

Treatment of Specific Phobia by using Exposure Therapy through Virtual Reality

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Abstract

A phobia is a kind of mental disorder related to anxiety, technically defined as an irrational and chronic fear of events or objects, for instance the claustrophobia (fear to be enclosed in small places) or arachnophobia (great fear to spiders) respectively. Most type of phobias are categorized in agoraphobia, social phobia and specific phobia. This work focuses on specific phobias which includes the fear to natural environments, blood, heights or the most common that are related to some animals, like snakes, dogs or in this case spiders. We propose an interactive system in controlled environment for apply the exposure therapy in arachnophobia treatment. The system shows different images of real spiders along with other representations like cartoons, for giving real stimuli and relax experience in the same session, with the aim of the patient facing the cause of their fear without risking their physical integrity.

Keywords: Phobia, controlled environment, arachnophobia, exposure treatment.

INTRODUCTION

Primary emotions such as fear, sadness, anger, pleasure and embarrassment are activated in the older part of the cerebral cortex, known as the emotional brain. Its main function is to ensure human survival [1]. Which makes them guidelines for dealing with threats or difficulties in daily life, which the rational mind does not have the ability to respond quickly.

Fear is part of the emotions developed by the human being through the process of evolution [2], being necessary for the survival and organization with the ambition of well-being for the constructions of modern societies [3]. Fear works as a system which anticipates danger by accessing consciousness, but operating independently of this [4], reason that indicates that it is an unconscious emotional system [5].

One of the most common disorders of fear are phobias, these consist of disproportionate fears significantly affecting the adaptation and development of the human being in their environment [6]. Among the most common phobias are fear of different types of animals in 5.7% of the population, heights by 5.3% and claustrophobia by 4.2% [7].

Neuroimaging and direct exposure methods are used in treatments for anxiety or fear disorders [8] and specifically in therapies to treat one of the most common animal disorders

such as arachnophobia [9]. As a result of these methods, changes in metabolic activity have been evidenced along with minimization of symptoms [10].

Different works have been developed, around the treatment of phobias through virtual reality, as a strategy to face fear in a safe and controlled way [11], demonstrating that it is an efficient technique for the treatment of phobias because it is safe and adaptable to different scenarios [12].

In [13] and [14] augmented reality techniques were developed in order to propose a treatment for patients with arachnophobia. From virtual reality devices, such as webcams, monitors and headsets, were obtained results that give technical feasibility to this type of techniques for the treatment of specific phobias and other disorders of anxiety.

The objective of this work is the development and implementation of an immersive virtual reality system for the treatment of arachnophobia, which is one of the most common anxiety disorders.

The first section of this work a conceptual introduction to the topics associated with phobias and their treatment was made, as well as a brief review of the state of art on some studies and therapies carried out in patients with specific phobias. Second, the methods and materials used to elaborate the virtual reality system are presented.

The third section contains the results obtained with the implementation of the immersion and virtual reality system to treat phobias, in this case arachnophobia. Finally, we present the conclusions and future perspectives to continue expanding the field of research in this area.

MATERIALS AND METHODS.

In this section are described the topics related with the development of non-invasive exposure therapy for arachnophobia treatment.

A. Types of specific phobias treatments

There are different kind of treatment for relieve the symptoms caused by phobias, some of these includes medicines or technological support like virtual reality. The first alternative of treatments for specific phobias were reduced to psychoanalysis, that used the subconscious and tried to find the

cause of phobia for its prevention or correction, but this method did not result in a practical and entirely successful way, due to many and long sessions of therapy were necessary, thus with the work developed in [15] by Jhon Wolpe, the behavior therapy has been fully integrated with fields related to rehabilitation of phobias.

Since then many treatments include some exposition to the phobia trigger, because the behavioral science behind the exposure therapies explain that a prolonged and controlled exposition to the cause without physical consequences, decrease progressively the symptoms of phobic reaction. Talking about practical implementations, the exposure treatments has different forms of application according with some of the following parameters, the use of techniques of cognitive control, the type of response that the patient present to the stimulus, the support used to start the patient response.

The use of exposure techniques that does not use the real stimuli is preferable when the real situation is not under the therapist control, also many patients refuse the therapy if they are going to be in touch with the real cause of its phobia.

1) Exposure therapy by images and virtual reality

To expose the patient to phobic stimulus is a common scenario in therapies like gradual exposition or systematic desensitization, but in the recent year new methodologies have been implemented, by using engineering solutions like virtual reality or treatment with images. The effectiveness of the methods depends on the similarity of the images with the actual trigger of the phobia, in fact this type of exposure has the best results in the treatment of many phobias, specifically with those related to natural elements, like animals, storms or environments.[16]

One of the most important factors for this type of treatment is the exposure time, different studies and authors consider that the times should oscillate between 60 and 180 minutes for each session, with an average duration of 120 minutes, to avoid generate emotional burden and unnecessary stress due to fatigue and exhaustion of the patient. The typical procedure for conducting an exposure therapy session is presented in the scheme of Figure 1.

It is important to mention that the therapy has a higher success rate if previous sessions are performed with the patients explaining the purpose of the therapy, and that they understand the importance of generating an approach to the factors that detonate the symptoms of their phobias, in a controlled environment to reduce physical risk, for this reason is a therapy suitable for the treatment of phobias specific to certain animals such as spiders, mice, cats and others.

One of the tools that has had a high impact in the therapies of rehabilitation of phobias is the virtual reality [17]. This technology is based on giving a feeling of real experience and immersion to the patient, therefore it differs from an audiovisual system because it seeks the subject to participate actively in a simulated environment with the elements that trigger their phobia. Table 1 show some advantages and disadvantages of virtual reality in phobia treatment.

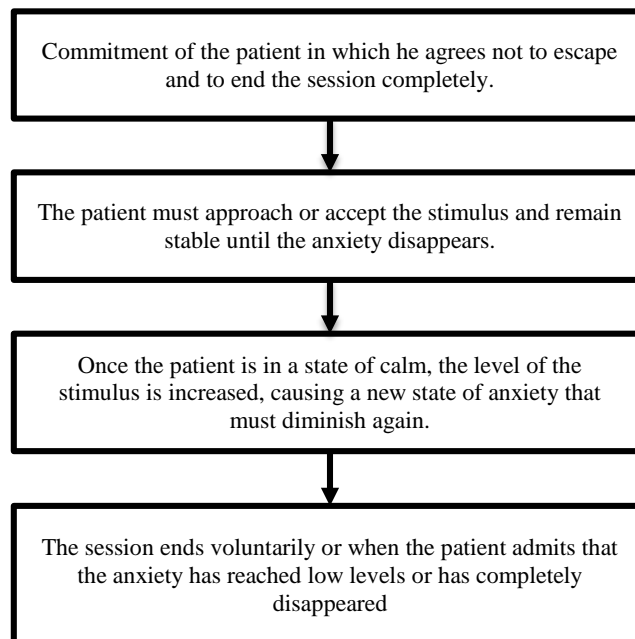


Figure 1. Procedure used in exposure therapy

Table 1. Comparison between the advantages and disadvantages of virtual reality systems.

Advantages	Disadvantages
Cost reduction in the stimuli application	It is not a total substitute for actual therapy.
The patient does not move to a different place, receives therapy in the consulting room	Some patients may express discomfort with virtual reality equipment
More safety and privacy for the patient	Their advantage over imaginative or suggestive therapies is unclear.

2) Pharmaceutical treatment

This treatment is used as a complement to exposure therapy and consists of giving psychotropic medications like benzodiazepines and beta-blockers, in order to decrease the emotional impact caused by phobias. These drugs are used for the similarity between different phobias with the same symptoms or reactions. For example, beta-blockers control heart rate, a factor that increases in the presence of panic attacks and specific or social phobias.

Until now the scientific evidence has not proved the aggregate value in therapeutic level of this medications, conversely is possible that reduce the benefits of the therapy, because it interferes with the sensitization process.

Is probably that a professional knowledge could improve the treatment by applying in specific moment a proper dose of medications to reduce extreme reactions in some patients when they face its respective phobias.

B. Test subjects

The target population was randomly and non-probabilistically selected to test performance in patients with any or no phobia. The group consisted of 10 individuals, 5 women and 5 men aged 19 to 24 years. A previous diagnosis was made using the DSM-IV criterion for specific phobias, a minimum sensation of anxiety to spiders, without alcohol or drug dependence and without physical or mental injuries.

C. Devices or equipment

A VR Box generic device coupled with a field-of-view equal to 55° was used to create the interactive and immersive 3D simulated environment. A set of images with spiders was showed to each subject during different periods.

D. Exposure treatment interface

The treatment interface consists of a monitor and an immersion and virtual reality tool known as VR Box. Using the aforementioned elements, different images of spiders as well as three-dimensional models were presented to all patients, gradually increasing the level of realism and detail in the images shown.

Three sessions were implemented for each patient, one of adaptation and two of virtual exhibition with the images, exchanging figures with real spiders and other illustrations with caricatures of spiders. Once the patient reports that anxiety levels are low, the virtual reality case is used to increase the visual impact of the images. Figure 2 illustrates the procedure for using the interface.

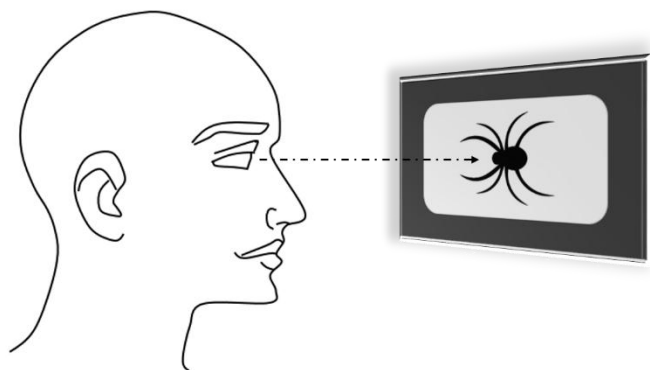


Figure 2. Scheme of exposure interface

The images that were shown to the patient were in a previously defined database, and they changed in a random way between the real ones and the artistic representations of the arachnids.

RESULTS

The first result is associated to the elaboration of the image presentation interface as shown in figure 3. The real figures and the representations are presented in a random way. The interface has a start button to begin the presentation, and stop

button to finish the show of images when the patient report that has a low level of anxiety, or does not want to see more the pictures. The example presented in figure 3 shows a common specie of spider that cause phobia in many people, a tarantula.

The images have a high quality and color features that provide an approach to a real experience

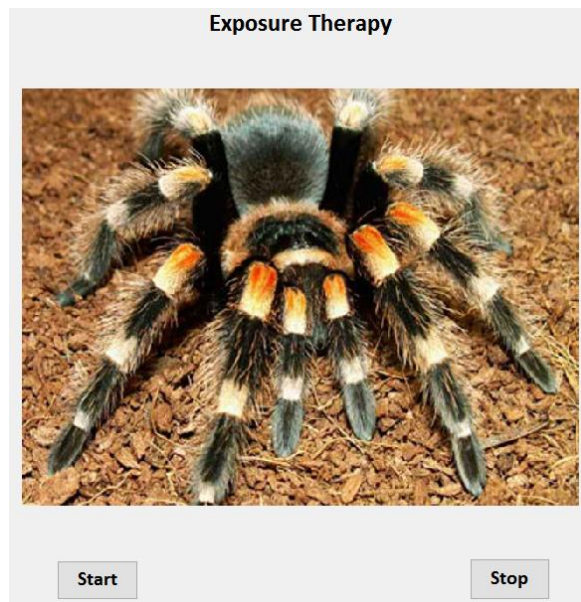


Figure 3. Graphic user interface presenting an image of real spider

The image shown in figure 4 is a 3d model representation, to change the fear of a real spider for something that cause a lower state of anxiety.



Figure 4. Graphic user interface presenting an image of spider in 3D model.

With these two types of images, the adaptation phase is completed, the next step is to equip the patient with the headset of virtual reality to increase the level of exposure, Figure 5 shows an example of what the patient would see.

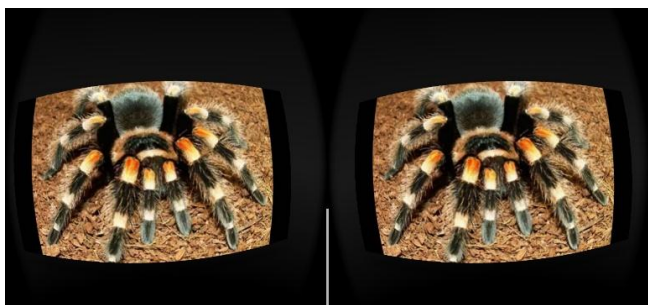


Figure 5. Immersive system for visualization of images.

This change in the exposure level, also changes the reaction of the patient, because its exposure generates an increasing of anxiety, becoming the experience something uncomfortable, but the patient has to deal with it, in order to decrease its phobia reaction gradually.

CONCLUSIONS Y FUTURE PERSPECTIVES

The use of technological supports with the proper management of the therapist results in a good alternative of treatment for phobias without the need to spend a high cost in infrastructure or implementation.

Some elements related to the effectiveness of exposure therapy are the realism of the images and the quality of the image, so it is advisable that the images have a high level of detail and the patient feels that he is visualizing the real element that generates his phobia.

As future work, it is proposed to implement the virtual reality system with a monitoring tool for vital signs such as heart beats and body temperature, in order to control the progress and magnitude of the symptoms associated with the suffering of phobias such as tachycardia, excessive sweating and temperature changes

ACKNOWLEDGEMENTS

Special thanks to the Research Vice-rectory of the Nueva Granada Military University, for financing the project PIC-ING- 2273, *Ambiente virtual para control, de fobia*, 2016 year.

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