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GRADUATION PROJECT: COVR

Thesis by

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by

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THESIS EXAMINATION RESULT FORM

We have read the thesis entitled "**GRADUATION PROJECT: COVR**" completed by **Selinay ALTUN, Emine İNAN, Elif ŞAHİNGÖZ, İmtisal AKDEDE** under supervision of **Nisanur Mühürdaroğlu Mercimek** and we certify that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.

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GRADUATION PROJECT: COVR

ABSTRACT

In this study, user experiences for the treatment of agorophobia caused by the COVID-19 epidemic in a three-dimensional virtual reality environment were taken. The aim of the study is to provide a gradual exposure treatment experience to the person who has fear and anxiety, who is adversely affected by the COVID-19 epidemic, and to offer solutions to this problem. 20 students studying in different departments of a state university participated in the study. While determining the study group, an easily accessible sampling method that has experienced COVID-19 disease was used. Each user participating in the study was exposed to the environments by spending at least 10 minutes in virtual reality environments using virtual reality glasses. The formative research technique was used in the study.The data in the study were obtained with the "Virtual Reality Environments Evaluation Opinion Form" developed by the researchers, and the data were interpreted by making content analysis. At the end of the study, users stated the potential advantages of virtual reality environments and potential problems that may arise in virtual reality environments. In addition, some suggestions have been made by users on how virtual reality environments can be improved. At the end of the study, some solution suggestions were presented by the researchers in order to make virtual reality environments more effective in line with user opinions and suggestions.

Keywords: Virtual Reality, Exposure Therapy, Covid-19, 3D Modeling

BİTİRME PROJESİ : COVR

ÖZ

Bu çalışmada üç boyutlu sanal gerçeklik ortamında COVID-19 salgınının neden olduğu agorofobinin tedavisine yönelik kullanıcı deneyimleri alınmıştır. Çalışmanın amacı COVID-19 salgınından olumsuz etkilenen korku ve kaygı sahibi kişiye kademeli olarak maruz bırakma tedavisi deneyimini yaşatmak ve bu probleme çözüm önerileri sunabilmektir. Çalışmaya bir devlet üniversitesinin farklı bölümlerinde okumakta olan 20 öğrenci katılmıştır. Çalışma grubu belirlenirken kolay ulaşılabilir ve COVID-19 hastalığını geçirmiş örnekleme yöntemi kullanılmıştır. Çalışmaya katılan her bir kullanıcı sanal gerçeklik gözlüğü kullanarak sanal gerçeklik ortamlarında en az 10 dakika zaman geçirerek ortamlara maruz bırakılmıştır. Çalışmada biçimlendirici araştırma tekniği kullanılmıştır. Çalışmadaki veriler araştırmacılar tarafından geliştirilen "Sanal Gerçeklik Ortamları Değerlendirme Görüş Formu" ile elde edilmiş, veriler içerik analizi yapılarak yorumlanmıştır. Çalışma sonunda kullanıcılar sanal gerçeklik ortamlarının potansiyel avantajlarını ve sanal gerçeklik ortamlarında ortaya çıkabilecek potansiyel problemleri belirtmiştir. Ayrıca sanal gerçeklik ortamlarının nasıl daha iyi hale getirilebileceği yönünde kullanıcılar tarafından bir takım önerilerde bulunulmuştur. Çalışma sonunda kullanıcı görüşleri ve önerileri doğrultusunda sanal gerçeklik ortamlarını daha etkili hale getirebilmek için araştırmacılar tarafından bir takım çözüm önerileri sunulmuştur.

Anahtar kelimeler: Sanal Gerçeklik, Maruz Bırakma Terapisi, Covid-19, 3B Modelleme

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NOMENCLATURE

Roman Letter Symbols

T	Absolute temperature, K
U	Overall heat transfer coefficient, $W/(m^2.K)$

Greek Letter Symbols

α	Ratio of heat transfer area of one side to total heat exchanger volume, m^2/m^3
β	Complex numbers
ρ	Density of fluid, kg/m^3

Subscripts

c	Cold fluid
h	Hot fluid

Acronyms

BDC	Bottom Dead Center
CI	Compression-ignition

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CHAPTER 1

INTRODUCTION

After the Covid-19 epidemic, many psychological disorders have emerged with the changing living conditions. In the project, research and developments were made on the most common of these problems, agoraphobia. Agoraphobia is the fear of field. The person fears leaving the home, being in public places, entering shopping malls or shops, being in crowds, movie theaters or narrow and closed rooms, or traveling by train, bus, or plane. Due to the high probability of transmission of Covid-19 in the crowd, this fear has been seen in people. Despite the precautions taken and being vaccinated, the person is afraid to go out in the crowd [1].

Until now, many phobias have been treated with exposure. There are varieties of exposure method. One of them is in vivo or "real life". This type exposes the patient to real fear-inducing situations. The second type of exposure is imagery, in which patients are asked to imagine a situation they fear. However, these methods have many disadvantages, are costly, and accessing phobic situations is not always easy or convenient. Many exposures are difficult or even impossible to regulate in real life. Since imagery depends on the imagination of the patient, it does not give objective and accurate results. In these cases, the therapist cannot intervene immediately.

The project is being developed using the Virtual Reality Exposure Therapy (VRET) method. VRET is used for the treatment of anxiety disorders and specific phobias. Clinicians can use VR technology without the cost, privacy, security concerns. Virtual reality exposure therapy (VRET) allows for personalized, gradual, controlled, immersive exposure that is simple for therapists to use and frequently more patient-friendly than in vivo or imaginal exposure. With the help of a therapist, users can practice behavioral skills in a safe setting. Social anxiety, PTSD, and panic disorder have all been treated with VRET. Data from studies have shown that exposure of patients to the feared stimulus rather than imagining it produces better outcomes for treatment. COVID-19 virus, which is one of the last epidemics in the history of the world and spread to the whole world in the last months of 2019 in the city of Wuhan,

China, leaves many psychological damages as well as known physical damage [1]. Many studies have been carried out after Covid-19. A study conducted in May 2021 shows that [2] one-third of patients with Covid-19 are diagnosed with depression, anxiety, agoraphobia, stress disorder and psychological symptoms within 6 months. In the light of these studies and as a result of interviews with experts in the field, agoraphobia anxiety disorder was selected in the project.

According to this study [3], exposure therapy was found to be effective in patients with specific phobias. In the study, it was stated that in traditional exposure therapy, patients are brought to their feared state throughout the sessions, this method can be costly and even dangerous because it is difficult to maintain the stimuli for the patients' specific phobias. In the study, it is explained that thanks to virtual reality exposure therapy, emotions and environments that activate patients are created virtually, and this method is cheaper and more accessible. According to the results of this and many other studies, it was decided to use the virtual reality exposure method in the project.

Studies on the diagnosis of agoraphobia and the method of exposure with virtual reality, which were decided in the project, were examined. The results of the study[4] of virtual reality exposure therapy with individuals with agoraphobia revealed that virtual reality-based exposure has a similar amount of effectiveness as experiential exposure in the treatment of agoraphobia anxiety disorder. Studies reveal that virtual reality can be effective in panic disorder and agoraphobia.

In the project, exposure therapy with virtual reality enables patients to create three-dimensional environments on the computer and treat them step by step by exposing them to anxiety disorders and stressful environments. It is very important for [5] the patient to interact with three-dimensional virtual scenarios like the real environment. The virtual reality exposure therapy used in the project [6] also protects the patient's privacy rights and privacy, as s/he continues her/his treatment in the patient's room and continues her/his treatment without being exposed to the gaze of other people without being taken to a real environment.

In the study,[7] it was stated that the game engines that support this technology, Unity,

Unreal Engine, CryEngine, AppGameKit VR, libGDX, Skyline, Torque3D can be used to develop a VR application. According to the study, Unity has a user-friendly interface that is easy to use and explore, provides high-quality tutorials and documentation to developers, and has the ability to compile developed environments for a wide variety of platforms such as Oculus Rift, HTC Vive, Gear VR. Together with the project team, it was decided to develop the project in Unity. C Sharp, an object-oriented language, is used for the project developed in the Unity game engine.

The aim of the project is to treat the agoraphobia caused by the Covid-19 epidemic on human psychology by gradually applying exposure therapy with virtual reality glasses in the created three-dimensional environments. The user undergoes an effective treatment process with the intervention of the therapist by being exposed to more than one environment in the project. The aim at the end of the project is to overcome the agoraphobia that affects one's life as a result of exposure to these environments.

In the project, three environments are created using the Unity game engine and C Sharp. The first of these environments is less crowded, the second is moderately crowded, and the third is very crowded. HTC Vive virtual reality glasses are integrated using SteamVR.

CHAPTER 2

MATERIALS AND SYSTEM DESIGN

2.1 Virtual Reality

The use of computer modeling and simulation to enable a human to engage with an artificial three-dimensional (3-D) visual or other sensory world is known as virtual reality (VR). VR applications immerse the user in a computer-generated environment that mimics reality through the use of interactive equipment such as goggles, headsets, gloves, or body suits that send and receive information. A user wearing a helmet with a stereoscopic screen displays animated pictures of a simulated environment in a standard VR style. The illusion of "being there" (telepresence) is created using motion sensors that detect the user's motions and change the display on the screen in real time (at the moment the user moves).

2.2 Exposure Therapy

Exposure therapy is a variation of behavioral therapy and is designed to help clients manage their problematic fears. With the use of certain systematic techniques, a person is gradually exposed to the stressful situation. The aim of exposure therapy is to increase the quality of life by teaching the person to manage the fears that create stress and negatively affect their daily life, through a safe environment.

2.2.1 Virtual Reality Exposure Therapy

Exposure is a successful method used in the successful treatment of phobias and anxiety disorders. Virtual reality offers the most effective way to provide exposure in this type of treatment. There are generally two types of approaches to exposure therapy. The first of these is known as the implosion overflow method. This technique involves prolonged exposure at high fear intensity with the aim of rapidly destroying the fear response. The other technique involves starting with phobic stimuli that trigger mild to moderate distress and gradually increasing exposure, which reduces the fear response before exposure to more intense trigger stimuli. This method is often paired with cognitive therapy and anxiety management techniques.

Standard approaches to providing exposure usually involve imaginary exposure as homework or encountering real-life phobic stimulus/situations in the office (in vivo). In office exposure, the therapist may follow the patient's reactions. In vivo exposure is more vivid, more "real", whether accompanied in or out of the office, or done by the patient alone as homework. While these two options are quite effective, each has some limitations. With Imagery exposure, you cannot control content or density. Even with guided in-office Imagery exposure, you cannot 'see' what your patient is imagining. Also, people have different capacities to imagine vividly, and the vividness of visual images declines with age, so patients may not be able to create effective images. In-office exposure, on the other hand, requires the introduction of phobic stimuli to the office. Adjustment of in vivo exposure outside the office is sometimes possible, for example, taking a public elevator or driving a car, but accessing phobic situations is not always easy or convenient. In addition, it is not suitable for patient privacy. Many exposures are difficult or even impossible to regulate in real life.

In summary, exposure therapy using virtual reality is quite easy and effective. Equipment and software are increasingly affordable, compact and easy to use. Technical support is available. Virtual reality therapy can be accepted by patients,

2.2.2 Virtual Reality Exposure Therapy and Agoraphobia

In the treatment of agoraphobia with virtual reality, it is aimed to expose the person to environments that cause anxiety repeatedly and to reduce the anxiety experienced when he enters these environments by using the coping skills he has acquired. Entering anxiety-provoking environments repeatedly without the help of an expert is very challenging due to the intense anxiety experienced by the person and is the reason why many people avoid psychotherapy.

It is observed that the motivation and belief of the person who is repeatedly exposed to anxiety-inducing environments such as shopping malls or bridges in the virtual environment, accompanied by a psychologist and with virtual reality glasses, is quite high, so that her/his anxiety decreases in a short time.

2.3 Software Development Methodology

Agile is used as a software development method in the project. Agile was chosen because the project continues to be developed day by day and changing situations may occur. Thanks to Agile, it is possible to respond quickly and easily to changing conditions. Another reason for using it in a project is to learn how to apply Agile, which is most preferred in large projects, correctly and efficiently.

While developing the project, Scrum, one of the Agile project management methodologies, is preferred. In this way, instead of producing products at the end of a linear development process for a long time, weekly work plans are carried out within working periods called sprints to respond to rapidly changing needs. A scrum master is selected every two weeks so that everyone in the project team can have equal experience in this regard. Sprints are created using Jira, a team member who is a scrum master for two weeks. Work that needs to be done in each sprint is owned by the people and comes out as a product at the end of the sprint. Business divisions in the project are easier to follow thanks to Jira. The process of necessary adjustments and updates by the project team is accelerated by using the GitHub service. Thanks to GitHub, the work done on the project can be instantly seen, interpreted, corrected and approved. Since the changes made are not included in the main project without approval, the project team makes its own arrangement easier, and the development process is accelerated.

During the software development phase of the CoVR project, the Software/ System Requirement Specification (SRS) has been prepared, in which the targeted purpose and environment are defined in detail. It is aimed to reduce the development time and cost of the project. IEEE Software Requirements Specification template is used. Overall Description detailing the purpose and features of the project; External Interface Requirements, including User Interfaces, Hardware Interfaces, Software Interfaces, and Communications Interfaces; System Features; The document is detailed under the headings of Performance Requirements, Safety Requirements, Security Requirements, Other Nonfunctional Requirements containing Software Quality Attributes, and finally Other Requirements.

2.4 Materials

To develop a VR environment, the developer must use one of the game engines that support this technology. These game engines are Unity, Unreal Engine, CryEngine, AppGameKit VR, libGDX, Skyline, Torque3D. The most popular among them are Unity, Unreal Engine and CryEngine. The most suitable game engine for those new to the VR game world is Unity. Primarily, the main programming language Unity is used in is C Sharp, an easy-to-learn, versatile and object-oriented language. Unity has a user-friendly interface that is easy to use and explore. It provides developers with high quality tutorials and documentation. Assets Store has a wide variety of assets and developers can easily incorporate them into their projects. Another important advantage that distinguishes Unity from other game engines is its ability to compile developed environments and games for a wide variety of platforms such as Oculus Rift, HTC Vive, Gear VR.

In this project, Unity Hub 3.0.0-beta was used to create the virtual environments. C Sharp was used to create scripts. Windows operating system will be used as it has the best support and is easy to use. Environments created in Unity with the SteamVR plugin are integrated into the HTC Vive virtual reality glasses. HTC Vive glass is preferred because it allows users to move in a wider area compared to other glasses.

2.5 Reality in Virtual Environments

To ensure that the visual perception experienced in virtual reality is not static, the developed system must detect and react to user movements. Sensors that monitor direction and position information are built into helmets and goggles for this purpose.Thus, by moving the head to change the angle of view of the user viewing the virtual environment with glasses, the direction of movement is changed accordingly.

By moving, the user can see the ground, the sky and the back, and also hear the sounds coming from his surroundings. Visuals related to the environment, physical laws and perception.It is designed to be easily perceived by using features such as color, texture, light and perspective during illusions. As Pimental and Teixeira stated, hardware only allows to enter and interact with the virtual environment; It does not create a virtual

reality environment.

In this case, depth perception is critical.Information from depth information sources is used to create depth perception. These include eye-related information, stereoscopic information, dynamic information, and pictorial data. Furthermore, the observer perceives space in a virtual reality environment by sensing his own presence in the environment.

Six main components are required to create a virtual reality environment. Model, computer programs, computer, location sensor, and interaction tool are among them.These elements can be defined in a variety of ways, which alters the environment's structure and perception. Media features such as the three-dimensional graphical world, interaction, immersion, and sensory feedback are also influenced by components.

The observer is surrounded by spatial information when they perceive the virtual environment. The observer is inside the space in the case of the interior, as in our hospital example; in the case of the exterior, as in our park and concert examples, the observer perceives the building in an environment surrounded by the sky, natural and artificial environment.As a result, the observer is constantly surrounded by spatial data from various sources. High visual field, resolution, refresh rate, amount of detail, use of head-mounted glasses, position sensor, stereoscopic image providing equipment, and degree of immersion in the environment have all been considered in order for the virtual reality environment to have a high perception of reality.

2.6 Sketch Up

Three environments are established to implement the cascade exposure method. The first of these environments was less crowded, the second is moderately crowded, and the third is very crowded.

2.6.1 Less Crowded Environment

In this interface, the client is exposed to the first level environment. The environment is designed to be less crowded. The environment is designed with few people

outdoors. The mockup design of this environment was made in SketchUp, a 3D design program.After the consultant system is opened, s/he presses the "Select Environment" button from the menu. S/He chooses the less crowded environment. The client wearing VR glasses is exposed to the environment.

2.6.2 Moderately Crowded Environment

In this interface, the client is exposed to the second level environment. The environment is designed in such a way that the client can still move freely in the closed area but will encounter much more people. The mockup design of this environment was made in SketchUp.After the consultant system is opened, s/he presses the "Select Environment" button from the menu. S/He chooses the moderately crowded environment. The client wearing VR glasses is exposed to the environment.

2.6.3 Very Crowded Environment

In this interface, the client is exposed to the third level environment. The environment is designed to be the most crowded. The environment is designed with a large crowd of people outdoors. The mockup design of this environment was made in SketchUp.After the consultant system is opened, s/he presses the "Select Environment" button from the menu. Selects the very crowded environment. The customer wearing VR glasses is exposed to the environment.

2.6.4 Therapist Panel

In this interface, the therapist can start the VR environment for the client, change the current environment, adjust the environment settings, make an instant stop in the environment, and terminate the VR therapy according to the client. After entering the environment settings, the therapist can set the time. To start or change the environment, the 3 environments and their visuals on the panel will come, and the therapist will choose from here.

2.7 System Design of Virtual Reality Environment with Unity

Before creating a virtual reality environment, the design of the environment was determined. After that, the transition to the unity environment was made. For the transition to the Unity environment, the steps in the figure below are followed.

(Explanations of the figure named Project Steps Chart on the Figure page.)

blue: giving basic tasks to provide environment design and visualization

yellow: missions done in unity game engine

green: design must be tested and deficiencies corrected

2.7.1 Initial Analysis and Preparation

Information about the environment to be created is obtained. The details of the objects are analyzed to make the environment realistic. Due to performance, not every object will have the same detail.

2.7.2 Assets Import

In order to create the environment, assets used from Unity Asset Store, SketchUp or .fbx extension are collected, and these assets are imported into Unity.

2.7.3 VR Environment Creation

Less Crowded, Moderately Crowded, Very Crowded environments targeted with the collected assets are created in a way that is close to the real-life layout. Components such as sound are added accordingly to increase realism.

2.7.4 Interaction Creation

Interaction is also important for increasing realism. Accordingly, components such as sound are added. Scripts are added to enable movement (horizontal) in the environment.

2.7.5 Testing

Tests were conducted on subjects who received seven points or more from the Fear of COVID-19 Scale test and met the necessary prerequisites. Data were collected with the responses received from the subjects and the survey answers.

2.7.6 Correction

Necessary corrections are made in cases where the environment is not realistic enough or there are errors in user movements.

2.7.7 Export and Utilization

When no errors are detected in the environments, the application becomes ready for the clients.

CHAPTER 3

METHODS AND TEST

3.1 Research Method

The formative research technique was used in the study. Since the outputs to be achieved in the formative research technique are not clear and unambiguous at the beginning of the application, the study is actually a natural discovery process by its nature. In formative research, users are asked questions about what works and what doesn't, and what improvements should be made in the design.

Implementation is evaluated using formative assessment techniques such as one-on-one, focus group and field tests. After this process, the data obtained are analyzed to find ways to develop the theory and the generalizations reached are hypothesized.After the data collection and analysis process is revised several times and its effectiveness is checked, it is reported.In the study, the improvement dimension of the formative research technique is discussed in order to reveal what works and what does not work and what improvements can be made in virtual reality environments.

3.2 Place and Time of Research

In this research, the application to the experimental groups was carried out in Ankara Yıldırım Beyazıt University Virtual Reality Laboratory, as it required technical equipment. of the study The data collection phase took place in May and June 2022.

3.3 Research Group

The experimental and control group of the study consisted of students between the ages of 18-27 studying at various faculties of Ankara Yıldırım Beyazıt University in the

2021-2022 academic year. Students with the following characteristics were determined for the experimental group. Criteria of the study:

• Volunteering of the participant,

• Having had the COVID-19 disease,

• Not using a psychiatric drug in the last 3 months,

• Absence of a psychotic disorder,

• Absence of alcohol or substance use,

3.4 Data Collection Tools

The data in the study were obtained with the "Fear of COVID-19 Scale" and "Virtual Reality Environments Evaluation Form" developed by the researchers. The Fear of COVID-19 Scale, a seven-item scale, has robust psychometric properties. With seven questions, the participants' fears of Covid-19 were scaled. According to these results, suitable environments were exposed to the participants.With the Virtual Reality Environments Evaluation Opinion Form, users are informed about how they feel as a result of the virtual reality experience.They were asked about the features they found positive and negative, the potential of using virtual reality in the treatment of the negative effects of the Covid-19 disease, and the issues that were deemed appropriate to be developed in applications.

In order to ensure the validity and reliability of the data collection tool, the research questions were prepared by examining the studies in the literature. The data collection tool did not include long questions that would bore the participants; instead, clear questions were asked to the participants to obtain in-depth information about the purpose of the study.

Below are questions asked to users who will experience the environment.

Fear of COVID-19 Scale:

Table 3.1 Fear of COVID-19 Scale

Sentences	Min-Max
I am most afraid of coronavirus	1-5
It makes me uncomfortable to think about coronavirus	1-5
My hands become clammy when I think about coronavirus.	1-5
I am afraid of dying due to coronavirus.	1-5
When watching news or stories about coronavirus on social media	1-5
I become nervous or anxious.	1-5
I cannot sleep because I'm worrying about coronavirus	1-5
My heart races or palpitates when I think about getting coronavirus.	1-5

Virtual Reality Environments Evaluation Form:

Table 3.2 Virtual Reality Environments Evaluation Form

Sentences	Min-Max
Feeling of Being Here	1-5
Sense of Reality	1-5
Like	1-5
Liking the Experience	1-5
Overcoming Fear	1-5
Resolution/Perception of Reality	1-5
Dizziness	1-5
Nausea	1-5
Feeling of cloudiness in the eyes	1-5
Uneasiness	1-5
Sweating	1-5
Are the ambient sounds adequate?	Yes/No

3.5 Analysis of Data

Before experiencing the virtual reality environment with VR glasses, the Fear of COVID-19 Scale was applied to the users. This experience was experienced with users who received seven or more results from this survey.It has been understood by the international study that there is a fear of Covid-19 in users who are seven or more.

What the users feel at the end of the experience, the feeling of being and reality as a result of the virtual reality experience of the created three-dimensional environments, the negative situations that affect the user experience physiologically (nausea, dizziness, etc.), the negative situations that affect the user experience psychologically (anxiety, fear, etc.), and scoring and comments about the level of appreciation of the experience

in three different virtual reality environments were taken into account.In the experience with users, three different environments were experienced. As a result of the experience, immediate comments were requested.

Some user experience comments are as follows:

• It was a therapy method that I heard for the first time.

• Its use in the treatment of such diseases is very positive.

• The virtual reality experience was impressive and beautiful.

• I was very impressed as I had such an experience for the first time in my life.

• Although I had a problem with my eyes getting used to it at first, I didn't have any problems afterwards.

• I was scared while looking at the creek from the bridge in the park environment.

• The hospital realism in the hospital environment was nice.

• I wish the sounds in the park environment were more intense.

• I would like to get closer to the stage in a concert environment.

• The warning signs in the hospital environment were beautiful.

• It was very close to reality. It created a feeling of being there. It made me independent from real life.

• Wearing VR glasses on top of my glasses restricted me during movement.

• I had problems sharpening the image.

• I really wanted to dance in a concert environment.

• The sounds and environment in the park environment made me feel like a windy park

morning.

• The hospital environment was a bit uneasy.

• I really liked all three of the environments.

• I felt dizzy after removing the glasses.

• Sounds a little loud at first.

• Some objects were not realistic.

• All the people were the same height.

The table below shows the results of the Fear of COVID-19 Scale before the experiment. The average of each question is given according to the user answers.

Fear of COVID-19 Scale Result:

Table 3.3 Fear of COVID-19 Scale Result

Sentences	Average(1-5)
I am most afraid of coronavirus	2.7
It makes me uncomfortable to think about coronavirus	3.1
My hands become clammy when I think about coronavirus.	1.3
I am afraid of dying due to coronavirus.	1.3
When watching news or stories about coronavirus on social media	2.6
I become nervous or anxious.	2.9
I cannot sleep because I'm worrying about coronavirus	1.2
My heart races or palpitates when I think about getting coronavirus.	1.5

The table below shows the results of the Virtual Reality Environments Evaluation Form after the experiment. The average of each question is given according to the user answers.

Virtual Reality Environments Evaluation Form Result:

Table 3.4 Virtual Reality Environments Evaluation Form Result

Sentences	Average(1-5)
Feeling of Being Here	4.5
Sense of Reality	4.4
Liking the Experience	4.6
Overcoming Fear	3
Resolution/Perception of Reality	4.4
Dizziness	1.1
Nausea	1.1
Feeling of cloudiness in the eyes	1.2
Uneasiness	1.9
Sweating	1.3
Are the ambient sounds adequate?	Yes

3.6 Discussion, Conclusion and Recommendations

According to the results of the study, virtual reality environments are interesting, impressive and intriguing and offer users a unique experience. Virtual reality environments provide realistic experiences, while at the same time creating a realistic perception of space.

Virtual reality environments can eliminate some negative situations such as agoraphobia seen in users after Covid-19. When the studies conducted to overcome agoraphobia are examined, it has been determined that virtual reality environments can reduce these negative anxieties. Virtual reality environments have caused physiological disturbances such as short-term dizziness, nausea and sweating in humans due to some technological limitations. Virtual reality technology has given users some difficulties in sharpening the image and providing control with head movements. In some applications of the study, the low resolution image quality outweighed the realism of the environment.

In the study, it was concluded that virtual reality can be used in the field of health. In previous studies, findings were obtained regarding the use of virtual reality in different areas and its use for orientation purposes. According to the findings of the study, virtual reality applications can provide the user to experience the avoided environment at a low cost and to expose the user to this environment and can be used to reduce the fear and phobia of the user.

Considering these positive results for the use of virtual reality in health, it can be concluded that an effective treatment can be made with virtual reality applications. In the virtual reality environment developed in the study, realistic ambient sounds could not be fully integrated into the application. In some parts of the application, low polygon objects were used, which gave the impression that the visuals could not create the expected effect. The results of the study were evaluated based on only 20 user opinions. In future studies, more ergonomic and easier mobility in virtual reality environments in order to create a more effective virtual reality environment tools may be used. The image quality of applications can be improved. Motion feature can be given to motionless objects in the environment. Attention can be paid to the length of application times. In addition, new research can be done with more users after the arrangements and improvements are made in the application contents.

CHAPTER 4

CONCLUSION

In this study, virtual reality can be used to treat a variety of diseases and psychological disorders. Following the studies, it was determined that virtual reality and the widely used exposure method in psychology can be used together to treat psychological disorders following Covid-19. The CoVR project aims to use virtual reality and exposure therapy to treat agoraphobia, a social phobia that develops in people after Covid-19. In the CoVR project, environments for the fear and anxieties of the patient were prepared in the computer environment in order to treat the post-Covid-19 agoraphobia with the exposure method. Users experienced these environments with the SteamVR plug-in and virtual reality glasses in Unity. Some changes were made in the environments according to the feedback given by the users.

Virtual reality environments, according to the study's findings, are interesting, impressive, and intriguing, and provide users with a unique experience. Virtual reality environments create a realistic perception of space while providing realistic

experiences. Some negative situations, such as agoraphobia, can be eliminated in virtual reality environments, as seen in users after Covid-19. When looking at studies on how to overcome agoraphobia, it has been discovered that virtual reality environments can help to reduce negative anxieties. Due to technological limitations, virtual reality environments have caused physiological disturbances in humans such as short-term dizziness, nausea, and sweating. Users of virtual reality technology have had some difficulty sharpening images and controlling head movements.

Given these promising results for the use of virtual reality in healthcare, it is reasonable to conclude that virtual reality applications can be used to provide effective treatment. Realistic ambient sounds could not be fully integrated into the virtual reality environment developed for the study. Low polygon objects were used in some parts of the application, giving the impression that the visuals couldn't achieve the desired effect. Only 20 user opinions were used to evaluate the study's findings. More ergonomic and easier mobility in virtual reality environments may be used in future studies to create more effective virtual reality environment tools.It is possible to improve the image quality of applications. The motion feature can be applied to objects in the environment that do not move. The length of application times should be considered. Furthermore, after the arrangements and improvements in the application content are made, new research can be conducted with a larger number of users.

4.1 Test Videos

https://youtu.be/X8Xbu-swBg0 -> Park Environment

https://youtu.be/Vkjxw5beFc4 -> Concert Park Environment

https://youtu.be/2YkgKGdZ0T0 -> Hospital Park Environment

Figure 1 Park

Figure 2 Market-I

Figure 3 Market II

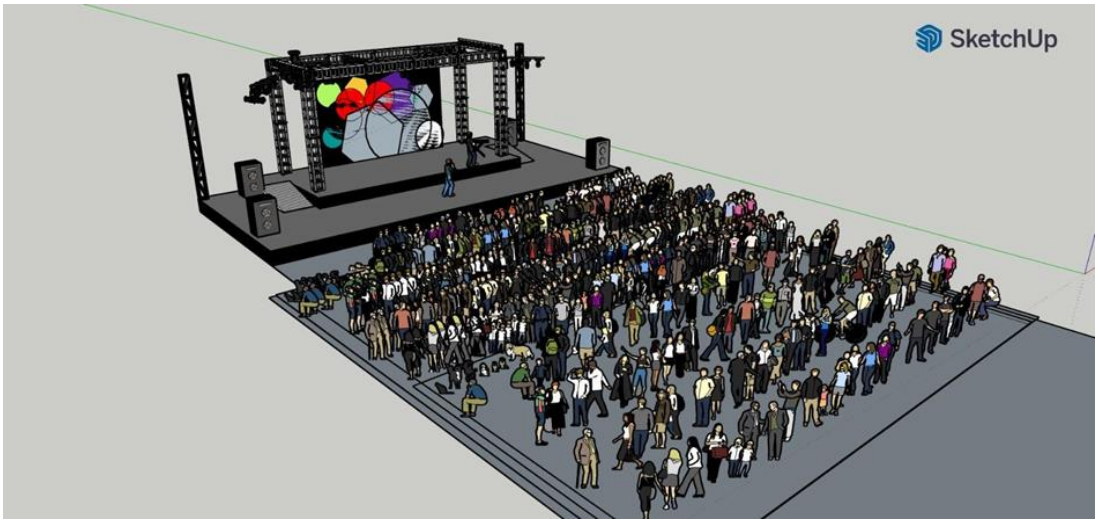

Figure 4 Concert

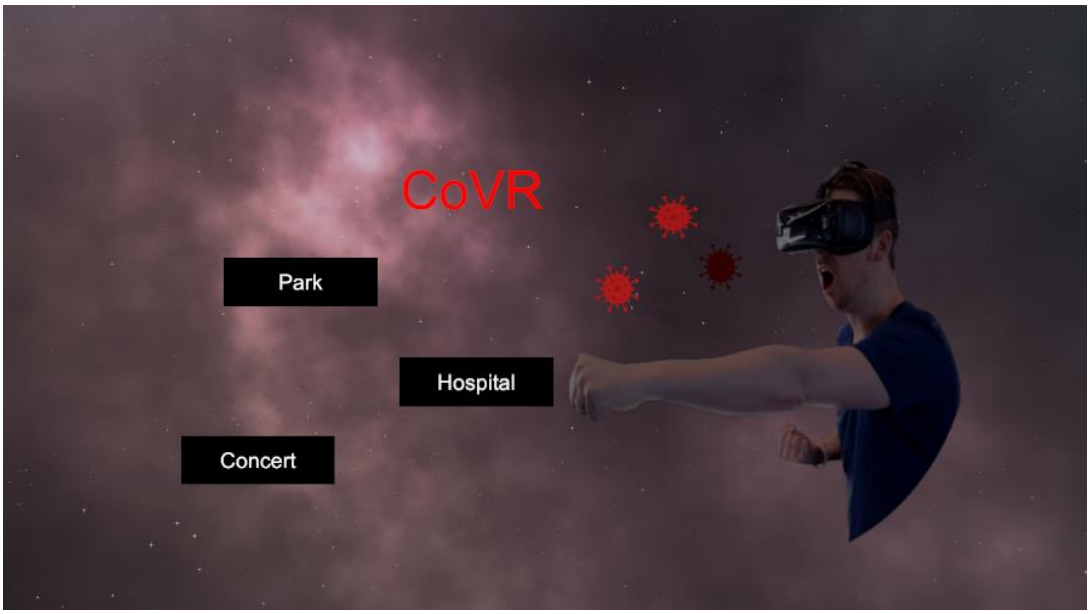

Figure 5 Therapist Panel

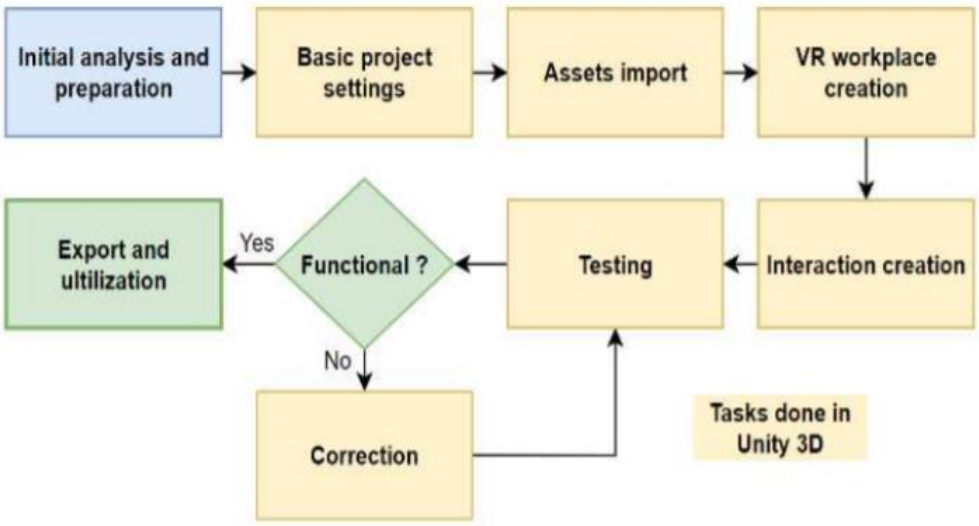

Figure 6 Project Steps Chart

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