

# Virtual Reality Therapy Implementation for Zoophobia

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*Abstract– Approximately 19.2 million adult Americans suffer from specific phobias, an irrational fear of a particular entity or event. Among the most common of phobias lies the fear of animals, normally called Zoophobia. Usually, when a person with Zoophobia is exposed to or even things about the animal dreaded, they will go through physical and emotional symptoms of extreme anxiety reaction, like: excessive sweating, trouble controlling muscles, dizziness, fainting, elevated heart rate, rapid and shallow breathing, etc. Some patients refuse to leave their homes in fear of encountering said animal, forcing them to become secluded. Unfortunately, many individuals do not seek treatment for their phobias, and only 20% of people who get professional help, recover completely. Therefore, the objective of this project is to provide a reasonable alternative for treating various types of Zoophobias, using virtual reality, beginning with the fear of cockroaches. To achieve said objective, a virtual world is developed using Unity, and Sweet Home 3D, and is implemented into an Oculus Rift virtual reality glasses. Patients will be transported to a house-like environment with the Oculus Rift, and gradually exposed to the cockroaches, while progressively approaching them with no real risk or further traumatization. This will be made to feel as realistic as possible to help the patient feel more at home, while helping them adjust to their fears in places where these animals are more likely to be found.*

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*Abstract– Approximately 19.2 million adult Americans suffer from specific phobias, an irrational fear of a particular entity or event. Among the most common of phobias lies the fear of animals, normally called Zoophobia. Usually, when a person with Zoophobia is exposed to or even things about the animal dreaded, they will go through physical and emotional symptoms of extreme anxiety reaction, like: excessive sweating, trouble controlling muscles, dizziness, fainting, elevated heart rate, rapid and shallow breathing, etc. Some patients refuse to leave their homes in fear of encountering said animal, forcing them to become secluded. Unfortunately, many individuals do not seek treatment for their phobias, and only 20% of people who get professional help, recover completely. Therefore, the objective of this project is to provide a reasonable alternative for treating various types of Zoophobias, using virtual reality, beginning with the fear of cockroaches. To achieve said objective, a virtual world is developed using Unity, and Sweet Home 3D, and is implemented into an Oculus Rift virtual reality glasses. Patients will be transported to a house-like environment with the Oculus Rift, and gradually exposed to the cockroaches, while progressively approaching them with no real risk or further traumatization. This will be made to feel as realistic as possible to help the patient feel more at home, while helping them adjust to their fears in places where these animals are more likely to be found.*

## I. INTRODUCTION

Many people fear animals, this can be due to traumatic experiences, over-generalization of animal fears, and, perhaps, even evolutionary factors. However, when said fear becomes an intense irrational distress this could be mean the person has Zoophobia. This phobia is universally defined as a fear of all types of animals. Some phobias that fall into this group are: Arachnophobia (fear of spiders), Scoliodentosaurophobia (fear of lizards), Ranidaphobia (fear of frogs), Ophidiophobia (fear of snakes), Katsaridaphobia (fear of cockroaches), Musophobia (fear of rats), Cynophobia (fear of dogs) [1] [2] and many more. This condition can produce many symptoms that interfere with daily functions, including the patient secluding themselves in their own home in order to avoid encountering the feared animal. Different types of therapy are used to treat these fears, including the psychotherapeutic method: Systematic desensitization [3]. Said method consists of the successive approximation of the subject to the situations which produces a state of strong anxiety disorder or emotional disarray to such a rate where the subject must seek help in dealing with that fear. However, treatment for Zoophobia is not commonly sought by phobic, and because it is such a broad term, a clinic may have some problem in completing the

rehabilitation process. This project seeks to offer a more cost-effective and broad solution through VR (Virtual Reality).

Virtual Reality refers to the use of a software that can generate realistic images, sounds and other sensations that replicate a real environment, in other words, create an imaginary setting that can be perceived as real as possible, and simulate a user's physical presence in this situation. VR has been defined as "...a realistic and immersive simulation of a three-dimensional environment, created using interactive software and hardware, and experienced or controlled by movement of the body"[4]. VR seeks to mislead the user's brain, using technology to reproduce various senses, making the spectator think it is real. The historical use of virtual reality has confined its application to areas where it is either hopeless to simulate something in another way or the danger of doing so would be too great. For example, aviation and medicine have made use of virtual reality to allow pilots and surgeons to train in their respective professions in a highly realistic manner without risking the safety of their lives. For this particular research, healthcare is one of the biggest supporters of virtual reality which encompasses surgery simulation, phobia treatment, robotic surgery and skills training [5]. One of the advantages of this rising technology is that it allows healthcare professionals to learn new skills as well as refreshing existing ones in a safe environment, while at the same time, allowing this without causing any danger to the patients [6].

## II. VIRTUAL REALITY AND REHABILITATION

In recent years and following the processes of intense and permanent literacy has begun to understand disability as a random circumstance of life that does not respect sex, economic or social position and that at any time is in the possibility of suffering. According to O.M.S., 15% of the world's population is affected by physical, psychological or sensory disabilities that hinder their personal development and their social, educational or work integration. This percentage is equivalent to 900 million people with a disadvantage in comparison with the others. There is therefore a possible global concern to eliminate, as far as the sea is possible such disadvantages by the means of specific actions as recovered by the missing functions and, when there is no sea possible full recovery, compensate it with rehabilitation, In Development of the necessary skills and skills, as well as providing people with

compensatory elements. This is where VR can be an alternative that facilitates the process and allows the achievement of higher goals in smaller times. RV rehabilitation is based on scientific foundations related to motor learning. All human capacity is characterized, among other things, by being able to be improved through experience and practice. Stimulation is defined as the set of techniques and strategies that seek to optimize the effectiveness of the functioning of different capacities and physical and cognitive functions (perception, attention, reasoning, abstraction, memory, language, orientation processes and praxis) through a series of specific situations and activities where RV can play an important role. It is well known that most primates learn by imitation and repetition. At this stage, learning - error is the fundamental basis for acquiring or practicing a skill. Another key element in feedback: what implies that repeated practice should produce a gain in the execution of the task. In general, the Central Nervous System, through the senses, information about the success and performance achieved when executing an action. In addition, in order to achieve the best results, it is essential to have patient motivation, since it is not just a matter of repeating a certain movement, in order to achieve lasting learning, it must become a motivating task [7].

Therapists who use VR argue that it is a more efficient practice compared to traditional therapies however. What kind of evidence exists about human motor learning in participants trained in virtual environments? Have studies been done comparing the gain in real rehabilitation processes compared to the one performed in virtual environments? On the first point, there is a good amount of evidence that humans can learn motor skills in virtual environments and then can transfer to a real environment [8][9][10]. On the second topic, there are few studies and many additional questions Why bother with equipment costs and sophisticated, Why not just do a real practice and now? Is there any that the actual work is better and less cost? Advocates of the RV believe that the results of the virtual practice are assured by the tasks: they become easier, less dangerous, more personalized and more fun. To date, only five studies have examined this issue in a controlled manner. These provide experimental evidence that motor learning in a virtual environment may be superior.

### III. METHODOLOGY

For this research we will be using a set of tools capable of making this idea a reality.

- *Oculus Rift* - We chose the Oculus Rift as it was the most balanced in performance out of the other VR headsets in its competition. This headset offers a 2160 x 1200 resolution across the two OLED displays on board, working at 233 million pixels per second with a 90Hz refresh rate [11]. A sensor is included in the package, which allows you to turn

your body almost 180 degrees, able to recognize your movement. It is important to note that long use of the VR headset may cause dizziness and or nausea. The Oculus Rift is a critical tool in our research.



Fig. 1 Oculus Rift Package

- *Alienware Area 51* - To be able to run a powerful device as the Oculus Rift, we were in need of an equally powerful computer able to handle it. Alienware's all-new Area 51, a colossal gaming desktop with enough power to fit all our needs and much more. Base spec model feature 6-core Haswell-E processor, X99 motherboard, Intel Core i7-5820K Processor and DDR4 RAM, giving us what people call “the most powerful platform the PC world has to offer” [12].



Fig. 2 Alienware Area 51 Desktop

- *Unity Game Engine* - Creating our imaginary world requires a good game engine, that at the same is compatible with our Oculus Rift. Unity is a closed-source, cross-platform game development application, which scripts are written in C# or UnityScript, commonly mistaken for Javascript, and attached to 3D objects as components [13]. Once a game is created, Unity makes it easy to export it to any mobile, desktop and/or web.



Fig. 3 Unity Game Engine Logo

- *Sweet Home 3D* - To build our model house, we used Sweet Home 3D. A free design application that lets us create a modeled house, filled with different rooms and furniture able to move about in 3D. Any project

can be set up using dragging options to build walls, furniture, structures etc. Measurements are offered in inches by default, but the metric system is also available. Another great feature is while designing the 2D model, you can dynamically view the 3D model of the design. Sweet Home 3D can also import other files as well, as long as they are in OBJ, DAE, 3DS or LWS formats [14].



Fig. 4 Sweet Home 3D Logo

#### IV. DEVELOPMENT

##### PHASE ONE – TESTING UNITY ENGINE

A virtual world was able to be created thanks to the Unity Game Engine and the assist of Sweet Home 3D. This virtual environment was created to simulate phobia treatments, more specifically, Zoophobia patients. This first prototype was made to help treat patients with the fear of cockroaches, where these were placed all around the home in locations that you would normally find said cockroaches in real life, for example, in the kitchen, or in the bathroom. This house model was a simple design that is currently still being modified to be used side by side with the Oculus Rift, so when the patient moves around the house, they would feel as if they were actually there.



Fig. 5 Virtual environment where the therapy takes place

At the time, it still needed some slight adjustments, some visual glitches appearing in walls here and there, and we were still unable to pass through doors fully. There are times when the program glitches, letting the user pass through walls and leave the house, making it difficult for the eyes.

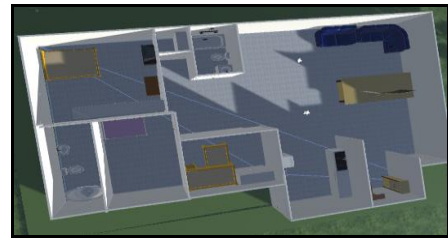


Fig. 6 Top view of the modeled house's structure

The cockroach model was designed as simple as possible, just to show how the real finished model would look like. It still is unable to move, as recommended by the Department of Psychology we are working along with.

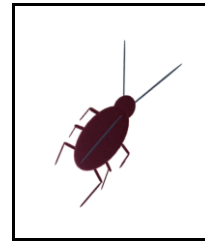


Fig. 7 Up close photo of the cockroach object created in Unity

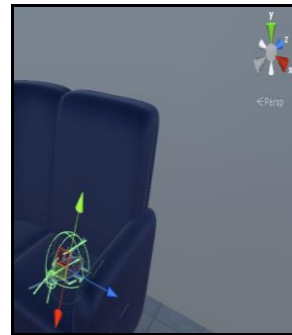


Fig. 8 Photo of cockroach object being operated

Regarding the VR headset's movements, it is able to track the patient's head movements smoothly, along with the use of an Xbox Controller that the Oculus Rift came with. The controls for the body are still a bit complex though, making it a bit difficult to move around the house to explore it. There are times where the patient stops moving after a light walk, only for the camera to turn slightly either left or right, acting disconnected to the head's movement.

##### PHASE TWO – WORKING WITH MODELS

For this phase, we started from scratch once again, but now with more familiar knowledge on how the Unity Game Engine worked, and how 3D models worked as well. We were planning on creating our own creature models, but with the limited research time we have, we decided against it, and instead, to seek the aid of the Unity Asset store, where there

were already pre-made models. This would let us have more time to spend on code implementation for the models' animation, while at the same time give us a chance to modify some of the already made models to our own personal preferences.

Starting off, we searched for a house model that would look as real as possible, while making sure not to spend too much. It was then we found one that peaked our interest, not too big nor small, and with many rooms to be able to use to the fullest for our research. Being three floors tall, it consists of four bedrooms, each with a private bathroom to accompany them, a large lounge room, a living room, a kitchen, a terrace deck, and a drawing room. Along with this, the interior is fully furnished, with furniture and appliances suited for each of those rooms.



Fig. 9 Updated house model

The model house is fully modifiable as well, as we are able to change every single inch of it, be it the color, mesh or box colliders. The only real problem we find ourselves with is that we are unable to change one part of the structure without needing to change multiple parts alongside it as well.



Fig. Model house, sky view

We plan to change quite a few things of the interior and exterior, for example, making a bit more room for people to walk around in, without many things in the way which they can bump into. We currently started playing around with the settings, changing some box colliders here and there, so that the person can walk through some of the doors, leading them to the other rooms.



Fig. 10 Interior look of the house, living room

We've also made some changes with floor by creating a material object and importing a wood tile .jpg format to the object, in which we then changed the floor. For the exterior, maybe add a bit more flora, something that most homes would usually have.



Fig. 11 Interior look, the kitchen

Also included with the new house model, we found at least four animal models we liked. These include, a German shepherd that can walk, run and sit, a spider that can walk, idle and attack if used for the therapy, a small rat that can also walk, run and idle, and a cockroach that can do the same.



Fig. 11 Dog model

Each of these animal models are really well made, that also include pre-made animations for, albeit simple ones. Each of these models can be modified as well if we wish it so, letting us created a fully functional model with each distinct phobias for our research.





Fig. 12 Spider model

The animations that are included are simple ones, be it being idle, walking, running, and so forth. Though, even if the animations include this, it doesn't mean the models will already move around our virtually created world.



Fig. 13 Rat model

We can also create a state diagram (Animator or AI) of these animation so that the model can follow the animation states and behaviours of the Virtual Reality.



Fig. 14 Cockroach model

The animal models can be scaled bigger or smaller, depending on our preference. Each animal has animations already pre-made, these animations is only for the model, but not for the actual movement of the model itself. For this, we

have to work on the animator and transform tab on the Unity Game Engine.

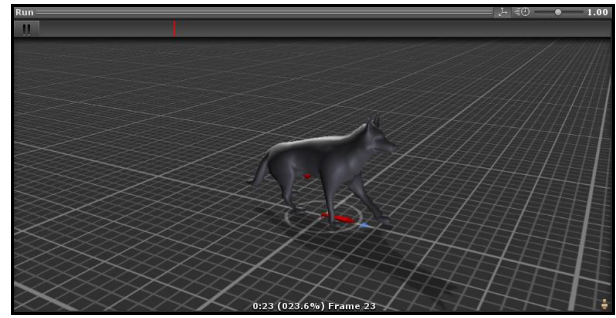


Fig. 15 Walking animation for the dog model

For this we created a script in C# using Visual Studio IDE. In this script the Start() and Update() function are automatically created so that we can control, and interact the object (model) and manipulate the Animator and Transform Tab among other things on each frame of the virtual reality scene. For basic testing we've only used the GetComponent<Animator>.Play() and Vector3.Translate() functions in order play the animation that we want and move the model itself on each frame using the Update() function.

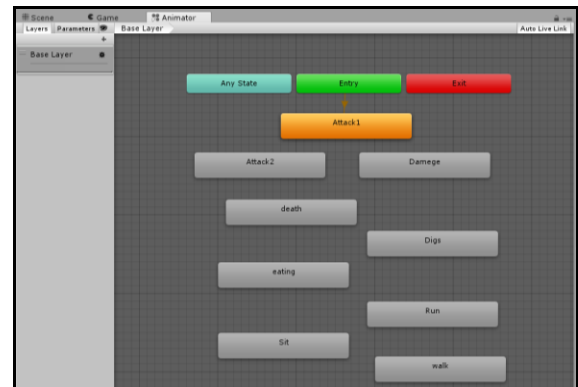


Fig. 16 All animations for the dog model

## V. RESULTS

The results obtained so far are partial, in this sense two groups were created: the control group and the experimental group, each composed of three people; Laboratory tests were performed with the experimental group using virtual reality and traditional therapy with the control group. In each patient, five sessions and two levels of complexity were performed.

The clinical status of the patients involved in the tests had symptoms of high heart rate, numbness, excessive sweating and anxiety.

After the session of the fifth practiced patients treated with VR, although the symptoms did not disappear completely, an 80% decrease in anxiety, sweating and heart rate was observed in all cases; While patients in the control group treated with traditional therapy, they had a 35% reduction for the same symptoms.

The next step to validate the best result and obtain new results, is to perform tests with larger groups of patients and possibly with other symptoms, is to install the application in the Clinic of Psychology of the UT, where specialists must apply the treatment One Patients by using VR.

## VI. CONCLUSIONS

The virtual reality for the treatment of phobias to the cockroaches, is a noninvasive therapy and generates much security to the patients, although they interact with the animals of a virtual form, the results show a great contribution in this type of treatments.

Patients treated with Virtual Reality, know in advance that they are in the comfort of a clinic, with monitoring of their vital signs and that are always assisted by their therapist, generates an atmosphere of security and tranquility making the therapy have the best results Possible, since at no time will they be subjected to a real animal.

## VII. FUTURE WORK

Improving the motion tracking and movement of the patient in this VR world is our top priority, as this will make the user feel what they are experiencing as close to real life as possible, while helping the chances the user feels less disoriented when they take the headset off. Further modifications to the model house will be made as well, being able to traverse through the whole space without any visual discomfort, while at the same time, making this environment feel as close to real objects in the real world.

Alongside the Department of Psychology in our university, we hope to get as much feedback as possible, creating additional scenarios to treat different types of Zoophobia. Different types of treatment levels may be created, in which the intensity of the therapy can be risen, for example, in the first level, only having the animal completely motionless, letting our patient get accustomed to this scenario, and when ready, move onto the next level, where the animal is moving, but in a controlled space, unable to reach our patient. This way, the patient can be treated in steps, slowly letting them get accustomed to the previous scenario before moving onto the next one.

The tasks we will be working on in the future include: Adding another animal, a lizard, even though the asset store only have a gecko we can still scale or change the appearance to make it look like a normal lizard, giving full functioning animation to all animals, moving from point A to point B, being idle in a corner of the ceiling, or running in a backyard while complicating the way they move around the virtual home. For this, we will be placing each of our animals in places where they tend to appear in the real world, for instance, the cockroach would appear in a kitchen, or maybe even a bathroom shower.

After making sure all animations are in check, we will be creating a start-up menu, or sorts. Thinking from a game type perspective, we will have a starting menu where the user will have the choice to select a difficulty setting, where each level will be a treatment level for the patient. This start-up menu will serve as our loading screen as well, each time the user selects a level, it will open a different scene in the Unity Game Engine, each one a modified version from the rest, where the animals' animations change depending on the difficulty chosen.

For now, we have planned a minimum of four intensity levels, where the last level would consist of the patient being in the same space as their feared animal for an extended period of time, with them unable to do anything about it.

To make this virtual world feel as real as possible, we also plan to include a first person model, in which the user can select if either female or male, and be able to move around in the virtual space, letting them have the opportunity to look down and see a human body where they are standing. Along with the footstep sounds already included, the sensation created from this is sure to make the patient connect with the virtual world even more so than before.

We also plan to make the world intractable, with the help of Oculus Touch, controls specifically made for the use alongside the Oculus Rift headset with some extra sensor to increase the range of the movement of the user while in the Virtual World. With these, we hope to give the patient an opportunity to interact and move objects around the house, in which would cause certain events to happen, be it an animal they fear to appear and such.

With the recommendation of the Department of Psychology from our university, a bracelet that will read and measure the patient's heartbeat is in the works as well. This bracelet will take all the information gathered from the patient, and add it to a database where a medical record will reside. We are still in the consultation part of this process, so no concrete database information is recorder yet.

It is important to note that this research is developing a program that psychologist will be able to use and implement in their workspace, aiding them in treating zoophobia.

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