A Serious Game for Hemophobia Treatment Phobos: First Insights

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Abstract. This paper addresses the development process of a serious game - PHOBOS - for hemophobia treatment. Hemophobia, also known as blood phobia, is the fear of blood, wounds, injuries, amongst others. The game addresses the issue through applied-tension exercise combined with exposure therapy on a virtual reality environment. One of the main challenges was to design a game that reconciliate in a balanced way an immersive narrative and plot with the treatment of a phobia that causes great tensions and find the best mechanics to allow a gradual exposure to blood. Artistically we wanted to create the more realistic environment possible, in tune with the sound design. This process was done with the help of a team of psychologists that in conjunction with the team of game developers created a plot that helps the player to adjust his discomfort and challenge himself in his path to deal with this phobia. We present an early stage development process of a virtual reality phobia game, from the brainstorming concept of the game to the development to the first prototype with its requirements and hardware used.

Keywords: Serious game · Development process · Programming
Game development · Hemophobia

1 Introduction

Blood-injection-injury phobia (also known as Hemophobia), is a specific phobia characterized by an intense fear of being exposed to blood or invasive medical procedures [1]. It is a relatively common disorder [1, 2] where up to 80% of suffers experience a vasovagal response when they face the stimuli [3]. Considering that the intense fear can be generalized to other associated stimuli such like doctors, nurses, hospitals, syringes or dentists, hemophobia can lead to serious effects on individual's health due to the avoidance of these settings [1]. To address this issue, we developed a virtual reality serious game - Phobos – which is a serious game for dealing with hemophobia using as gameplay the exposition method as a way to help the player to adjust his discomfort and challenge himself in his path to deal with this phobia. We also have an educational part to educate its patients on how to control their physical

responses when facing fear. It was built under Unity engine using photorealistic scenery to be played in virtual reality. This paper describes the development process, including the hardware and game design aspects, as well as the artistic aspect of the modelling, lightning and sound design.

2   Related Work

There is evidence suggesting people who suffer from specific phobias tend to be hesitant to seek treatment [4]. Despite this reluctance, research suggests that specific phobia is one of the most treatable of psychological disorders [5]. Along with a wide diverse of treatment approaches, exposure techniques are often considered the first line treatment and widely used with phobic patients [6] presenting robust evidence of efficacy [5].

Therefore, computer-based tools may present an attractive tool to potentiate and amplify the range and effectiveness of psychological treatments and reduce the attrition [7]. Research has been describing the potential effectiveness of using computer games as an adjunct to psychotherapy [8]. One example of this kind of games is based on the model of solution-focused therapy, designed for adolescents to increase their motivation for therapy [9]. Other examples of serious games, grounded on Cognitive-Behavioral Therapy, are the Treasure Hunt [10] or the *gNats* [5]. In fact, the National Institute for Clinical Excellence has inclusively recommended computer-aided psychotherapy programs [6] targeted for adults suffering from mood and anxiety disorders like Beating the Blues [11] and FearFighter [12].

In the last few years another line of research that uses advanced technology in the service of psychotherapy has been emerging: the development of Virtual Reality (VR) applications, either to use in the assessment or in the treatment of mental health problems [13, 14]. VR is an advanced form of human computer interface that enables the individual to manipulate problematic situations related with his/her problem, in a sheltered setting, without feeling threatened [14]. So, virtual reality exposure therapy (VRET) has become a new medium for exposure therapy presenting good results in terms of efficacy, especially with specific phobias [15, 16] and several advantages over in vivo or imaginal exposure. As Rothbaum et al. say [17], "What distinguishes VR from a mere multimedia system or an interactive computer graphics display is a sense of presence. A sense of presence is also essential to conducting exposure therapy." Hemophobia, being one of the most common phobias and not being addressed in any of the games found on our research, made us want to develop our game to aid phobic patients and ease the costs on their treatments.

3   PHOBOS – A Serious Game for Dealing with Hemophobia

Phobos is a serious game to help with the treatment of hemophobia patients through a controlled VRET. This allows the patients to be exposed to their phobia in a controlled environment, in the psychologist room, that in most phobia cases is impossible. We use Unity engine and the STEAM®VR SDK (Software Development Kit) for the

development of the game because it is one of the most used platforms in game development and the background we had on developing on Unity.

3.1 Game Design

We started the game design process by a requirement assessment conference with our peers from the psychology department, where we discussed which types of games could be suitable to this type of phobia, and which mechanics we should explore, as the treatment therapy for hemophobic patients, is the exposure method. After we used the brainstorming technique [18], which allowed the developers to start with a series of ideas narrowing them down to a narrative, some mechanics and a gameplay.

One of our main ideas was that we had to create safe havens and safe cues to our players, this idea was then discarded in conference with the psychology team because it's an avoidance technique that isn't beneficial to the patient. The goal was to create a plot that could put the patient controlling the phobia stimuli but motivating the patient to exceed himself, in a progressive way. The narrative chosen was a detective that is called to a murder scene. The patient is the detective that arrives to a penthouse that has been the scene of a murder, with no body, and has to solve it. He/she has to pick up clues in order to progress in the game, which have phobic stimuli, in this case, blood. In the beginning of the game these phobic stimuli are very few and of small impact to the user, as the detective progresses throughout the crime scene, the phobic stimuli increase gradually leading to more realistic and strong impact blood exposure, so the user gets a paced exposure to his fear. The gameplay is a first person, virtual reality and role-playing genres as the player is in the role of the detective that can freely explore an apartment in virtual reality, can gather clues, read the items gathered, get further knowledge on his phobia and the techniques used to treat it, as well as confront their phobia by controlled phobia exposure, as is the patient who decides if he/she wants to expose himself/herself. The main mechanics are the gather, examining objects/clues, reading their information and the ability to solve puzzles throughout the level until solve the mystery. The more he explores and become closer to the solving, the more he exposes. The patient knows that he needs to expose himself to know the truth but also know that he can control that exposure, which allow the patient to mentally prepare himself to the inner challenge. Concerning this aspect, we developed an educational tutorial to help the patient dealing with his own phobia.

The opinion from our peers from the psychology department was that one of the key features should be a tutorial that can explain to patients all the physical reactions that our bodies feel during the exposition with blood, and how to overcome some of those effects like for example, to apply tension on hands, arms and legs, so that the patient can prevent faint which occurs from exposure to blood due to the increase in blood pressure followed by its the rapid drop [19]. In this tutorial, first we teach the player the basic mechanics on VR controls, which include how to move, how to grab items as well as how to interact with the game inventory system as displayed on Fig. 1 then we incorporated the tutorial with the beginning of the game, the introductory part, example in the suitcase file, in the lobby before entering the house, the user gets access to information about the description of the phobia. The key points of information to be presented are an explanation of the phobia, the natural body reactions, the

hypersensitivity, the panic attacks and the treatment process. These key points were chosen and validated by the psychology team, since it was the most relevant information to be passed to the player.
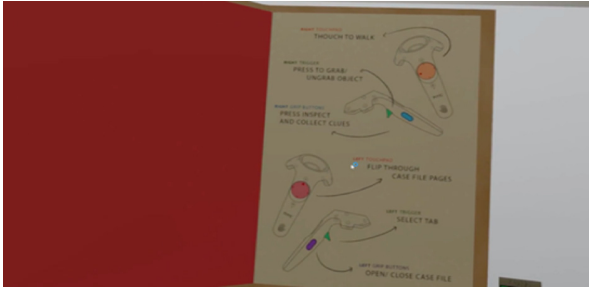
Fig. 1. HUD (Head-Up Display) tutorial on controller mechanics

Our concern related with the artistic aspect of the game, was to simulate a realistic environment. The realism was explored by creating a modern and comfortable apartment exploring the light and sounds and by creating an immersive plot. The goal was not to scare, nor to daunt but to defy the patient to his own fear. All the interaction is made through the HTC Vive as it is ergonomic and easy to learn and can use for example the grip button to grab the interactable objects described above and the trigger button to open the doors, to see the voicemail left in the phone in the lobby and to trigger the puzzle events, for example to turn paintings by 90° until all paintings are in the right order. We designed the game to be played like therapy sessions, so the patient can process the information gathered in that session and feel the accomplishment of passing another stage of the game and of overcoming their phobia as well as the description of each session, for example, the player having grabbed the key in the plant vase, now opens the door and starts searching for clues in the living room, being exposed to the first phobic stimuli a bloodied broken wine glass. The platform, we only chose Windows pc due to its virtual reality support and technology as the Macintosh didn't support virtual reality graphic cards and is more focused for work and not for gaming.

4   Validation

Since the game is still under development, we still haven't done the functionality and usability testing on a large sample. Both tests will first be done on colleagues and afterwards only the usability test will be done on phobic patients to ensure the validity of the project. The functionality tests consist on trying to break the game, using force to see every possible existing bug, while the usability tests consist on seeing if the game doesn't cause motion sickness, if the UI can be read properly without causing strain on the eyes and assess the space required for room-scale virtual reality. After these tests we will test if the game can really help phobic patients in dealing with their phobias.

5   Final Remarks

This project started to be developed for the master's in engineering of Digital Game Development, Project I and Project II classes, which will now be continued for the master's dissertation, where we will test the interaction of biometric sensors for data acquisition on physical responses to the phobia and an AI (artificial intelligence) dynamic control of the phobic stimuli. The development can sometimes be strenuous due to the unknown methods of developing for virtual reality making us go through a series of trial and error implementations to make the game perfect. In the undergoing phases of the development we want to include biometric sensor data acquisition to help us understand the stress inputted on the patient and also to make the phobic stimuli appear gradually and their intensity linked to their blood pressure so that we can warn the user to apply the applied tension method and prevent fainting from happening.

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