expression that leads to emotional numbness (Porillo & Tungol, 2021). It includes the overwhelming sadness (Valdeavilla, Santos, Domingo & Pulido, 2019) and academic stress especially for math related subjects (Pineda & Bueno, 2019), moodiness, irritability, and anxiety (Valdeavilla *et al.*, 2019). Moreover, the cognitive concerns. include the uncertainty towards the future and accomplishing academic requirements (Pineda & Bueno, 2019). It affects their task performance and concentration (Lee, Maria, Estanislao & Rodriguez, 2013). The behavioral challenges include being aloof, quiet (Porillo & Tungol, 2021), low motivation (Valdeavilla *et al.*, 2019), and other somatic symptoms are referred to physiological concerns. In addition, studies have emphasized the concern role played by the social environment and relationship. It established that Filipinos influence others with their emotion and are also influenced by others.

Furthermore, the household setting asserts the idea of the Filipino's parental depressive symptoms and negative parenting behaviors. It states that mothers have higher levels of depressive symptoms, and they are the caregivers of the children and management of the house. Further, although mothers' results on harsh parenting with small effect size have increased with higher reports of depressive symptoms. Jocson (2020) notes that mental health professionals must have a sense of the negative repercussions of poor mental health on the community. There are narrated scenarios of depressive behaviors of crying in the living room, having a messy household and being restless in the bed are a few (Yap, Chua, Chan & Canoy, 2020). Moreover, parental expectations, guilt feelings, anxiety, difficulty of letting go of tension, and difficulty of acceptance are vital incidents of depressive behavior (Pineda *et al.*, 2019).

Another significant public health issue about depression is its presence in the workplace. Although the potential to be a key setting for interventions targeted at preventing the onset of depression (Tan, L., Wang, MJ., Modini, M. *et al.*, 2014) it still has a significant detrimental impact on performance, productivity, absenteeism, and disability expenses (Bender & Farvolden, 2008). Depression does not have the same effect on all individuals for it has a range of personal, social, environmental moderators within each of us that influence our susceptibility and coping abilities in relation to stressors we experience (Goldberg & Steury, 2001). When exposed to a stressful environment repeatedly, people exhibit a variety of indications and symptoms as having hazy feelings, despair, boredom, apathy, emotional exhaustion, sleep difficulties, irritability, lack of sex desire, acute anxiety, withdrawal, restlessness, and suicidal thoughts which don't happen all at once but develop over time (Tan, L., Wang, MJ., Modini, M. *et al.*, 2014). Despite this expanding concern regarding this, there are many untapped aspects that have not been studied yet such as the sex, age, year level, course and religion in the Philippine setting (Lee *et al.*, 2019).

Virtual Reality Technology has expanded substantially since Sutherland's concept of an 'Ultimate Display' and Jaron Lanier's coining of the term 'Virtual Reality' in the Mid to Late 20th Century (Schroeder, 1993). The current wave of Virtual Reality, which started with the kickstarter of the Oculus Rift Head-Mounted Display (HMD) in 2012, has brought vast amounts of options not only for research but also for the consumer (Anthes, García-Hernández, Wiedemann & Kranzlmüller, 2016).

Davis, Steury & Pagulayan (2005) reticles have been a staple in games, especially in the First-Person Shooter (FPS) genre, with virtual reality applications and games being mainly rendered and displayed to the user in first person to provide graphical visual aids for improved user experience and feedback. Use of reticles or crosshairs have also been proven to reduce VR sickness or cybersickness (Seok, Kim, Son, & Kim, 2021) while using an HMD which further improves immersion (Arshad, Mello, Ender, McEwen & Ferré, 2021). With mobile HMD's or smartphone-based VR's, gaze-dwelling technique is widely used to interact with objects and the user interface by using an indicator that slowly fills up as long as the object is continuously looked at (Steed, Takala, Archer, Lages & Lindeman, 2021).

In terms of environments, there are certain common categories of such in which symptoms of depression are typically experienced by various people in different circumstances. Adolescents commonly experience depressive symptoms at school, particularly in classrooms, and in their own households due to the stress brought about by academic pressure being exerted on them by their parents and familial stress due to certain problems being experienced within their respective households (Deng, Cherian, Khan, Kumari, Sial, Comite, Gavurova & Popp, 2022) (Bezold, Banay, Coull, Hart, James, Kubzansky, Missmer & Laden, 2018). Moreover, as cited

by Philipps (2018), the physical structure of a classroom plays an important role in improving and maintaining students' morale and learning. As for elderly people, the neighborhood environment also contributes to the depressive symptoms being experienced by them (Lam, Loo, & Mahendran, 2020). This meant that each of the households were directly affected by the physical and architectural features of the community settings which could, in turn, lead to environmental stressors and affect the response of an elderly person to depression. Moreover, the prevalence of depression has been found to be affected by the quality of housing as well as the numbers of rooms present in the home (Lam *et al.*, 2020). Moving on, Broom, Kokanović, Ziebland & Hill (2017) stated that an intersection between depression and work was encountered after the interviews of participants of their study who were citizens of the United Kingdom and Australia. Most of the Australian workforce believed that workplace problems were causing them distress with well-being and work-life balance declining in relation to such. Moving on, Veitch (2011) stated that existing knowledge suggested that workplace or office design could have an influence in mental health. Examples of such include light exposure effects on circadian regulation, social behavior, & affect, aesthetic judgements effect on at-work mood, physical wellbeing, & at-home sleep quality, and effects of having access to nature on recovery from stressful experiences. Additionally, a well-designed workplace could be supportive to an employee's mental health through removal of potential stressors for better individual focus and productivity. Some examples of design considerations for workplace include spatial density (the floor area per person) to prevent or alleviate crowding, placement of windows within a workplace or office space to allow employees access to a view of the outside environment, and the amount of white light passing through the workspace or office space for better overall mood.

Currently in the Philippines, there has been virtual reality-related research regarding the design of environments in the virtual space but none of these tackled the design and development of virtual-reality environments based on real-life social contexts while taking into consideration people experiencing symptoms of depression. The virtual reality environments produced by Grepon and Martinez (2021) and which were translations of real-life school buildings and rooms found in the Philippines, only focused on the conversion of such real-life environments into the virtual world space but never took into consideration anything related to depression and its symptoms. Though, the colors used in their designs and architectural shape & layout of the structures were similar with the common color of the materials being represented and the real-life structure being represented. Additionally, overall quality and addition of functionalities would be ideal for such environments (Valdez, Rivera & Pabico, 2015).

In this study, the virtual reality translation of Filipino perspectives on selected depressive social contexts were investigated and the relevant virtual environments were designed.

Methodology

The conceptual framework of the VR environment design is shown in Figure 1. The process began by identifying the necessary input components for the design of the environment, namely room lighting, physical structure, spatial density, color scheme, and window placement. These input components were identified through the principles of game design and development which were based on data acquired from previously conducted studies related to virtual reality, depression, and social contexts. The actual virtual environment design was carried out with Unity as the development platform.

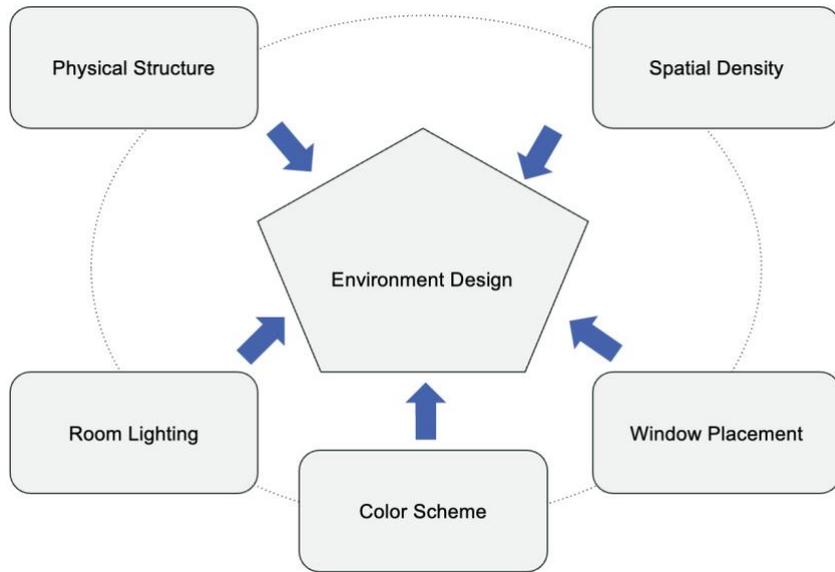


Figure 1: *Conceptual Framework of VR Environment Design*

Aside from the input components, this also included objects that would be necessary for the virtual reality environment design in replicating a certain depressive social context. Moving on, once the design was done, this was then finally exported into the device handling virtual reality-related environments and applications. The equipment necessary for such process included a Windows laptop and a Samsung smartphone wherein the application containing the environments were built in Unity by means of a Windows laptop and then exported into the Samsung smartphone using serial communication.

Acquisition of Data for Design Considerations with Regards to Depressive Social Contexts

The data was acquired from the methodologies and discussion of results within the studies conducted by Phillips (2014); Lam *et al.*, 2020; Ridge *et al.*, 2017; Veitch (2011); Grepon & Lester (2017); and Valdez *et al.*, 2015. Table 1 shows the design considerations that were taken into account when the virtual environments were developed.

Table 1: *Design Considerations for the Development of the Virtual Environments*

Design Consideration	Details
Physical structure	Should be similar with real-life environment being represented
Spatial density	Adequate spacing should be provided within the environment for space traversal
Room lighting	Room should be well-lit such that all elements of its interior are visible

Window placement	Handful of windows should be present to represent access to the outside world
Color scheme	Should match the common color of the real-life material being represented

Table 1 shows the design considerations that were considered when the environments were developed. Looking at the table, there were five (5) design considerations included, which were physical structure, spatial density, room lighting, window placement, and color scheme. The first design consideration was meant to give the environment a real-life feel through similarity with its real-life counterpart. Meanwhile, the second design consideration was necessary to allow for movement within the environment to further enhance the immersive experience that comes with it. As for the third design consideration, this was so that all objects included within the environment could be easily seen by the user and also to inhibit any negative thoughts while going through the environment. The fourth design consideration was included so that the user immersed in the environment could have a grasp of the artificial outside world within the virtual reality and exhibit the capability of being able to view such world space. Lastly, the fifth design consideration was necessary to further amplify the feel for the environment through imitation of the object's common material color. Additionally, quality of the objects and structure components included were also taken into consideration during the development of such environments.

Design and Development of Virtual Environments

The virtual reality application was designed using Unity, a cross-platform game engine development platform. Moreover, the application featured three (3) environments powered by the platform initially mentioned and Google Cardboard. To be more specific, Unity was used to create not only the application but also the environments, Google Cardboard XR Plugin for Unity and Cardboard SDK were utilized to provide virtual reality capabilities, and Ink Unity Integration was utilized for integration of non-player character (NPC) dialogue interaction between it and the user. Additionally, the objects that were utilized were taken from various asset stores which were then modified to meet the needs of the environment with regards to the design considerations found in Table 1.

Development of Program Functionalities

Two (2) virtual reality techniques were implemented to enable the user to visualize interactions within the environments. The following were the techniques that were used for such:

- 1) Reticule: This was implemented to aid the user in determining the interactable objects that he or she looked at.
- 2) Loading indicator: The application used gazes to register input from UI elements. A loading indicator was used which filled up as the user continued to look at the gazed UI element, the user could easily determine if he or she was about to select a button.

Meanwhile, interactions included within the environment were also developed. Three (3) unique features pertaining to such various functionalities were designed and implemented within the application. Such components are as follows:

- 1) **Gaze:** Gaze was a feature implemented to select user interface objects such as buttons and press them in the virtual environment. A reticle or crosshair was provided that guided the user where he or she was looking at.
- 2) **Movement:** Movement was determined by looking at the ground and pressing the corresponding left mouse button on the controller. This allowed the user to travel to a specific position being gazed at upon pressing the left mouse button.
- 3) **NPC Dialogue:** Dialogue between the NPC's and the user used Ink Unity Integration, this provided conversational capabilities between an NPC and a user.

Results and Discussion

Depression is a mental health concern in which the occurrence of each symptom can be seen across personal, social, academic, and occupational functioning. The dysfunction of a person represents the course and onset of the depressive symptoms. Based on the previous studies, there are social contexts and objects that are related to certain clinical criteria for depression. With these as considerations, the current study has included the classroom, household and workplace in the replication for the virtual reality environment.

A local classroom setting is shown in Figures 2 and 3. The reference photos were taken from a typical classroom in Philippine Public School.



Figure 2: Reference photo of a Philippine Classroom (taken from DZRH News, n.d.)

The reference photos collected all employ the guideline of organizing classroom space in terms of personal territory as David (2002) stated which consists of each student having their own space/desk to place personal belongings. Arrangement of the desks are done in Large Group Row Arrangements, with Rows of wooden desks facing a blackboard, with a teacher's desk in front. Decorations in the classroom are also found in the reference photos such as letters of the alphabet or papers plastered on the upper areas of the classroom walls or above the blackboard. Large windows can be found on one side of the classroom.



Figure 3: Reference photo of a Philippine Classroom (taken from L.M. David, n.d.)

Figures 4, 5, and 6 shows the translated virtual environment for the classroom, office, and household, respectively.



Figure 4: Virtual Classroom Environment

The translated virtual classroom environment is of 3 rows of 3 desks in each row. The rows of desks are facing a blackboard in which the menu can also be found. An alphabet and numbers from 1-10 are found above the blackboard. A map of Europe can be found on one side, with a board with papers can be found on the other side. The classroom floors are made of wooden textures, while the walls are made out of off-white textures and wooden textures. Windows can be found on the right side facing the blackboard. A board with papers can also be found on the opposite side of the classroom. The virtual classroom has similarities with the reference photos of the classroom, with similar arrangements of desks, its windows, and sharing of decorations on the walls.



Figure 5: *Virtual Office Environment*

The translated office environment is a conference room. The conference room consists of a large table and chairs used for formal meetings in office settings, which can also provide teleconference services (Rechavi, 2009). The translated virtual office environment in Fig 5. has those similar themes with a large conference table with chairs in a conference format (Evans, 2003). The television on one end containing the main menu emulates the ability for teleconference service.

The office environment reference is a conference room. This room consists of a long, white, conference table in the center with chairs facing each other. On the far end of the room is a television with a wooden cabinet below it. The right side of the room facing the television consists of large windows and an elongated white cabinet below. The opposite side has multiple doors. The virtual office environment is a replica of the reference photo. The room consists of a similar layout, a conference table in the center with a menu on one end. The windows and doors on each side of the room are also replicated in the virtual office. The main menu to connect to other environments has replaced the television from the reference photo.

The virtual household environment consists of just a living room space. The living room space has four (4) walls with a couch on one side of the wall, a coffee table, and two extra chairs, one diagonally and another across the couch. The opposite side of the couch has a Television where the menu to go to other environments are found. Windows are also found on the right side facing the television. Various objects are found on the walls used as decorations such as pictures. There are other items around the room such as vases and lamps that serve as decoration in the virtual household environment.



Figure 6: *Virtual Household Environment*

A living room in a household shares several objects and themes despite the fact that households are made of different types of dwellings, like apartments or stand alone houses, or have people of different genders and economic abilities living in them. The “living room prototype” according to Rechavi (2009) consists of a couch, a coffee table, and an additional seat diagonally across or beside it. Additionally, a living room includes objects that are meaningful to its inhabitants. The living room of the virtual household environment meets these themes of a living room.

The built environments are known to impact a person’s mental health, directly or indirectly through its design. The interior design of a room, such as the arrangement of chairs or addition of decoration on walls affects the social interaction and passive behavior of people interacting in the room (David, 2022). A virtual environment can emulate a presence with realism within a safe environment, and it has been suggested that virtual environments can produce the same social effects it has when interacting with real people. Being able to translate the classroom, office and household into a virtual environment greatly aids in the goal of being able to reproduce depressive symptoms for further study.

Conclusion

In general, people with depression are assessed based on reported levels of functional impairment because of their depressive symptoms. These symptoms experienced by the participants from the previous papers have caused difficulty for them to work, complete tasks at home or be efficient in performance. The social aspect of Filipinos has influenced factors of depression and needs to be in consideration to see a greater risk. The criterion of abnormal behavior involves dysfunction, distress, atypical behavior, and deviance. The extent of these criteria being present in a person’s depressive state can be seen across different contexts of functioning. Virtual reality proves encouraging opportunities to be used widely in the assessment, therapy and rehabilitation for various mental health concerns in the future. The virtual reality environments, which were based from the design of real-life depressive social contexts, that were designed along with the developed application containing such environments would be of great help in the medical field, particularly in the field of mental health and psychology. These could be utilized as a medium for assessing and treating people experiencing depression, its symptoms, and certain episodes of such illness. With the design considerations taken into account when the environments were, the world space provided by the environments would prove to be useful in making sure that control for both the patient and

doctor addressing the patient's illness could be established while ensuring that the environment provides the patient a pleasant experience during the sessions.

Moving on, it is recommended to involve a clinical trial to assess the system's efficacy on the intended subject population. Long-term research is also required to look into the emotional interface design and graphical visualization of the system in order to enhance patient testing and to expand the potential of virtual reality and its environments in utilizing and addressing therapeutic gaps so that appropriate preventive measures may be taken and reduce the prevalence of mental illness which can be addressed in different research approaches, norms, methodology and variables.

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