

## Virtual Reality applied to Exposure Therapy for Obsessive Compulsive Disorder

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### Abstract

Obsessive-compulsive disorder (OCD) is a mental illness that causes repeated unwanted thoughts or sensations (obsessions) or the urge to do something over and over again (compulsions). OCD has various subtypes, including the fear of contamination in which individuals fear bacteria, germs, disease, or bodily secretions, and engage in clinically significant cleaning and avoidance rituals. In recent years, Virtual Reality (VR) has shown the potential to cure people suffering from anxiety disorders and OCD in Exposure and response prevention Therapy. The objective of this study is to create an application with VR for doctors which helps them during treatments. So, in this case, VR is one alternative to cure patients without using medication. This application simulates uncomfortable situations for people to overcome their obsession and compulsive behaviour.

**Keywords** Interaction Design, Obsessive Compulsive Disorder, Virtual Reality, Accessibility & Inclusive

### Introduction

For the elaboration of this project, we started with a first research and exploration process divided into four fields: accessibility, inclusion, human technology, 17 UN Sustainable Development Goals.

Accessibility is now understood as an issue of human rights recognized in the laws of several countries in the world - the right to equal opportunities, non-discrimination, inclusion, and participation in all aspects of life in society.

Also refers to the possibility and condition of reach for safe, autonomous use of spaces, furniture, urban equipment, buildings, transport, information, and communication, including their systems and technologies, as well as other services and facilities open to the public, for public or private use for collective use, both in urban and rural areas, by persons with disabilities or with reduced mobility.

It is common to associate the theme of access to Cultural Heritage with 'disability, but today the approach must be taken in terms of 'disability.

According to the World Health Organization (WHO), respiratory diseases are among the leading causes of death and disability in the world. This classification is made considering the person's relationship with the environment and develops from two 'health' components, which are 'functionality' and disability.

Personality can also be predicted by other biological, social, psychological, and behavioural measures. Depression is a leading contributor to the burden of disability worldwide, with some evidence that disability attributed to depression is rising, particularly among youth.

Inclusion manifests principles that should guide the development of a society open to all, which leads to the con-

cepts of inclusive design and universal design. “This design concept has gained strength in parallel with the so-called inclusive society, one that aims to include the individual as opposed to their exclusion” (Introduction to the concept of inclusive design, practical applications in urban design and social/health equipment, AM Almeida Machado, 2006).

This concept consists of creating accessible and usable products and services capable of being used by as many people as possible, including children, the elderly, people with disabilities, the sick, the injured, or people who are disadvantaged by circumstances.

Therefore, it is intended to develop products or environments that allow its use by any type of people regardless of their capabilities. Its main objective is to eliminate social stigmas associated with products created exclusively for people without disabilities, giving people with disabilities the opportunity to participate in society. In this way, a designer must also be responsible for the positive impacts on people, the economy, and the natural environment, linking what is technologically possible to what is ecologically necessary, giving rise to new proposals that are appreciable in the social area, including solutions in sustainable areas, which must be the best possible, whether to innovate or modify a product, as we must create for a better and continuous life.

As Vezzoli and Manzini mentioned in their book *Design for Environmental Sustainability* (2008), “the role of design can be summarized in a general way, as the activity responsible for making something technologically viable and ecologically correct, and that must reflect the origin of significant new socio-cultural proposals.”

Human technology refers to the present days where technology connects us like never, thus making explicit the degree to which we are defined and anticipated by others and how our ideas and identities no longer merely belong to us but are part of a great flow of connected individuals. More specifically, a crowd on the network becomes a stream of common consciousness.

Human nature is a broad concept, which nature has altered and expanded throughout history. Digital technologies in-

creasingly challenge us to ask what it means to be creatures of language, self-awareness, and rationality.

Machines are not the human mind but are increasingly acquiring exclusively human attributes: reason, action, reaction, language, logic, adaptation, and learning. Above all, we think of ourselves as individuals, with rational minds and describe our relationships with technology on this basis. When asking what it means to be human, we are prone to think of ourselves as rational and individual minds, and to describe our relationships through technology on this basis: as distant “users”, whose agency and freedom are a matter of skills and options substantiated. In conclusion, we have a moral obligation to start talking about our future and the role of technology in it. We are more than intelligence and data.

**17 UN Sustainable Development Goals** It is an Agenda for 2030, launched in 2015 by the UN (United Nations), consisting of 17 Sustainable Development Goals (SDGs) and 169 goals. A project that addresses several dimensions of sustainable development (social, economic, environmental) and that promotes peace, justice, and effective institutions. They are based on the progress and lessons learned from the 8 Millennium Development Goals (2000-2015) and work between governments and citizens around the world, a common vision for humanity, and a contract between world leaders and people.

Each of these objectives aims at improving people's quality of life as well as creating a climate of peace between nations. For that, it is necessary not only the creation of infrastructures that allow basic services, as well as the construction of an environment of equality among all. This agenda seeks to solve simple and complex problems.

The SDGs represent global priorities signed by more than 190 countries and define global priorities and aspirations. To that end, they require action on a global scale by governments, companies, and civil society. As an engine of economic growth, employment, and as a source of technology and innovation, the business sector has a fundamental role to play and self-interest in contributing to achieving the SDGs.

These are an opportunity for companies to enhance existing strategic actions and projects and implement new actions and projects that contribute to national and global goals.

## ODS

We started this research with the definition of anxiety. Being an emotion characterized by feelings of tension, concern, and insecurity, accompanied by physical changes. When it persists, it interferes negatively and causes significant suffering, it is a pathology. It has been increasing, with a higher prevalence among women. Under normal conditions and when properly controlled, anxiety acts as a stimulant. In excess, it causes unnecessary suffering.

There are different types, the main ones being the following: Obsessive-compulsive disease, post-traumatic stress, Panic, Agoraphobia, Generalized anxiety, Social, Separation. That way we select obsessive-compulsive disease. It is an anxiety disorder in which a pattern of unwanted thoughts or intrusive, negative, and distressing sensations (obsessions) is created that leads to the adoption of conscious, standardized, and recurring behaviours to relieve tension (compulsions).

They have repercussions on people of all age groups and focus on a family, social and productive life. A simple negative thought triggers behaviours so that it does not occur. Due to this distorted sense of responsibility, the individual is distressed to realize that he is unable to ensure security. It mostly starts in adolescence or early adulthood, but it can start in childhood. It occurs more in the male gender – when manifested in childhood; and more in the female gender – the one in adulthood. The sooner the symptoms begin, the worse the consequences and causes will be.

## User Research

For the accomplishment of this task, we elaborated two questionnaires to characterize personas. For the creation of the first questionnaire, we tried to make a small study about people in general, namely, to understand the levels of anxiety, even in people who do not suffer from it.

The objective was to start with general questions such as age, gender, current situation (occupation), whether they lead a healthy lifestyle (healthy eating and regular exercise) to get to know our users in a “basic” way. This research was carried out in 4 days - between March 19 and March 23, 2021, through the google forms platform with the collaboration of 1414 participants.

Among the participants, 97% (1358) were female and 3% (40) were male. The ages were between 16 and over 40 years old. The age group with the highest participation in the research were people over 40 years old and with the lowest participation, people under 20 years old.

We also assess the stress caused by relationships with others, as they are situations that cause medium stress or anxiety in most ages and genders. Family relationships, in general, cause more stress than relationships with others. Furthermore, a small percentage of people use therapy as a treatment, and the most common treatment is medication. It is necessary to create a second questionnaire for us to understand deeper insight into how this disease particularly affects each person. In this research, we obtained 9 female answers between 24 and 50 years. We kept from this questionnaire that the comfort zone of the participants is mostly family and nature.

The participants revealed that in some cases they feel anxious in times of facing the unknown, facing new situations, dangers at home and cleaning, untidiness, and someone messing up the personal objects of the people in question, particularly personal problems. This disorder in a behavioural way manifests itself in the participants mainly through repetitive behaviours or rituals based on actions. On an emotional level, patients with this disorder experience excessive worry, insecurity, and fear.

However, in terms of symptoms, the participants experience a racing heart, weakness, pain, and tightness in the chest, dizziness, a feeling of imminent death, and panic attacks. Few participants reveal that they are undergoing treatment and all treatments consist of medication. The situations that

aid in the treatment were divisions in the family's question, the alimentation, the relaxation techniques, and sport are efficient. However, medication is also helping.

### **How does virtual reality work in psychology?**

Virtual reality can be defined as a dynamic and reactive composition with the virtual environment created by a computer and used for different modalities of human interaction. Baños defines virtual reality as a human experience, an advanced interface communication that allows the user to experience "other realities".

The use of virtual environments for the treatment of exposure is quite effective when compared to results with imaginary exposure. It is known that for habituation to occur more effectively, it is necessary for the patient to feel activation, both objectively (anxiety measured by objective instruments, such as physiological measures) and subjective (self-reported anxiety).

This is what the concept of synchrony says, which occurs when objective and subjective measures happen together during treatment, being more propitious to occur in situations of great anxiogenic activation (Rachman; Rodgson, 1974 cited by Wiederhold; Wiederhold21).

In imaginary exposure, there may be no immersion in imaginary scenarios subject to objective and subjective activation, since patients can more easily avoid cognitive exposure to scenarios, reducing the anxiety experienced and making habituation more difficult. In addition, virtual reality exposures provide greater changes in the sense of self-efficacy than imaginary exposure since virtual environments increase the possibility for the patient to successfully handle very anxiogenic situations.

In addition, exposure in virtual reality environments allows the filling of a gap: it allows the patient to be exposed to anxiogenic stimuli in a vivid way, as if they were real, when live exposure is not possible or anxiety about the real situation it is still extreme, making it difficult for the patient to enter or remain in the exposure situation, also decreasing the abandonment of treatment.

### **E-TOC**

This project is developed in an application divided into two parts: one part designed to be used by the therapist – creation, planning, and implementation of therapy and another to be used by the patient – use of virtual reality mechanisms, such as glasses, heart rate meter, gloves that allow the capture of movements.

In this project, we have three different personas included as participation's elements: Psychiatrists/Therapists who deal with patients with OCD (obsessive compulsive disorder); people with this condition: People who deal directly with someone with this disorder - family members and educators. Considering the particularities of each of these users, achieved through questionnaires carried out to them, it was necessary to develop two aspects of the project and, consequently, two user journeys. Although the application was created and developed with the patient in mind, with the development of the project, there was a need to support the therapist, mainly due to the planning and monitoring of the treatment.

In addition, since the treatments can usually last for more than two years, if the doctor must be absent, the process can always be temporarily carried out by another professional, although this situation is not recommended, especially by trust between therapist and patient already created. For this project, the creation of an application was considered, which allowed the implementation of exposure therapy and treatment planning, using Virtual Reality to simulate obsessions.

The program records the patient's heartbeat and allows psychologists to report on the patient's clinical status and consult their progress. During treatment, when the patient is ready to start treatment - the presentation of the videos begins. While using the Virtual Reality mechanisms - glasses, headphones, watches that measure the heartbeat, and the gloves or rings that capture the patient's movements, the therapist has access to all the information. This information includes a visualization of what the patient is seeing/doing in the virtual world, of the heartbeat, to understand when they are no longer normal, alternative video options, and the sequence if several videos are presented in

the same session.

Although the therapist cannot/should speak to the patient during treatment, he or she can draw notes on various conclusions throughout the process. In addition, the program lets you review the comments from previous sessions if there is one related to a problem not solved in the previous session, but which in the current one is important to reinforce. The advantage of this program being digital is that the acquired data can serve as a statistical and objective study about the disease and the treatment. The project even considers asking the patient about the use of his data only for statistical studies, maintaining anonymity.

Through the data collected, the system allows concluding such as average treatment times, the evolution of recovery, success, or failure cases, proving the effectiveness of treatment by exposure, general characteristics of the patient, such as age and gender, managing to understand the ways these two influence the same, among others. When inserted in the program, the data would be immediately organized and easy to study and interpret.

## Conclusion

Virtual reality is not just to facilitate the work of doctors. The concept can also be explored to bring direct benefits to patients, either in the form of treatment or as a means of alleviating obsessive-compulsive disorder. Increasingly, virtual reality can function as a way of treating mental illnesses because three-dimensional images, in fact, make the brain interpret the virtual content as real.

The essential point of this work is to cure the patient throu-

gh the possibility of interacting with a virtual environment in which he is inserted sensorially. The individual is passive to the images but with sensory elements available, he is not restricted to simple observation, there is the measurement of his beats and devices that transmit senses such as sensory bracelets or rings.

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