

Gamifying Darkness - Design and Development of a Serious Game to Treat Nyctophobia

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Abstract. The impact of certain mental illnesses in our society is becoming more and more noticeable. Among them are the anxiety disorders known as phobias, which, depending on the degree of affection, can seriously harm people's quality of life. Nyctophobia in particular is the irrational fear of the dark that, although it can appear at a very young age and persist into adult life, is not as widely treated as one might suppose. This work seeks to offer a tool that is easy to access and use to reinforce the treatment of said phobia. For this, a serious game called OSCURO has been developed, which proposes the player to perform simple tasks in a low-light domestic environment. As steps prior to its complementary use in psychological therapy, this video game has been published as a free download for PC, it has been tested by real players and subjected to qualitative analysis by various specialists in the field. After several iterations detecting errors and improving important aspects of its functionality, usability and aesthetics, some useful conclusions are drawn here for the design and development of similar projects.

Keywords: Fear of the Dark · Phobia · Psychological Therapy · First Person Adventure · Game Design · Game Development

1 Introduction

Fear of the dark is normal in children 2 to 7 years old, and it is also normal for it to disappear progressively. However, it may happen that this fear does not disappear and even intensifies, manifesting in some people an anxiety disorder known as *nyctophobia*. Many people suffer from this phobia but we do not have that impression due in part to how difficult it is to recognize our own mental disorders and also to the social stigma associated to this problem.

Phobias are not easy to address and their treatment should never be taken lightly. If we are not properly advised by experts and we do not know the consequences of our actions, when trying to help a patient we could aggravate the ailment instead of approaching its cure. Many of the negative events that scare a person may not be directly related to the dark, but may be hidden dangers that

usually occur in a nighttime context and whose fear is acquired from what they have known in movies, video games, stories of terror, crime news, etc. For this type of disorders, there are treatments based on Cognitive-Behavioral Therapy (CBT) that work on the structure of thought with which the person perceives the world and with the behaviors that derive from said perception [11].

The objective of this project is for people with nyctophobia to perceive activities carried out in the dark as more enjoyable and relaxing, through game dynamics. These dynamics will be migrated to a virtual environment, taking advantage of the immersive possibilities offered by current video games, both to create realistic scenarios and fantastic characters and audiovisual effects.

After this introductory section, Section 2 of the article provides more information on the use of serious games to support the treatment of phobias. Section 3 presents the details of the developed video game, and Section 4 explains the tests and reviews carried out with the intention of evaluating its functionality, usability and even aesthetics. Finally, in Section 5 the conclusions obtained throughout this investigation are presented.

2 Phobias and Serious Games

Ohman [6] states that fears naturally develop in the process of evolution of organisms and occur as a response to stimuli that are important for survival, that is why fear of the dark, for example, can be a common situation at some point in the life of the human being. However, when these fears are not overcome, they turn into disproportionate symptoms of anxiety and anguish, which affect the personal, social and cognitive development in minors, and specific phobias can develop. Among these specific phobias linked to anxiety disorders is nyctophobia, an intense fear of the dark that makes the person very nervous in dark environments, forces them to sleep in bright places and can present physiological symptoms such as trembling, sweating, increased heart rate, nausea, headaches, and others [10].

Other authors estimate that there are still gaps to be closed to treat phobias in infants, since the consequences that this type of fear can cause in them are underestimated. This is due to the specific ignorance of each of the phobias and to the fact that in children this type of episodes can be taken as passengers since it is true that they are usually overcome in the course of child development [5].

Specifically for nyctophobia, experts recommend developing therapeutic methods that involve a certain passivity to face the disorder [7] and applying them in different spaces (at school or institute, at home ...), preferably in natural environments. Several studies have shown that children treated psychologically using games reduced fear and increased their interaction behaviors with the dark [8]. Orgiles et al. conducted an investigation with children between the ages of 5 and 8 with a diagnosed darkness phobia, using therapeutic treatments with game dynamics. He found that the playful component in the sessions and the material reinforcement emerged as important elements in the treatment, in view of

the results obtained in the rest of the experimental conditions. Play helps the child to initially approach darkness, facilitates their immersion in therapy, and minimizes the aversive nature of the feared stimulus.

If we talk about the benefits, not only of games in general, but of video games, we find that these have been used to treat physical and mental illnesses for many years [4], as well as for speech therapy, improvement of eating habits, improving postural balance, pain therapy, etc. Therefore, it seems reasonable to pursue these benefits also in the treatment of fear of the dark, or nyctophobia, based on the idea of increasing the motivation of patients, taking advantage of the favorable climate offered by a playful context; the greater sense of security reduces the level of tension and increases the patient's ability to bond and cope with that environment that produces anxiety.

Video games are applications that, in general terms, seek to encourage human behavior for their own enjoyment and well-being, using Multimedia and Human-Computer Interaction technologies. Thanks to these new technologies, health professionals have also oriented these tools towards other fields, such as the treatment of diseases such as cancer, asthma and diabetes, among others.

Video game consoles appear in the 1970s and somewhat later, they become a resource for certain health professionals, since they observe that, thanks to consoles, patients are able to comply with the treatments that they did not follow when only they received written instructions. Video games then become relevant since, through learning in simulated experiences, they manage to change behaviors despite the autonomy of the participants. Parrado et al. hold "video games are a promising tool for applied psychology because they can organize environments arbitrarily with contingencies of reinforcement or punishment, to direct the increase or decrease of certain behaviors, in quantity and time consistent with the player's behavior (...) Video games for health create personal experiences, where in addition to the contingencies established in the game there is social learning from the virtual image of the participant" [9].

There are studies that show that video games are tools that can be integrated into the clinical context and contribute to successful treatment. Although there are those who highlight the dangers of addiction to these games, other authors consider that, by introducing adequate concepts of Psychology in the design, video games activate brain circuits (reward or punishment) that can be instrumented as methods for the treatment of phobias [4].

Baranowski et al. [1] point out that the success of serious games for health lies in five important elements: the high degree of interactivity, the narrative behind the game, the challenges that promote experience and fun in the participant, feedback on the behaviors carried out and the possibility that the skills learned can be transferred to real contexts. All these aspects must be taken into account when creating a serious game for the treatment of disorders such as nyctophobia.

3 OSCURO: A Serious Game about Nyctophobia

Following the CBT paradigm, a game called OSCURO has been designed that uses darkness as a theme for the player to change their perception of it. It tries to reflect the treatments aimed at nyctophobia, mainly those used in children, so that the video game reflects something similar to what the patient experiences in real life therapy. In this way the game can serve as accessible therapy from anywhere without depending on specific hardware or accessories.

It should be clarified that the proposed video game does not aim to replace the care that a professional psychologist can offer to a patient diagnosed with nyctophobia, but rather to serve as a support tool.

3.1 Narrative Design

The video game is a first-person adventure aimed mainly at children around 6 years of age, although it may be valid for older children.

One of the main stigmas that we have to contend with and that is deeply ingrained in most gamers is that darkness is synonymous with terror, the unknown, the unexpected, the unsafe. This feeling is enhanced by many titles that evoke sinister sensations in the dark, developing certain mechanics and certain aesthetics such as the Survival Horror genre.

In OSCURO, a well-kept environment is sought that avoids being gloomy, a non-violent language is used with innocent fantasy and warm dialogues. According to the psychological counseling, some guidelines were established for the narrative design that CBT uses in the treatment of nyctophobia:

1. Not subjecting the player to additional stress to that already generated by darkness.
2. Reward or congratulate after a task is successful. This pattern is common to the design principles of video games, that their own dynamic structure has a reward system designed to generate satisfaction in the player.
3. Divert attention from the dark environment by focusing the player on an activity.
4. Use soft sounds, nothing surprising that might disturb the player.
5. Properly handle frustration when losing or failing in a task.
6. Be very explanatory and clear in the instructions given by the game, leaving nothing to the interpretation of the player.
7. Limit the total time required to complete the game to 30 minutes. This is especially important when the brain maturation of a good part of the target audience has this time as the maximum concentration time on average [2].

With these clear guidelines, a story is built that revolves around darkness and seeks to encourage the player to be comfortable in it. The setting is a closed environment, a house inhabited by a magical fairy, a non-player character (NPC), that will ask you to play with her. Playing games in the dark (hide and seek,

treasure hunt, etc.) we gradually turn on the lights of this comfortable two-story chalet. In order to win the game, you should get the three magic keys, beating a series of minigames (Figure 1). On two occasions the player will have to go around the house looking for a series of striking objects (first red balls, then Easter eggs). The first minigame with its own interface is that of the Chinese shadows, where we will have to recognize the silhouette of various animals. Then we will play to recognize characteristic sounds of animals and finally we will memorize a sequence of images that we will have to enter as a code in the home computer.

Players gradually puts their (infantile) skills into practice and at the same time have fun with all these funny games in the dark.



Fig. 1. Screenshots of the minigames included in OSCURO v2.0

3.2 Level Design

The game has been created for a single player, with total freedom to explore the scenario and only conditioned to meet some challenges before being able to access others. Each mission has clear instructions that are reflected in the dialogues or as messages from the narrator, as appropriate.

The game's scenario will have a realistic style that helps us to connect with the environment but at the same time with a magic touch that, experienced through the screen, helps reduce the level of tension. The characters have a friendly and somewhat childish appearance, so that players who are children can identify with them and get that feeling of confidence and tranquility (Figure 2).

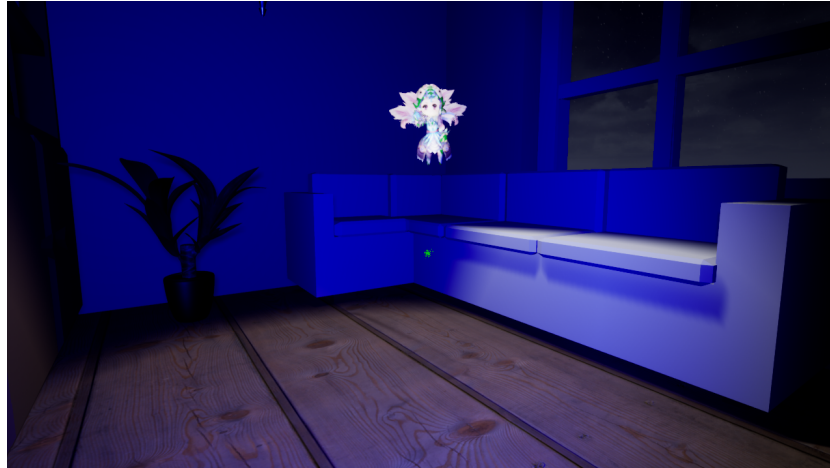


Fig. 2. Screenshot where we see the fairy, NPC in OSCURO v2.0

The layout of the house (Figure 3) aims to give the house a familiar air, minimizing obstacles and with doors that open automatically when the player's avatar approaches. An attempt has been made to follow the good practices of architecture and the design is inspired by the typical country house, although with modifications so that the adventure can be better developed. On the first floor, for example, two rooms were left open with the idea that they would be useful for carrying out the activities of two of the mini-games.



Fig. 3. Draft of the house, scenario in OSCURO v1.0

3.3 Implementation

The integrated development environment (IDE) used to implement OSCURO is Unreal Engine, the popular technology from Epic Games. It is one of the most used IDEs in the world, free since 2015, with all the necessary tools to develop a video game, including a proprietary visual scripting language, Blueprints. OSCURO has been created using the stable version 4.25, coded entirely in Blueprints.

As development methodology, an iterative and incremental process with an agile approach has been used in order to facilitate specification changes. These changes will have a lesser impact working in small increments, so that the effort invested will be less than following a traditional development process.

The iterations (redesign, development, evaluation...) helped to improve the functionality and aesthetics of the prototype. Within the development planning, the following 5 phases were taken into account, especially the last four being mired in a markedly iterative process.

Concept phase. OSCURO v1.0 started with a strong concept phase, where the fundamentals of the game were built from an idea. In this phase, the genre of the game (adventure) was determined, the target audience, what will be the guidelines that its design will follow ... all based on a research work that establishes the starting line. In this phase, a sketch of the game's "script" is built according to the ideas read about nyctophobia and its treatment. There is also the need to think a lot about the details and to get adequate advice for the production to find the best way to convey the message. Our psychologist were contacted from the beginning to obtain a clear guide on how to approach the subject of the video game without falling into communication errors.

Analysis and design phase. This phase is divided into two large sub-phases: one properly focused on the software design of the game and the other linked to the artistic creation of audiovisual resources. The first sub-phase implements the mechanics of the game, fits into the narrative the simple missions and minigames that the player is going to find, giving them an order and a structure so that the player manages to get involved with that world until generating new thoughts from the new perception that the video game offers regarding the dark. The second sub-phase seeks to create the right conditions for the player to feel comfortable in the dark. Avoiding that gloomy reflection that the night has, looking for that feeling of spaciousness and freedom of exploration. The design of the characters is key to generate empathy and get the player to see themselves reflected in them and thus have a closer experience.

Development phase. In this phase, all the tasks are carried out with the game design document as a guide. The stage is built, with its basic geometry and decorative elements, obtained from the Unreal Marketplace. The materials and lighting that will be part of the world are determined, the characters (player and non-player), their movement and interaction, their animations and their dialogues are organized. The missions and minigames of the game are programmed in Blueprints and details such as music, sound and voices for the different ac-

tions, etc. are added. All this going through several minor iterations, making many adjustments.

Test phase. As we will detail in Section 4, in this phase we begin to perform unit tests, improve the gameplay, correct inconsistencies and add details that improve the experience. The general functionality and that of the minigames are isolated to verify their behavior at a purely functional level. After the unit tests where everything seems to work separately comes the integration tests, whose objective is to test all the components together, making sure that they interoperate properly and that the video game works correctly from start to end in less than 30 minutes. Alpha and beta versions are produced, to involve a small group of experts who offer suggestions and recommendations (qualitative evaluation), and to later involve a larger group of testers, respectively, for a more formal testing.

Deployment phase. At the end of each iteration, we generate the executable of the corresponding version that will allow experts and testers to have access to the most recent changes from their own devices. Here we become aware of the minimum and recommended hardware and software requirements of the different existing platforms. In this case, the game is built only for PC and is available for free download from the platform Itch.io¹.

4 Testing and Expert Evaluation

The evaluation has been carried out with different approaches, obtaining a high degree of feedback and support for the project. The game has been subjected to qualitative evaluation by experts in video game creation: a game designer, specialist on narrative and level design, the owners of Didactoons², a company that produces educational video games for children, and a clinical psychologist. It has been quantitatively evaluated by 13 students from a training activity at the Faculty of Computer Science from the Complutense University of Madrid, entitled “Quality Management in Video Games”. Although not official patients, the game has also been informally tested with two girls, ages 7 and 9, with a moderate fear of the dark and a reasonable degree of PC gaming experience using mouse and keyboard.

OSCURO’s playtesting quantitative tests required the tester to answer some questions, divided into two parts: one that deals properly with the experience of the game and another that explores something as important as the sensation of presence that the player experiences, with questions referring to the questionnaire Slater-Usch-Steed (SUS) standard. From the responses to the questionnaire carried out after the experiment with the students, it can be deduced that in the penultimate version of the system, 85% of them finish the game in less than 20 minutes, 77% understand the instructions, 61% see it as original, 47% did consider it fun (we assume that it is because the game is aimed at small children),

¹ <https://narratech.itch.io/osкуро>

² <https://www.didactoons.com/>

46% useful for nyctophobia (it was not a goal of this test), 31% consider the movement of the avatar satisfactory (it was extremely simple), and only 23% like the characters (we clearly had a problem there) and other data like that.

Given the shortage of related work, the design and development of this video game was a significant challenge. Trying to make darkness fun through an adventure video game, when fear and anguish are usually associated with it. Expert input revealed a number of important design flaws that required improving the user experience: use of directional light, backgrounds in total darkness and shadows, sinister and unpleasant NPC, treatment of light as a reward, etc. Thanks to the contributions, mainly from the narrative and level designer, the results were improving remarkably.

OSCURO is different to other serious games, because although Virtual Reality applications that treat this type of phobias focus on a progressive exposure, they do not involve purely playful activities that remove the patient from the disturbing feelings that darkness generates.

5 Conclusions

This project describes the design and development of a video game that seeks to complement the psychological treatment of persistent nyctophobia in patients from 6 years onwards. The research work has turned out to be practically inexhaustible but it has allowed us to know researchers, points of view, alternatives, etc. that confirm that around the world of mental health there are many possibilities to develop new and increasingly effective techniques for this and other problems, using information technology and gamification.

The main objective, which was the creation of the game at a functional and usability level, was achieved, although the magnitude and complexity that may lie behind the development of a video game is such that there are always many aspects to improve. For this type of projects, there is usually a powerful interdisciplinary team in management, design, programming, artistic creation tasks, etc. as well as the ability to correct the course according to the results of the tests, for which abundant testers are used and milestones and versions that the project is reaching are established.

As we stated at the beginning, when it comes to treating phobias, exposure therapy through virtual means is as effective as traditional forms of live exposure therapy [3], and that is why expectations are very high for its application in this branch of health.

One of the most important conclusions obtained during this project and on which we want to emphasize, is the need to consult with experts from the concept phase. Although we believe we know the most important aspects of the entire project development process, we must always be aware that we do not know everything and that a certain aesthetic can be functional but cause the opposite effects to those we seek.

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