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Master's Thesis
Academic Year 2015

Video Based Therapy Method for Acrophobia
Self-Treatment.

Graduate School of Media Design,
Keio University

Marta Wojcikowska

A Master's Thesis
submitted to Graduate School of Media Design, Keio University
in partial fulfillment of the requirements for the degree of
MASTER of Media Design

Marta Wojcikowska

Thesis Committee:

Associate Professor Kouta Minamizawa	(Supervisor)
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Abstract of Master's Thesis of Academic Year 2015

Video Based Therapy Method for Acrophobia Self-Treatment.

Category: Design

Summary

Psychotherapies are not something people easily admit they might need, even to themselves. Even when help is available the social stigma that is attached to needing this kind of help, putting priority on one's career instead of health, lack of professional, specialised help in the area - reasons for not undergoing a therapy are multiple and vary greatly. Yet, the outcome is the same - psychological problems that could have been erased still are present in society and negatively impact daily lives of those who suffer from them. Phobias, one of the most common mental issue, are an example of this situation.

This research is aiming to change this situation. By exploring solutions available thanks to new technologies the aim of this thesis is to design a new therapy method that can help people suffering from acrophobia - the fear of heights. The therapy method is designed to deliver the necessary help and support for people with low to moderate fear of heights, without disrupting their daily lives and with no need of visiting professional's office. It is designed as an alternative solution for those reluctant to seek professional help - solution that can bring a positive change to their lives.

Keywords:

Computerised Cognitive-Behavioural Therapy, Acrophobia, Serious Games, Self-help, Interaction Design

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Marta Wojcikowska

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“It’s a dangerous business, Frodo, going out of your door (...). You step into the Road, and if you don’t keep your feet, there is no knowing where you might be swept off to.”

- J.R.R. Tolkien, Lord of the Rings. The Fellowship of the Ring.

There is no way of knowing where the Road will take you, even if you do pay attention where you are going. Sometimes all it takes is one action, one challenge to turn your life upside-down and inside-out for a good measure. For me, this moment was coming to Graduate School of Media Design in Keio University. With educational background that has nothing to do with neither design, management, technology nor policy I found myself being accepted - in every meaning of the word; as a student among the ranks of newcomers in September 2013, and throughout the four terms simply as a person. I’ve been swept off into adventure of my lifetime, and the rollercoaster that lasted for two years left me equally terrified and overjoyed. It made me stronger, more open, more capable of facing challenges I would never think were possible for me to overcome.

I would like to express my deep gratitude to Professor Kouta Minamizawa, whose unwavering support, patience and academic guidance allowed me to get to this point. It is not easy working with a student who because of lack of specialised knowledge frowns and makes a “what is going on” face at every turn, and still believing that the said student will be able to complete all the requirements. For trusting that I will find my way on time, no matter how long it will take.

I thank my co-supervisor, Professor Masa Inakage, for asking all the right questions at the right time and forcing me to not only think outside of the box, but forgetting the box ever existed.

My great thanks and gratitude to all my seniors - you all deserve a medal for putting up with me and not losing your patience, especially when I have been

ABSTRACT

at my most stubborn. And that have been quite often. Charity Fernando, MHD Yamen Saraiji, Minato Takeda - you helped me find my feet, showed me the ropes and inspired to aim for the best. I am proud to be able to count you among my friends.

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The Author
Marta Wojcikowska

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Chapter 1

Introduction

1.1 Background and Motivation

With the invention and establishment of the Behavioural Therapy by Watson, phobias have been classified as a psychological problem for which cure is available. Despite that, to this day it still remains a widely spread and a common issue in our society. And yet, why would people not seek help and cure for a oftentimes very serious problem that lowers their quality of life? Why would so many people downright refuse any help, or downplay the issue as *not important* or *not that bad*? In some cases even admitting to actively rearranging their daily lives to avoid the stimuli they are afraid of, at all costs.

Reasons are multiple and just as complex, varying greatly from one to another person.

Financial reason is one of them. Therapy sessions are expensive and as they tend to stretch over time, last for months, even years, the costs are extensive and in many cases out of reach for many families.

Tempo of how we live is another reason. Working fast, working hard, working long hours as many jobs require employees to be available and ready to stay overtime without previous notice. Scheduled therapies and standing appointments tend to not withstand the pace, resulting in patients dropping out completely after few missed sessions.

The fear of facing the stimuli is a major concern for those who refuse to undergo therapy. It is long established that exposure therapies, be it systematic or enforced by conditioning, bring best results. But as the name suggests, they require people to face their fears. It is not something that most people agree to readily, especially when, as it was mentioned before, avoiding situations that involve the fear-inducting stimuli is one of the coping mechanisms people use to manage their fear in everyday lives. Why would they pay to face something they want to avoid.

In cases when someone agreed to get rid of their phobia, starting the therapy is not so straight-forward, either. Long waiting lines, appointments made even months in advance tend to discourage people. Similar problem face people living in small towns, away from cities and their more specialised therapist offices. Costs and time used to commute for 60 minute session, for an issue that in most cases is not life-threatening is not something many find justifiable. The negative stigma of needing help of a psychologist or psychiatrist remains an important factor preventing many from seeking help. Even in situations when issues are more severe and could threaten one's life (depression, schizophrenia, etc.). *People will talk* and *they will laugh* are still strong enough reasons to never admit needing help, common especially among small communities, children and adolescents.

In recent years the technological development have offered an alternative solution to many the aforementioned concerns.

Call centres open 24/7 with professionals waiting for a call, online services and fora where anonymously one can try to find an answer and help. Therapist offices go as far as offering consultations through Skype when, for whatever reason, it is impossible to come to the office in person. Example of another approach are smartphone applications, video and computer games that are designed specifically to target certain issues and/or age groups. Not every type of help is appropriate for every issue. In many situation, though the choice is between choosing an application that have a chance of bringing even temporary relief and not seeking help at all - the choice seems obvious.

While all those services and apps have potential of helping¹, services focused on phobias are yet to be available.

How this situation can be changed is the main question of this research.

The author strongly believes that in this time and age, in the modern society, with all the technological possibilities and research tools answering questions that 10 years ago people never thought about asking, everyone and everywhere should have an access to help. The author focuses on phobias, and fear of heights specifically, as it is believed to be one of the most constricting and disrupting people's lives, as well as one of the most common.² Having a mild case of acrophobia herself, as well as growing up with highly acrophobic Mother, the author is happy to have chance to try finding solution for the problem. Understanding the lives of people suffering from this phobia and the impact it has on not only on their lives but also their families is the factor that drove the author towards the best

possible solution.

Author's understanding of Psychotherapy and Psychology is another point that drove the research in this direction. Coming from Psychology and Pedagogics education background and prior to tackling this topic having done extensive research in alternative, innovative therapies - broadly understood Art Therapies, as well as Japanese Tea Ceremony as a form of Psychotherapy - using new media for the purpose of bringing psychological relief and help to those who may need it seemed like a natural progress.

Inspiration for the concept came from an unexpected source.

While working on a First-Person View drone racing project, the author noticed reluctance some of users showed during showcases. They were afraid of heights and the idea of looking at the world through drone's eyes was daunting. This spurred the idea of using drones and real-time video feed in a way that would, instead of scaring users afraid of heights, help them in overcoming their fear. From drones the idea went through many changes that would help with staying true to the primary objectives this project was meant to answer to.

1.2 Research Objective

In this thesis, the author proposes an alternative approach, another possible solution for phobia, and specifically, acrophobia treatment. A tool that can be used in privacy of one's home, whenever a person afraid of heights feels the need to do face their fears, feels strong and determined enough to put themselves in a vulnerable position and try to overcome their handicap. The field of this research is mainly focused on designing a therapy tool that would be the answer for the needs of acrophobic person, in terms of getting rid of the acrophobia symptoms people experience. Another objective is developing examples of tools that would serve as a carrier for the concept.

By using new media, tools largely available, in this research the author wants to ensure that those who may want or need help - but for reasons already mentioned are reluctant or even unable to look for it in professional offices - will still be able to receive it. While it is close to impossible to reach every one - especially with acrophobia, which manifests in many specific ways that will be explained in further chapters - in this research the author's objective was to find solution that would help at least one group of acrophobic people for whom the fear manifests

in a similar way. Here, the method has been tailored for needs of people who are anxious about situations that involve suspension in a high place (for example, standing on a ladder, on a rooftop) and for those for whom action of ascend triggers the fearful response.

1.3 Thesis Overview

This thesis consists of six chapters.

Chapter One, Introduction, is as the name suggests serves as an introduction to the problem described in this thesis, along with background and author's motivation for undertaking this particular subject. Key term for this work can also be reviewed in the appropriate subsection.

Chapter Two: Related Works is the chapter where review of all the relevant literature available on the subject can be found. Starting from introducing terms like "therapy" and "phobia" in the first subsection information and discussion about *in vivo* therapies, the One Session Treatment (OST) as well as Self-Exposure can be found. It is the section relating to the traditional therapy, the foundation for every following work described later in the chapter. Second subsection tackles theme of computerised therapy and what have been done in the field with Virtual Reality (VR) and Augmented Reality based treatments. Researches discussed in this subsection point to computerised therapy possibly being the future of psychotherapy, as results of the researches are very promising. Importance of self-motion of the user in the virtual environment is emphasised. The third subsection refers to the serious game concept that allows users to experience therapy through computer game, in privacy of their own home, and available therapy-related and technology based services are also described.

The third Chapter of this work tells the story of the concept behind the design and the project, as well as presents initial design and user study done in order to find the best possible solution. In this chapter, going from introductory section focusing on the philosophy and vision, ethnography and the concept for the project to section explaining meanders of finding the best possible system to realise the concept is presented.

Chapter Four consists of the final system proposed for this research.

Chapter Five describes the experiments and the user studies undertaken for the purpose of testing viability of the concept.

Chapter Six discusses results of the findings from Chapter Four, as well as offers author's predictions for the future of this project and this concept.

1.4 Key Terms

Computerised Cognitive-Behavioural Therapy (CCBT)

"Generic term that is used to refer to a number of methods of delivering CBT via an interactive computer interface. It can be delivered on a personal computer, over the Internet or via the telephone using interactive voice response (IVR) systems." ³

Acrophobia

Type of phobia. Fear of heights.

Serious Games

"Games that do not have entertainment, enjoyment or fun as their primary purpose" ⁴

Interaction Design

"Designing interactive systems is concerned with developing high quality interactive systems and products that fit with people and their ways of living." ⁵

Notes

- 1 And according to comments and feedbacks on the websites, many of those tools really does bring relief to some individuals.
- 2 (Craske, Barlow, Clark, Curtis, Hill, Himle and et al. 1996)
- 3 Definition by NICE - National institute for Health and Care Excellence (<http://www.nice.org.uk/guidance/ta97>)
- 4 (Michael and Chen 2005)
- 5 (Benyon 2010)

Chapter 2

Related Works

Origins of the word “therapy” reach as far as Ancient Greece and the corresponding term *therapeia*. Later, in the form of more familiar Latin *therapia* it still carries the same meaning - *to cure, to heal* and also *service done to the sick*, and in modern times it is used as English equivalent to *therapy* and described as an attempt to cure a health problem, usually following a diagnosis. While in medical field it is synonymous with *treatment*, in Psychology and Psychiatry the act of healing is referred to as *psychotherapy* - another interesting word that in modern understanding has been in use only since the end of XX century. The suffix *psycho-*, taken from Greek *psykho-*, is an element meaning *mind, spirit*. In combination with *therapy* the term *psychotherapy* can be understood as *an action that heals/cures ones mind*, and even in this very simple understanding, it is not far from the mark.

Various sources define “psychotherapy” in different, slightly varying, ways though the core meaning - taken from the etymology of its make-up words, always remains. For the author of this thesis, Psychotherapy has always been about actions one undertakes to bring to oneself relief from mental and emotional problems and disorders, while not simultaneously bringing any harm to yourself or others. While managing serious and deeply-rooted psychological conditions need to be supervised by a professional, the author strongly believes that very often relief can be achieved by other methods, outside of therapist’s office.

From sports as a form of therapy, through various Arts, to animal therapies, multiple non-invasive methods and approaches are in use to help people deal with whatever mental and/or emotional problems they experience. Sports are good for managing aggression. Arts are best for relaxation (music therapy), and self-expression (Fine Arts based art therapy), a mean for dialog between a patient and a therapist when words are not enough. All traditional media known are utilised in one way or another for a very simple reason - to find means, a tool that will help this particular person with his or her problem. New Media and technologies

are rapidly catching up, as well. Computers, Virtual Reality, Augmented Reality, Internet, smartphone applications, have started to become the “go-to” sources and means to which people turn to seeking help. And as the recent research shows, it’s potential for phobia treatment is especially promising.

2.1 Phobia

According to Diagnostic and Statistical Manual of Mental Disorders (DSM) ¹ phobias are considered as a sub-type of anxiety disorder, and classified into two categories:

1. Specific phobias;
2. Agoraphobia - fear of leaving home or a small, considered as *safe* area, possibly resulting in following panic attacks.

International Statistical Classification of Diseases and Related Health Problems (ICD) ² puts phobias under category F - Mental and Behavioural Disorders, between markers F40-F48 relating to Neurotic, Stress-related and soma form Disorders, point F40: Phobic Anxiety Disorders. Acrophobia, which is the subject of this research is placed under category F40.2 - specific (isolated) phobias.

Following the DSM-5, diagnostic criteria for specific phobias are:

“A. Marked fear or anxiety about a specific object or situation (e.g., flying, heights, animals, receiving an injection, seeing blood). Note: In children, the fear or anxiety may be expressed by crying, tantrums, freezing, or clinging.

B. The phobic object or situation almost always provokes immediate fear or anxiety.

C. The phobic object or situation is actively avoided or endured with intense fear or anxiety.

D. The fear or anxiety is out of proportion to the actual danger posed by the specific object or situation and to the sociocultural context.

E. The fear, anxiety, or avoidance is persistent, typically lasting for 6 months or more.

F. The fear, anxiety, or avoidance causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.

G. The disturbance is not better explained by the symptoms of another mental disorder, including fear, anxiety, and avoidance of situations associated with panic-like symptoms or other incapacitating symptoms (as in agoraphobia): objects or

situations related to obsessions (as in obsessive-compulsive disorder); reminders of traumatic events (as in post-traumatic stress disorder); separation from home or attachment figures (as in separation anxiety disorder); or social situations (as in social anxiety disorder).”³

Acrophobia (the fear of heights), the phobia which is in the main focus for this research, is a specific phobia of the natural environment stimulus type, that also seems to be closely related to the fear of flying and/or elevators (the situational type of stimuli).⁴ Typical behaviour for people experiencing this fear is avoidance of any height-related situations, including but not limited to staircases, balconies, being on a high floor of a building, bridges, etc. It is one of the most restrictive phobias, greatly impairing everyday lives of those who suffer from it.⁵

In literature, acrophobia does not divide into subtypes. While highly situations and tied to specific situations, person is considered as acrophobic when he or she experiences the already cited unreasonable amount of anxiety when faced with a situation involving heights. In diagnosis, it does not matter whether the anxiety is triggered by climbing the staircase or crossing a bridge, flying a plane or standing on a rooftop. Each and every situation involving heights that causes the anxiety is enough of a foundation for someone to think about themselves as acrophobic.

2.1.1 In Vivo Exposure

Psychological therapy in the traditional understanding is a meeting between the therapist - a psychologist or psychiatrist, social counsellor or advisor, and a person needing help or guidance. Sometimes it is a one-on-one meeting, sometimes it is a group session in which case simply more people seeking help with a similar issue is in the room. Either way, the meeting takes place at an appointed time, in therapist's office. Meetings like this are usually scheduled for a prolonged period oftentimes, once a week from 3-6 months up to more than a year, solely depending on the severity of patient's problem and their willingness to work on the issue.

Psychology is not an uniform science. Multiple schools of thought claim that their approach and their understanding of how and why humans are the way they are. Some approaches have been proved to be more effective for certain kinds of mental issues, some people respond better to a certain therapeutical method. Phobias have been known to be curable - or at least made manageable - with the

use of mix of Cognitive and Behavioural approaches, called Cognitive-Behavioural Therapy (CBT). The idea behind this method is to change the way person looks at certain problems, change the way they perceive it, and to simultaneously equip that person with new behavioural patterns they could use in daily lives. For phobias, it is most commonly done by *in vivo* exposure therapy and desensitisation.

In vivo exposure therapies and desensitisation are exactly what their names suggest. The point of those techniques in the CBT canon is to gradually expose yourself to something you are afraid of, learn how to get used to it, and in controlled environment build up a set of new behaviours that will serve you outside of therapist's office. They are the "go-to" techniques for all anxiety disorders, including phobias.

2.1.2 One Session Treatment

The idea of One Session Treatment (OST) has been developed by Lars-Goran Ost and tested over a number of trials, and has been discussed in a number of papers.

6 7 8

Idea of the One Session Treatment incorporates a combination of graduated *in vivo* exposure, participant modeling, reinforcement, psychoeducation, cognitive challenges, as well as skills training - delivered over a remarkably short time period of maximum 3h as the name suggests, during a single session with a therapist. One could wonder about efficacy of such method, especially when traditional therapies are known to last even years, or not at least multiple sessions. And yet, the positive response rate of 76% and higher has been proven, based on a controlled clinical studies examining this treatment.⁹

The OST method is targeting a specific phobia, only one at time. It has been tested for various kinds of phobias. Arachnophobia (fear of spiders) has been the primary subject on which Ost tested his method, along with injection phobia on a smaller scale. He suggested that given the results, his experience in phobia treatment and observations during trials all animal phobias, as well as most of the specific phobias should be suitable for this treatment method. Exception has to be made for flying phobia and claustrophobia (fear of small, enclosed spaces), though.

¹⁰Participants with risk of panic attack are to be excluded from participation.

Despite the name, this method is seen as an opening, a first serious step in therapy. It brings relatively immediate positive results, building up patients' confidence in overcoming their fears. To be fully successful and have lasting

effects maintenance and continued exposure needs to be applied, including making conscious decisions to not avoid interaction with the stimuli that causes the fear.¹¹

It is also worth mentioning that originally, following Ost 's suggestion, during the session video recording is performed. It 's been suggested that given the short time and large steps taken by patients on the way to managing their fears, the situation may feel "unreal" after the adrenaline goes down. Video recordings are the proof that can be delivered to patients who would like to see with their own eyes, relive the experience and strengthen the results of the treatment.¹²

2.1.3 Self-Exposure

In cases when person's fear does not cause any additional dangers to this persons well-being nor manifests in physical way (panic attacks, vomiting, fever, convulsions, etc.) self-exposure is always an option. In mild to moderate cases in general exposing yourself to the stimuli that causes fear is not necessarily need to be done with assistance of professional. Each case is individual and should be carefully considered separately - nonetheless the general consensus is that if phobic individual feels strong enough to face the fear and expresses want to concur it, it is possible to reduce the severity of responses to the stimuli on your own.

Certain preventive steps should be kept in mind, like for example not exposing yourself to a strong stimuli or not planning to spend long period of time trying to desensitise yourself. That is to say the so called "shock therapy" is known to bring positive results, as well. Yet, for majority, small steps and stretched overtime in a schedule of exposure sessions is what works the best and brings the relief.

Decision whether to consult a professionalism and trust them to lead you through the exposure therapy, or brace yourself and plan a therapy schedule on your own, or even go for the shock treatment, ultimately lies in hands of the person making the decision. The higher the level of the fear is, the more probable is that person experiencing it won't be able to face it on their own, without professional and skilled assistance. As phobias, if they are not a product of accident, especially when neglected and ignored, tend to intensify over-time it is highly recommended to try and fight with them, in whatever way is available.

2.1.4 Acrophobia Questionnaire

Acrophobia Questionnaire (AQ) is a standardised tool to assess the severity of anxiety and avoidance, and it relates to common situations involving heights. It lists 20 specific situations, from riding an elevator to 50th floor to an airplane trip or standing on a ladder (see: Appendix, B). Person taking the test needs to mark on a scale from 0 to 6 how anxious would they feel in each situation, and from 0 to 2 how likely they are to avoid it. The seven-point scale for anxiety ranges from 0 (feeling calm, not at all anxious) to 6 (extremely anxious). Similarly, the three-point avoidance scale ranges from 0 (would not avoid this situation) to 2 (would not do it under any circumstances, avoid at all cost). AQ is scored by summing up Participant's scores for anxiety and avoidance, separately.

The AQ takes approximately 5-10 minutes to administer, participants are asked to not overthink the ratings they are about to give each situation and provide answers on how they would currently feel or act.

Reliability of the test (Spearman-Brown split-half reliabilities) equals $r = .82$ for anxiety scale and $r = .70$ for avoidance. The reliability remains over 3 months time period for both scales.

This test is sensitive to effects of treatment. Convergent validity is unknown as there are no other standardised tests for fear of heights that could be used for comparison.¹³

2.2 Computer Generated Realities and Therapy

2.2.1 Virtual Reality in Therapy

Virtual Reality (VR) Therapy, also known as Computerised Cognitive Behavioural Therapy (CCBT), Virtual Reality Immersion Therapy (VRIT), and most commonly Virtual Reality Exposure Therapy (VRET) is relatively new method used in psychotherapy that uses virtual reality technologies in treatment. It's been found to be effective in anxiety disorders treatments, most noticeably in case of various phobias, but also in case of social phobia/public speaking phobia. It is used in treatment of Post-Traumatic Stress Disorder (PTSD), as well as in pain control.

Thanks to the unique opportunities offered by virtual reality technology a lot of attention has been given especially to phobia treatment - height and flying

phobias. Researchers have been experimenting with the new medium, comparing it with other methods that are already in use like relaxation methods¹⁴, *in vivo* exposure therapy^{15 16}, systematic desensitisation¹⁷ and control groups, including wait-list controls^{18 19}. In one study virtual reality has been used as an adjunctive element of the treatment.²⁰

Results of those experiments are positive, with varying level of success.

Studies comparing virtual reality treatments with *in vivo* exposure found the VR method to be equally effective. The study comparing VR treatment and desensitisation method found that the VR method gives equal results in alleviating patient's anxiety. It is more effective, though, in real-life application. Phobia researched in this study was the fear of flying, and more people who underwent the VR therapy flew after completing the virtual treatment (VR method: 18 out of 20 patients; desensitisation method: 1 out of 10 patients)²¹. Virtual reality seems to be a fairly good adjunctive component for cognitive therapy, and while results for control group comparison experiments were less consistent, based on self-reported questionnaire, all of them (involving spider phobia and acrophobia, respectively) resulted in less anxiety and avoidance from patients.

Virtual Reality treatment specifically oriented on acrophobia has comparable results.

In addition, various points across researches has been made that show the virtual reality treatment may be the future and new treatment model for phobias. Flexibility of the virtual systems, from the practical point of view, offers to both the therapist and patients advantages:

- For therapist: better control of the situation and the environment;
- For patients: avoidance of embarrassment in public;
- For both sides: preservation of confidentiality.^{22 23}

According to research done by Garcia, et al.²⁴ 90% of students with arachnophobia would actually prefer the virtual treatment to *in vivo* exposure. It is also worth mentioning that the drop-out level in experiments involving virtual reality therapy are significantly lower than in any regular treatment, especially comparing to *in vivo* exposure therapy. With results being comparatively the same, patients involved in VR therapy are more likely to complete the therapy and benefit from a full treatment.²⁵

2.2.2 Augmented Reality in Therapy

Augmented Reality (AR) refers to “technology of combining real world images, video, etc. with computer generated information and/or imagery” (Kerry Maxwell, Macmillian dictionary). It is a “direct or indirect view of physical real-world environment that has been enhanced by adding virtual computer-generated information.”²⁶ Coined by Thomas Caudell in early nineties the expression has since then started appearing in everyday language, mostly accompanied by “app” and referring to mobile phone applications that allow users to combine images captured by phone camera with digital content. Where Virtual Reality replaces real world with a digital one, Augmented Reality overlays the digital content over the captured real-world images, in real-time.

Since the term and technology became available, it’s application has spread over numerous fields. From Arts and Education, navigation, through tourism and sightseeing, to medical use, task support, search and rescue; and last but not least Entertainment. Gamification has taken especially kindly to the possibilities offered by Augmented Reality, transforming and supporting not only the new quality of city games, but also in commerce.

It is not surprising therefore that in the era of digitalisation Psychology and Therapy fields have also looked into benefits this technology can offer, especially in phobia treatment.

Being able to exchange the real-world based, physical stimuli that causes fear in patients with it’s digital representation, and still receive positive, comparable to the *in vivo* approach results, is an option that therapists found intriguing. Psychological treatments are never easy, no matter whether they originate in behavioural science, cognitive approaches or are psychoanalysis based. In phobias’ case, ever since the behavioural therapy has been established it became the “go-to” solution, and in many cases, bar some fine-tuning details, the subject of phobia treatment problem was considered as solved.

Real life practice paints a slightly different picture. As it was mentioned in previous chapters, *in vivo* exposure, a method during which patients are slowly and steadily, gradually exposed to the stimuli they fear, treads a very thin line between helping and scaring patients even further. Cautious approach is required, careful observation and monitoring of patient’s reactions, so that progress is made without causing further mental distress. This makes the low treatment seek rate and a very high drop-out rate not surprising, and results in phobias still being very much present and common in our society, despite the cure being readily available.

Augmented Reality offers an alternative solution.

Patients, while still confronted with the feared stimuli as per the exposure therapy requirements, they confront the digital representation of it, placed in a real-world situation. Augmented Reality based approach offers the comfort of facing a virtual stimulus, while eliciting the response required for the therapy to work. The placement of the stimulus in the real-world context, as opposed to the full virtual approach, creates more intimate, easier to understand environment. While the stimuli are still virtual, the real world context makes it even easier for patients to translate the results of the therapy into their everyday environment.

Arachnophobia and fear of cockroaches have been in the research focus for this method.²⁷ Whether the method of administration is projection based²⁸, or as a serious game on a mobile phone²⁹, results remain promising, mirroring those achieved by Virtual Reality and those of traditional *in vivo* exposure treatments.

2.2.3 Importance of Self-Motion

Although at the recent level of study it is still unclear what the origins of acrophobia are and why it develops, certain studies shone some light on the problem. Studies with small children showed that the fear of heights may develop around the beginning of the self-locomotion (crawling) stage in children's development.³⁰ While retaining a certain awareness of dangers connected with heights is healthy, one of the possible explanations, however uncertain, is that after the initial learning process and natural overcoming the fear by exposure, practice, etc., those who for whatever reason did not may experience fear of heights in adult life.³¹

Study by Coelho, Santos et al.³² found the correlation between experiencing acrophobia and self-motion plays important role, especially in the virtual reality-based environment. While increasing and decreasing height of the visualisation presented to patients is important, their anxiety levels are significantly higher when test subject were given the opportunity to move laterally at a certain height.

Additionally, it is worth mentioning that an early study by Brandt et al.³³ suggests that the fear of height may be a by-product of conflict between vision, somatosensory and vestibular senses, not unlike the motion sickness.

2.3 Serious Games

Times when game - video and computer games, to be exact - have been considered only as a mindless, useless and time-wasting activity that had degenerative influence on players are slowly gone. Many independent researches done on the subject show the public other side of gaming and games.

Military and even health training centres have started using games - serious games - as a platform and tool for simulations and training, with positive results. In fields of psychology and therapy, use of games may be the most controversial yet. Partly, given to the opinion that games can awaken and influence aggressive behaviours in children. Partly, because game addiction is a serious problem, although not so widely discussed. And yet, despite all that negative examples, games can be a positive influence - smartly designed, can become a tool in psychotherapy, especially for younger people.

SPARX (Smart, Positive, Active, Realistic, X-factor thoughts)³⁴ is a game addressed to adolescents, who seek help for depression. It is designed as a virtual game that is intended to be used as a self-help tool - rationale behind this arrangement being the reluctance of young people to seek help, shortages of workforce, as well as costs that are decisively lower in case of computerised therapy comparing to the traditional one. The concept of this virtual game, based in a fantasy-like world, lies in a Cognitive-Behavioural Therapy (CBT) for clinically significant depression. The Player's task is to undergo series of challenges scattered over 7 sequential levels of the game, and by doing so free the fantasy world of GNATs (Gloomy Negative Automatic Thoughts). Each level starts and end with a guide, whose role is to provide context for the level, provide information, measure mood and set real-life challenges for the Player as a homework to complete.

Game, delivered on a CD-ROM, runs on PC and is supplemented by a paper notebook with summaries and empty spaces for the Player to fill out.

Effectiveness of the game have been tested in a trial with over 300 participants, aged 12-19, from 24 therapy enters in new Zealand. Results shown that this form of treatment is "at least as good as treatment as usual in primary healthcare settings in New Zealand and is a potentially a useful treatment". It is also suggested it could be used as a first step in managing depression in the that age group. And while research done so far, although extensive, does not cover all the possibilities and does not answer all the question about computerised therapy, it can be argued that it carries huge potential in treatment and in approach to mental illnesses,

and not only.

Rainbow SPARX³⁵ have been designed for adolescents with depressive symptoms who belong to the sexual minority youth (in other words, those who are sexually attracted to the same sex, both sexes, or questioning their sexuality). In this customised version of SPARX 5.9% of the overall script for the game, as well as appearance of the game have been altered to appeal to the group - changes that were made with consultation to the sexual minority adolescents. Research had shown that while some disadvantages need to be considered, overall the game and treatment have been well received, with depression ratings improving post-trial and at 3-month follow-up.

It is worth noting that research among mental health professionals in Sweden have been conducted in order to see what attitudes professionals working with traditional therapy methods have towards computerised therapies for children and adolescents. Although majority of clinicians had no previous experience nor knowledge about cCBT, attitudes were positive. Results had shown that mental health professionals were open to the concept, believed it to be as effective as prevention programs and suitable for mild to moderate cases. On the other hand the need of professional supervision was stressed and the idea of such services available online have not been accepted as a viable solution. Face-to-face treatment was still judged as preferable option. Limitation of the study however point out that results should be interpreted with caution.³⁶ Survey on a larger scale with wider demographics should be conducted to get more relatable data, although the novelty of the method and lack of long-term follow-up researches among test subjects, as well as lack of previous experience with computerised therapy can be considered as the main factors that decided on the tentatively positive but cautious responses. These results certainly line up with author's own ethnography among professionals. At this point in the research, when idea of computerised therapy is still new, cautious positive attitude among professionals is probably the best possible result. It means that while they have some concerns and do not blindly trust whatever idea non-professionals come up with, at the same time, they are open and willing to put it into test, possibly implement in their own work, if it turns out to bring positive results and help patients.

Other computerised Cognitive-Behavioural Therapy programs for young people with depression are "Stressbusters", "Master Your Mood Online", "CATCH-IT", "MoodGym" just to name a few. Alongside the controlled studies, where New Media and technologies are designed for purpose of that particular research,

self-help based forms of psychological and therapeutical help and therapy are available on the market. Mostly in form of smartphone applications (apps), but some websites also offer their services in the same spirit as the control research studies - to deliver an alternative form of help to those for who going for the traditional form of therapy sessions is not an option. Cognitive Behavioural Therapy (CBT) is the one targeted more often in case of apps, with websites that target relaxation methods. From white noise generators that are supposed to help in focus and relaxation, through websites that offer a way to safely write down one's thoughts just to see them being visually destroyed - websites offer services of this kind.

There are also services and applications not directly connected with therapy - especially acrophobia therapy, that at first glance might be considered as a therapeutic tools. In reality, they are not - and although it's not impossible for an individual to find some level of comfort in them, for majority they are far from therapeutic. Entertaining and exciting? Yes, very much so. But suitable for therapy they are not.

One of such examples are 360° videos largely available on the Internet. As this research also focuses on using videos for therapy (which can be read in following chapters on the subject), videos used in this research are highly specific and follow points taken from exposure and desensitisation therapy methods. They were planned and shot with therapy in mind, unlike the videos available in the Web which are posted for entertainment and to shock the viewer. Such goals cannot be further from therapeutic goals which are to ease the viewer as gently as possible into the situation that causes them fear. In other words, A First-Person View 360° video of someone jumping from a cliff with a parachute is sure to bring some entertainment to a regular viewer, maybe even give them the adrenaline rush or convince them to give such activity a try. For a viewer with acrophobia video like this is sure to scare them and push even more into the fear and deepen their phobia. In acute cases it might even trigger panic attack and become a serious danger to viewers life and health.

Notes

- 1 (Association 2013)
- 2 (Organization 2015)
- 3 (Association 2013)

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- 4 (Association 2013)
 - 5 (Menzies 1997)
 - 6 (Ost 1996)
 - 7 (Ost 1989)
 - 8 (Zlomke and Davis 2008)
 - 9 (Zlomke and Davis 2008)
 - 10 (Ost 1989)
 - 11 (Zlomke and Davis 2008)
 - 12 (Ost 1989)
 - 13 (Antony, Orsillo and Roemer 2002)
 - 14 (Muhlberger, Herrmann, Wiedermann, Ellgring and Pauli 2001)
 - 15 (Emmelkamp, Krijn, Hulsbosch, de Vries, Schuemie and van der Mast 2002)
 - 16 (Rothbaum, Hodges, Smith, Lee and Price 2000)
 - 17 (Wiederhold, Jang, Gevirtz, Kim, Kim and Wiederhold 2002)
 - 18 (Garcia-Palacios, Hoffman, Carlin, Furness and Botella 2002)
 - 19 (Krijn, Emmelkamp, Biemond, de Wilde de Ligny, Schuemie and van der Mast 2004)
 - 20 (Muhlberger, Wiedermann and Pauli 2003)
 - 21 (Wiederhold et al. 2002)
 - 22 (Rothbaum, Hodges, Alarcon, Ready, Shahar and et al. 1999)
 - 23 (Roy 2003)
 - 24 (Garcia, Hoffman, See, Tsai and Botella 2001)
 - 25 (Choy, Fyer and Lipsitz 2007)
 - 26 (Carmigniani and Furht 2011)
 - 27 (Botella, Breton-Lopez, Quero, Banos and Garcia-Palacios 2010)
 - 28 (Wrzesien, Botella, Breton-Lopez, Rio Gonzalez, Burkhardt, Alcaniz and Perez-Ara 2015)
 - 29 (Botella, Breton-Lopez, Quero, Banos, Garcia-Palacios, Zaragoza and Alcaniz 2011)
 - 30 (Scarr and Salapatek 1970)
 - 31 (Coelho, Waters, Hine and Wallis 2009)
 - 32 (Coelho, Santos, Silva, Tichoon, Hine and Wallis 2008)
 - 33 (Brandt, Arnold, Bles and Kapteyn 1980)
 - 34 (Merry, Stasis, Shepherd, Frampton, Fleming and Lucassen 2012)
 - 35 (Lucassen, Merry, Hatcher and Frampton 2015)
 - 36 (Vigerland, Ljotsson, Gustafsson, Hagert, Thulin, Andersson and Serlachius 2014)

Chapter 3

Design Concept

3.1 Introduction

3.1.1 Philosophy and Vision

As the example of phobias shows, availability of a working and successful method of therapy does not mean the method will be accepted and used by people requiring help with the problem the therapy was made for. It shows that phobias, although as it was already mentioned in previous chapters, are very much curable by a range of therapies, including *in vivo* exposure therapy and desensitisation just to name a few, and yet, people experiencing them are not too keen on looking for help. It's easier for them to look for ways of extreme avoidance going as far as pushing them to rearrange their whole daily lives than to undergo the therapy. Clearly, that situation shows that an alternative ways of approaching the therapy itself should be found. After all, even when available, the cure itself is useless if it is not used.

The author believes that everyone should be able to undergo a therapy that would help them with their fears.

Whether the reason phobic people are not under therapist's counsel is because of financial reasons, their reluctance to face their fears, work-related responsibilities keep them too busy to commit to scheduled therapy, they experience feelings of shame derived from subjective feelings of being "not normal" - whatever their reasons are, I strongly believe an alternative solutions should be found, designed and widely available so that all those people have an alternative option and can find relief.

An available and accessible, self-administered, doctor approved painkiller that will make the phobia treatment fun and interesting.

Technology, and Internet in particular, have influenced our lives in ways we are

just starting to understand. Ready access to information that were not available in the last decade is just under the tip of our fingers. And that - the access - has an impact on every aspect of our lives. It changes the way we shop, the way we handle our social lives, the way we plan. It also changes the way we study, how we educate ourselves, how aware we are of what is going on with the world we live in. We actively look for information ranging from “how to tie a tie” and “how to whistle”¹, through “what is gluten” and “what is bitcoin”² to pregnancy, influenza and diabetes symptoms. ³ Shelves in bookstores are full of self-guides, Do-It-Yourself (DIY) positions on almost every topic, from self-growth through house building to natural medications. Popularity of the on-demand options given by TV providers is also fitting into the trend. The trend that tells an interesting story about how we like to be in charge. How much it means to be self-sufficient, to have (to some extend, at least) control over our everyday lives.

It is safe to say that the same trend applies to therapy, as well. One of the most common reasons of why therapies with professionals are not enough for many people, apart from the financial burden they carry, is either that the hours and frequency cannot be reconciled with work or the waiting lists for appointments are long and discouraging. Nevertheless the discussion on how living the “instant” life taught us it is possible to have things here and now, immediately, without need for any waiting, and how that might be one of the reasons the current, traditional therapy system is no longer satisfactory is not the topic of this thesis. Neither is evaluating it in any way.

Finding a way to deliver the help, with consideration to how people think and live their lives in these times? Yes, and author’s solution - consequently the design itself - will be discussed in further chapters.

3.1.2 Ethnography and Target Persona

Ethnography

In preparation to the research the author conducted series of informal interviews with people who admitted to being afraid of heights. The level of their fear have not been tested nor measured - what counted was the opinion they had about their own state. While this may seem subjective, fears are a subjective and greatly increased response to a stimuli in the first place. For the purpose of this survey, it was more than enough. Transcripts from the informal interviews can be found in the Appendix.

3 people have been interviewed over video conferences between May 2nd and 4th 2015. Age of interviewees ranged from 25-56 years old, two women and one man. The informal interviews' subject was their phobia and how it influences their daily lives. None of the interviewees have ever received any professional help with managing their fear. None of them remembered when or how the phobia started - as far as they could tell, it wasn't triggered by any accident or other traumatic experience, or if it was, the situation had to take place very early in their life. Early enough so they couldn't retain memory of it.

For one of the interviewees, 56 years old woman, a Housewife, phobia is strong enough to make it impossible for her to clean windows on the second floor of the building. She is also vary of escalators and elevators. She is able to face a situation involving heights if there's no other option left, but it takes a lot out of her to face the challenge, and leaves her with a headache for the rest of the day. The 31 years old man have been very reluctant to admit to having fear of heights, even though when asked to describe situations involving heights it was clear that facing them is for him quite difficult. He shared a story about a trip to mountainside where him and his colleagues had to cross a very thin bridge hung over a river to get to the other side. Although he managed to cross it, it made him violently vomit once he was on the other side, and ever since then he never agrees to participate in trips that would involve crossing mountain bridges or rivers. 25 years old woman said she grew up with the fear of heights and that it has always been part of her life. No one ever suggested to her it might be something that needs or could be cured. She had a very strong recollection of a history from Middle-School when during Physical Education class she and her classmates had to climb a ladder as an exercise. She couldn't do it and had spend the rest of the lesson crying. As she couldn't give the teacher any explanation why she refused to complete the exercise, and no encouragement from the teacher's side could convince her to try the climbing, it ended up being the only failed mark she received that year.

Two out of three interviewees admitted that while they don't have time or the courage to seek for help with the acrophobia, if there was a way they could treat it at home, in their free time, they would use it.

Target Persona

For the purpose of the design concept, basing on profiles gathered during the ethnography and literature research on the topic, the following Target Persona have been created.

Meet Jake - the model Target Persona for the concept. He is 27 years old young professional working in a corporate firm. He enjoys nature, cycling, fast cars and during free time likes to play video games. He is also mildly afraid of heights, though no one apart from his closest family knows about it. He claims he learned to live with this small inconvenience and accepted that there's nothing he can do about it. And yet his daily life doesn't make it easy of him to forget about the phobia.

His office is at 27th floor of a building and the open space design of the place makes it very difficult for Jake to ignore window panels that cover whole wall of the office. Senior staff in his department have desks closer to the windows, and since Jake is due a promotion, instead of being happy he's dreading the moment he will be told to change desks and move closer to windows. Recently he has been late to work few times because the only elevator in the building without glass walls was broken, and Jake was forced to climb the stairs up to the 27th floor - there was no way he would ride different elevator, with glass panels.

Jake's friends are planning a trip to the mountains this weekend, complete with a challenging hike along the upper part of a 75m high gorge. Even though Jake enjoys hiking and, especially after taxing week at work, he would like to join them very much - the gorge is something he knows he will not be able to face without his friends knowing about his "weakness". He already informed his friends that unfortunately, due to hectic deadlines at work he will be forced to work during that weekend and therefore regretfully has to decline the invitation. Last month he also declined participation in a trip to an amusement park - rollercoasters, ferris wheels are not something he is comfortable with.

When asked about therapy to get rid of the fear, he claims it is not a big deal, that he learned to work around the phobia just fine. Besides, with how long it takes him to commute to work, the fact that he works typically 8-10 hours daily, he simply has no time for therapies.

For people like Jake, for all those who have no time or are uncomfortable with visiting psychologist's office, the design for this concept have been researched and created.

3.1.3 Design Concept

Concept of this design is derived from the psychological theory of Cognitive-Behavioural Therapy (CBT), computerised Cognitive-Behavioural Therapy (cCBT), *in vivo* exposure therapy, Virtual Reality Exposure Therapy (VRET). Taking into account research done on each of those subjects, as well as basing on ethnography research done pre-design, idea of an alternative therapy as well as a service widely available is proposed as an answer.

As a rule, people are highly reluctant to admit they may need psychological help. Suffering from this type of disadvantage is still considered as a stigma by majority, as a factor that completely and irreversibly discounts people from functioning as a full member of society. The negative label people who needed to undergo psychological or psychiatrists therapy carry is something that, when out in the open, is strong enough to disrupt relationships a person has already established and highly influence future ones. Bullying in school, having problems with finding employment due to discrimination and simple lack of knowledge from the side of potential employers on how to handle particular case of a person with history in therapy, are just few examples on why many are highly reluctant to seek help.

While the situation is already slowly changing for better and on top of having the need of psychological support the reason why it is needed is also being considered, the situation where people refuse to undergo a therapy is still far from ideal. Especially with other factors coming into play in recent decades and changes of lifestyle in modern societies. Economy, personal finances and costs of medical care, lack of enough budget to provide in local clinics the number of specialists who could manage the number of patients and clients in a acceptable and timely manner. Thanks to the rapid technology development some of the problems may soon be solved, though. CCBT, as discussed in previous chapter, has a high change of becoming an alternative to traditional forms of therapy. Virtual Reality, Augmented Reality, serious games, while are not something older generations accept easily, are a valid and viable option of reaching out to the younger generations - to those who grew up with video games, with virtual realities, and to those who speak and understand intuitively the language of technology. While professionals are cautious⁴ about usage of such methods, current research results show promise in the field, and open a previously unknown path in future of therapy.

Various phobia treatment methods have been tested and researched in recent

years - and yet, the author believes that the full potential of using sources available have yet to be reached. That, while everything that has been done so far to use technology in therapy is remarkable and invaluable for further research, more can be and should be done to reach out to wider demographic of the targeted group.

It is a good thing to have a VR-based treatment available at a clinic in a psychologist's office. But it does not really help the majority who refuses to make the appointment in the first place. It is a good thing to have an AR application for phobia treatment, but no build-in interaction modules, no ways of responding to the stimuli inside the AR content, being left to passively observe the content is not something that will hold one's interest for long, especially in case of children and adolescents. And while this group may feel perfectly comfortable in a fully virtual setting, for those who are not gamers, who simply do not play video games, Virtual Reality holds little to none advantages. In other words, situations that gamers immediately grasp due to familiarity with virtual content and the ways such environments work, non-games find confusing and discouraging. And while it is not such big issue when game is serving as a leisure activity (for example, for a grandson who teaches grandmother how to play his favourite game), if the content is tackling problems like a phobia and is designed to be therapeutical, any additional issues should be minimised to avoid distressing players even further.

The concept of this design is addressed to those people who, for whatever reason, are unable or refuse to undergo therapy under professional supervision. As such, it has been thought out to be accessible, possible to use without help of other people, and didn't require extensive preparations. Something that could be easily used after work, or in the morning before going to class. Something that could be used inside one's apartment, or - if that was preferable - even taken outside.

A tool and method that wouldn't interfere with one's lifestyle - but rather seamless fit into it.

To achieve these goals and address those points, various designs have been implemented and tested. Further chapters present the progress and development of the concept, leading to the final design.

3.2 Preliminary Designs

Having an idea, even a concept is one thing. Finding the best way to translate it into technology and deliver to potential users, is a whole another matter. Sometimes the answer is quite straight-forward. Sometimes, finding the best solution requires many attempts. And sometimes the idea, the concept itself is found when another idea is pursued.

During this project all those scenarios have taken place. Solutions have been designed and discarded, build and tested and improved. The final one, proposed for this research, have been described in the following chapters.

3.2.1 Initial Designs

Drones

The first solution for the concept for acrophobia therapy came from the initial idea of a First Person View (FPV) drone racing game. During tests of that concept, the author noticed reluctance from the side of some potential users to try out the system, and the fear of heights turned out to be the reason behind their hesitation and in some cases even an outright refusal to participate. This reaction prompted the author to look into ways how drones, and more specifically the FPV can be used in therapy of this phobia.

To test how the First-Person View could be used for therapy, the following combination has been proposed (Figure 3.1):

- Parrot AR drone with a build-in camera;
- x-Box controller;
- Oculus Rift for the First Person View (FPV) experience;

The following combination was made possible thanks to solution provided by Matthias Weise⁵, under GNU Lesser General Public License (LGPL) version 3 or later.⁶

The interface for this solution have been chosen as one of the most suitable options for the purpose of the research and validating the concept. It's design directly addressed most of the issues the testings done for the drone racing project uncovered, mainly the need of some markings on the surface for controller. The



Figure 3.1: First proposal set-up for the concept.

flat surface of a smartphone has proven to be challenging to use, especially for beginner drone users, and particularly to even larger group, if they were wearing the Head-Mounted Display (HMD). As the surface of smartphone is relatively small, those users who were unfamiliar with the interface of the drone controlling app had problems with controlling the quadcopter, more when because of HMD they could not simply look down at their hands and assess the position of areas where controlling buttons have been placed in the app. X-Box controller design solved the issue by allowing potential users to navigate the position of controlling buttons by touch (Figure 3.2).

Moreover, interesting is the apparent users' need of a hand-held controlling device. Decision to use the x-Box controller have been made based on input and discussions with people afraid of heights, among who most were not overly familiar with using technologies proposed in this concept - drones and HMDs. While it certainly would be possible to control the drone with head movements (especially that the HMD of choice have been Oculus Rift), responses from potential users prevented the author from pursuing this direction. Reasons for such decision were simple and convincing.

Head movement control requires concentration and focus, nerves of steel, especially with a tool like a drone that is very prone to be easily swayed, too fast and too responsive. When the project is designed to make people face their own fears, to expect they won't be affected by the therapy process and that no involuntary head movements will occur is not realistic. Having controllers in hands is much more natural in the sense that it is something we are already doing on a daily

basis. Thanks to smartphones, for example, we are used to manual control. At this stage of the project, facing someone with a new type of therapy and new control system for it seemed to be simply too much. Nonetheless, the idea has been noted for consideration and implemented in further research. More on the subject can be found in the following chapters.



Figure 3.2: X-Box controlling the drone.

In theory, it seemed like a direction worth pursuing (Table 3.3).

Drones with cameras, either mounted or build-in that had the capabilities of connecting the video feed from them in real-time to the Head-Mounted Display users would wear during the flight, gave an unique opportunity for user to be able to experience the feeling of flying, of being up in the air above the ground without the need of physically being in a anxiety triggering location. While safe on the ground, the user wearing HMD would have full control over the drone and the flight - ascend and descend, speed of all the motions, height up to which user would feel comfortable with reaching, as well as time spend in the air.

On the other hand, disadvantages of such set-up were, as it became clear in the designing process, quite serious and impossible to overlook. First and foremost are the location issues. To fly drones, especially those equipped with cameras capable of transmitting video feed to HMD and user in real-time are big. Big enough to make it close to impossible, and most definitely inadvisable, to fly them inside one's house or apartment. To take the drone outside, while generally fine in theory, requires many preparations pre-flight. Good weather conditions for flying are imperative in therapy flight - rain and snow, as well as strong wind make it impossible to fly. Flying at night requires finding a well-lit area, and flying in

a too bright sunlight affects cameras and the view user receives may be painful for eyes. Connected with location are Policy regulations about flying unmanned vehicles - restrictions and bans of usage of such tools, drones and quadcopters included, need to be thoroughly checked before taking the drone outside for a flight, especially if the flight would take place in a public area, like a park or garden.

Last but not least, safety of those around needs to be taken into consideration for each singular flight. loosing control over the machine is easy, and if the area chosen for flight is full of people - even those in passing - situation like this can lead to serious injuries, not to mention cause additional stress for the person controlling the machine - who, according to this concept design, would be already under great stress by undergoing a therapy during the flight.

Finding a location that satisfies all those requirements, while not impossible, is very difficult. Moreover all the listed disadvantages are in a conflict with the main purpose of this project - finding a method that would be problematic as little as possible, which acrophobic people could use any time, anywhere, and therefore this set-up had to be rethought and redesigned.

Advantages	Disadvantages
Feeling of flying while physically remaining safe on the ground.	Weather conditions - not every day is safe to fly.
User having the full control over the speed of flight, of ascent and descend, and the reached height.	Location issues - space required to fly.
	Policy regulations over flight control in locations.

Figure 3.3: Advantages and Disadvantages. Drone set-up.

Video Feed

While drone and flying on a location may be problematic, the advantages of having a view from a real location - not computer generated, but someplace users can easily relate to is a big advantage of the concept. *TamaFly* - uses a prerecorded footage captured by drone with a camera. This set-up allows to keep the idea of setting the game visually in the real world context and maximising the realness of the experience, while at the same time erasing the issues with restrictions toward flying in public locations.

This set-up has been proposed to test how users with fear of heights react to this environment, and whether a video of a existing location is a suitable tool in acrophobia therapy.

Simple video footage from drone racing concept testing, shot back when flying was yet to be restricted, have been used. With a code that allowed to control the video feed (pause and play options, activated by pressing the Space and Return keys on keyboard), a simple application have been made to validate the idea of using prerecorded material (Figure 3.4). For immersion and First-Person View experience, Head-Mounted Display (HMD) have been implemented (Figure 3.5).



Figure 3.4: Video Prototype.

As it has been mentioned, in phobia therapy, whether it is *in vivo* exposure or virtual based, the point is to elicit an emotional response from user. In other words, the user must feel some level of fear and anxiety during the session, otherwise the therapeutical value will be null. Consciously stepping out of your comfort zone into territory that is marked as dangerous in phobic person's mind is when the process of desensitisation happens. For any prototype designated to serve as a therapy tool it is therefore crucial to determine whether the design is capable of making the users feel scared.

Having this in mind, *TamaFly* have been thought out to elicit in acrophobic users low level of anxiety and apprehension, while simultaneously giving the user the power to control (to a certain point) the situation he or she is in - an option to freely pause and play the recording, whenever they feel anxiety building up to an uncomfortable level. There is no way to rewind the video however, and it is



Figure 3.5: Video prototype. HMD view.

intentional, as it lines up with therapy prerogatives and game design.

As the goal of this thesis is to find a design for games that could help with acrophobia, allowing users to backtrack is not something that works well for game scenarios. Seeing how users respond to this arrangement is one of the points of focus of the following user study for this solution.

3.2.2 User Study

The User Study for *TamaFly*, have been conducted in order to test how the concept of a prerecorded flight is perceived and received by users. Taking from the rationale mentioned in Chapter 3 that led to construction of this work, this User Study have been designed to gather informations from users about the general impression they had on the simulation and usage of video footage in therapy for acrophobia.

Participants

6 participants have underwent the user study (Table 3.1). Before the Study, they were asked if they are afraid of heights and, if they answered affirmative, they were informed that the simulation they are about to take part in may be a potential trigger. Any history of panic attack caused by situation involving heights was the faster that excluded volunteers from participation. From 9 volunteers, 6 passed the preliminary selection and have agreed to take part in the User Study. From the 3 who were not included, 1 mentioned history of panic attacks and therefore for safety reasons had to be excluded; 2 shared they were too afraid of facing their fear and would prefer to avoid any situations involving heights.

Table 3.1: Participants of the TamaFly simulation.

	GROUP	AGE	SEX
User1A	Acrophobic	32	M
User2A	Acrophobic	25	F
User3A	Acrophobic	27	F
User4A	Acrophobic	46	F
User1N	Non-Acrophobic	23	M
User2N	Non-Acrophobic	26	F

The final group of 6 consisted of 4 participants with self-diagnosed low to moderate level of acrophobia and 2 without the fear of heights. Participants without the phobia have been asked to participate in the user study in order to see if a simulation like this can have a value for a group other than those with fear of heights.

Age of participant ranges from 23-46 years old. Both groups consisted of a random sample of men and woman of various nationalities and background education.

Procedure

Users have been seated in front of a computer. The content of the simulation have been explained and they were informed about the option to pause and un-pause the recording they were about to view, and that they could use it whenever they thought they needed to or wanted to. After that, participants were asked to wear the Head-Mounted Display (HMD) and once they were comfortable, the simulation have been launched.

The simulation video have been identical for each participant. It was approximately 3 minutes long and have been played once for each participant. It consisted of a First-Person View flight footage captured by drone, shot during concept testing done on July 2014, performed at Tamagawa Park, Kanagawa Prefecture in Japan. During the flight experience, participants could freely pause and un-play the video.

After completing viewing the simulation, participant have been informally

interviewed and asked about feedback on the simulation and the experience.

User Study Results

Preliminary testings of *TamaFly*, have shown that the prerecorded material can be used in building a program that would serve as a therapy for people with acrophobia.

As it was explained previously, for a method to be successful, response in form of fear, anxiety or nervousness upon contact with the stimuli needs to be elicited. *TamaFly*, albeit simple, have managed to get that response from 4 out of 6 participants: in 3 out of 4 in the group with fear of heights, and 1 out of 2 in the group without acrophobia (Figure 3.6).

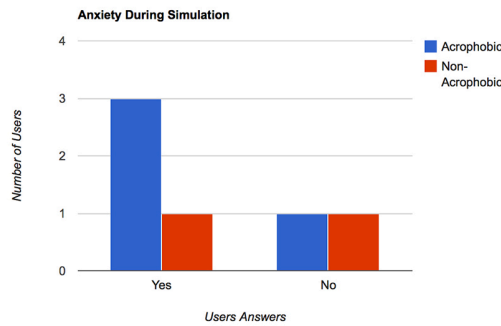


Figure 3.6: Anxiety during the TamaFly simulation. Users' Responses.

Pause function have been used by the majority of users. One participant from the acrophobic group refrained from using the pause option. The *TamaFly* simulator did not manage to elicit fear response in this user. Reasons for not using the pause option were that the participant enjoyed the footage and did not want to pause it. Similar reasons were given by the Non-Acrophobic group of users, although they did not refrain from using the pause option - they enjoyed the experience and found the pause option useful to admire the scenery captured in the footage (Figure 3.7 and Table 3.2).

It is important to note that almost all participants of the User Study admitted to experiencing the motion sickness, or dizziness during the simulation. In neither case it was strong enough to require stopping the simulation (Figure 3.8).

TamaFly has been build using a regular video file. During the simulation, users wearing the HMD were repeatedly trying to look around and control the scene by

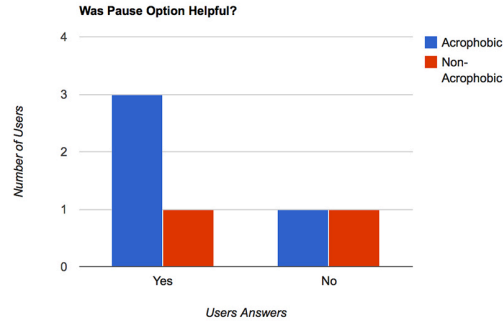


Figure 3.7: Pause function during the TamaFly simulation. Users' Responses.

Table 3.2: Use of the pause function during the TamaFly simulation for Acrophobic (A) and Non-Acrophobic (N) Users.

Users	Use of Pause
User1A	2 times
User2A	1 time
User3A	3 times
User4A	0 times
User1N	5 times
User2N	2 times

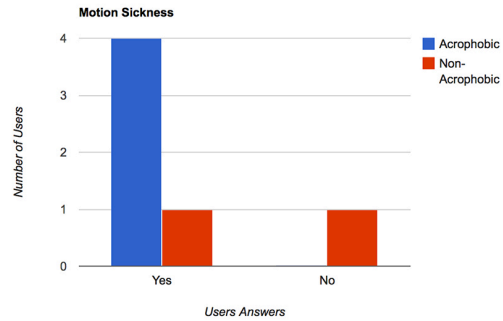


Figure 3.8: Motion Sickness during the TamaFly simulation. Users' Responses.

Table 3.3: User Experience feedback for the TamaFly simulation.

Users	Experience
User1A	rather positive
User2A	indifferent
User3A	rather positive
User4A	positive
User1N	indifferent
User2N	positive

themselves. As the video used had no 360 degree capabilities, all the users - as reported in the informal interview after simulation - were feeling disappointed and even confused by the lack of this type of interaction. While discarded in case of a real-time flight with drone, head movement control and giving the user ability to look around on their own proved to be an expected function in case of using a video footage.

General opinion on the experience of the *TamaFly* simulation users expressed with a 5-point scale: negative; rather negative; indifferent; rather positive; positive. No negative opinions have been received (Table 3.3).

Notes

- 1 (Waxman 2013)
- 2 (Carbone 2013)
- 3 (Sifferlin 2013)
- 4 Rightfully, in author's personal opinion - as new media in therapy are a *novum* in the field, and they all require much more attention and research, especially on the long-term effects, to be welcomed in the therapy canon without reservations. Also, it needs to be pointed out, that along with technological development and usage of technologies in psychotherapy, professionals should also become medially literate enough to understand and be able to fairly judge the innovations proposed.
- 5 Matthias Weise: matthiasweise@online.de, <https://github.com/scopus777/RiftDrone>
- 6 GNU Lesser General Public License: <http://www.gnu.org/licenses/lgpl.html>

Chapter 4

The Final Design

Literature research done on the subject of acrophobia treatment and Computerised Cognitive-behavioural Therapy (CCBT), ethnography and results of user tests done on the initial designs led to creating the final system that answers the best to the problem posed for this research: how to give people with fear of heights opportunity to receive therapy without disrupting their everyday lives.

The answer is a 360° video, shot according to therapy guidelines which were also constructed during the research, that focus on the therapeutic values; a player capable of playing those videos and a Head-Mounted Display (HMD) for the immersive factor. Previously discarded head movement that comes naturally when interacting with a scenery has been used for this system.

User, wearing the HMD can freely look around the captured 360° scene in a therapeutic video clip. Immersive factor from wearing the HMD as well as the natural movement of views head and whole body to see the scene is considered as a substitute to physically being in a fear-triggering location. User, being safe in their chosen place - at home, in a park, in bed, etc. can transport themselves into a place that normally causes them discomfort and triggers their anxiety. It is up to the user to decide how long they will remain immersed in the scene, as only the User knows where their limits lie.

Using a video footage offers an option that have yet to be implemented and researched before - where the prerecorded footage from a real location gives even stronger, compared to virtual reality based simulations - sense of being “there”, in the actual existing location, of virtually transporting yourself in a real place. Both Augmented Reality-based and video footage-based solutions come from the same concept idea of maximising the realism of the game and making the transition from a virtual therapy (that has been tested in papers discussed) to the real world more seamless.

4.1 Points for Consideration

Like in many aspects in life, intent is what matters the most and what makes all the difference. Similarly to art therapy, in phobia treatments the mindset of the person undergoing the therapy and going through the required motions and tasks is what distinguishes therapeutical approach from any other activity.

In therapy it is imperative for phobic person to interact with whatever medium presented and be aware that this activity has a therapeutic purpose and is intended to address the problem the person has. From the point of view of those who undergo a therapy, being aware and informed about the proceedings and predicted outcome is not only ethical, but also an important step to mentally prepare patient for the difficult and stressful situation they are about to face. Leaving out information like this can cause unwanted situations, ranging from therapy being simply ineffective to - especially in case of phobia treatments - scaring participants and instead of lessening, deepening their fears and anxiety.

Corresponding to this argument is also the will of participation in therapy from the users' side. Even when informed and educated about therapy proceedings, when a person refuses to fully engage and participate in therapy, even the best and most effective methods will fail. Willingness to participate and use the method alongside with genially wanting to be helped, to be cured are a crucial factor in psychological treatment. In other words, unlike in medical therapies and treatments with pharmaceutic input, in psychotherapy it is impossible to treat someone who doesn't want to be treated. Realising that you have a problem and admitting to yourself that you have it, that it negatively affects your life are the first and most important steps on the way to getting better. They cannot be forced and one of the reasons regular therapies last that long is precisely because of the time people usually need to reach this point of acceptance of their own weakness, and gather enough will and strength to decide to make a change in their life.

It is also important to emphasise the level of fear therapy is aiming to elicit.

As a rule, for exposure therapy a certain level of anxiety and fear should be elicited during the session. It is necessary for the patient to connect with the fear, acknowledge it, and then learn how to cope with it. That being said, there is a fine line between eliciting a fear response and shocking the user, and the latter should be avoided by all costs.

There are many services and games on the market which goal is to simply shock the user. Give them the rush of adrenaline, rattle their minds. From amusement

parks' attractions to games and applications, the range of such services is truly impressive. Yet none of them is suitable for therapy. In other words, phobic people may straight out refuse to play some of the games like, for example "VR Jump Tour"¹ (acrophobia), "Slender Game"² (nyctophobia - fear of dark) or ride a rollercoaster at amusement park (tachophobia - fear of speed). It is not uncommon for them to feel disturbed and uncomfortable after such activity, which may even add to their phobia instead of lessening it's symptoms.

While desensitisation therapy and exposure therapy does face people who undergo it with their fears, the approach is completely different. It is not about putting a person afraid of spiders in a room full of them - it's about starting from things as small as showing a picture of a spider first and once the person is ok with it, can look at the picture without experiencing fear, even take the picture in hands, therapist may move onto a physical representation of the spider, usually a toy. Step by step arachnophobic person get used to seeing the object of fear in a completely harmless environment and through the interaction with stimuli learns new sets of behavioural responses that once internalised will serve this person in a daily life in situations when he or she finds a spider in home.

4.2 The System

For the purpose of capturing the appropriate footage a 360° camera Ricoh Theta m15 have been used. For the aerial material, the camera has been strapped to a helium balloon (Figure 4.1) and (Figure 4.2), with a string attached at the bottom for controlling the flight. Otherwise, the camera has been held by the person shooting the video, or positioned on a tripod (Figure 4.3).

On the Participant's side, smartphone with an application capable of playing 360° videos is necessary. For immersion factor a Head-Mounted Display compatible with smartphone is used.

4.3 Video Guidelines

As it has been already mentioned in previous chapters any content or activity to be considered as therapeutical needs to fulfil certain points. For this method, similarly, it needs to be understood that not every and not all 360° videos all have therapeutic properties.

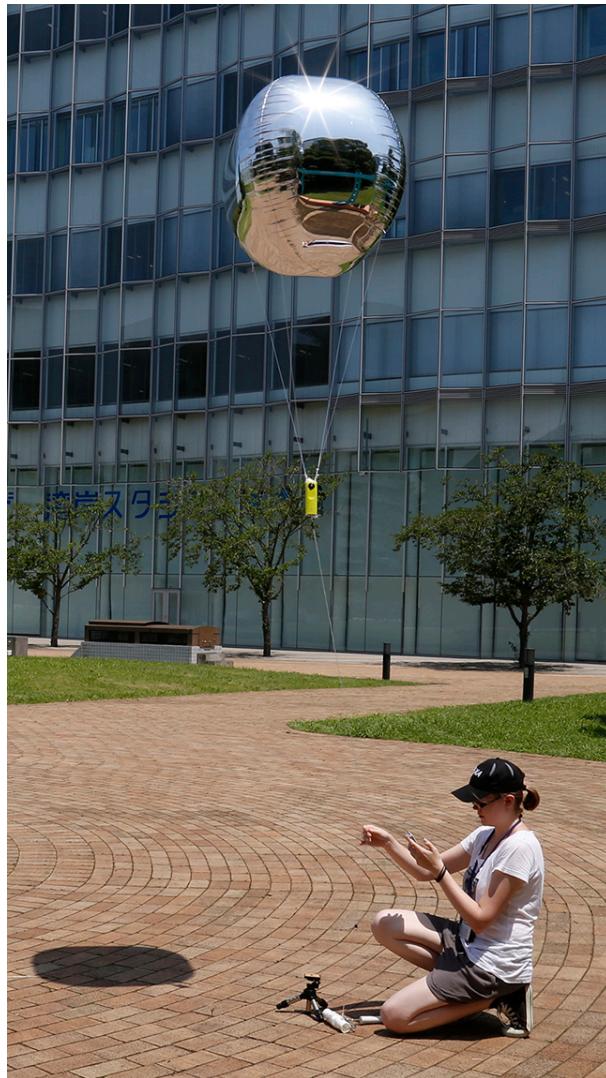


Figure 4.1: Set-up for aerial shots.



Figure 4.2: Setup for aerial shots. Close-up.



Figure 4.3: 360° camera on a tripod.

In the course of preparing this system various videos and capturing methods have been tested and the most promising results have been included in the User Study, which description can be found in the following chapter.

Acrophobia comes in many forms. People considered as acrophobic are very often triggered by different situation. Situations that have only one thing in common - in some way, they involve heights. As such, one and unified type of content to reach as many potential users as possible does not exist and is very difficult, if not simply impossible to design. Decisions have to be made which group and which type of fear of heights is being targeted in this project, and based on that, appropriate content needed to be prepared.

For this research the target group are acrophobic people triggered by motion of ascend - of going up, as well as those afraid of suspension - remaining motionless in a position above the ground. Content for the User Study therefore has been prepared with those two points in mind, and various scenarios have been explored in order to find the best solutions for video capturing that would address these points and allowed to create a therapeutic video content.

Video Length

Therapeutic videos work best when are 1-2 minutes long. During the viewing, the loop option in the player allows the user to review the scene multiple times without the need of pulling out of the scene to hit the replay button.

Videos shorter than 1 minute, when looped, cause discomfort to the user and are more likely to startle them by rewinding to the beginning. Videos longer than 2 minutes, tend to make the user pull out without finishing watching the full video length.

Camera Movement

During the video shooting camera movement around it's own axis should be avoided. Camera should be positioned facing the same direction through the whole duration of the clip shooting. Reason for this goes to the future viewer and his interaction with the video.

While watching the clip, user wears a HMD and at his or her own leisure turns his or hers head around in order to watch the whole scene in 360°. If, during the video shooting camera has been moving too much, the movement will be reflected in the final clip. The enforced horizontal movement will interfere with users' own

head movement. That could lead to nausea, dizziness and disrupt the feeling of being transported into the watched scene.

As it was mentioned in previous chapters, in CCBT self-motion of the user is found to be important in order to make the user feel as if they were part of the watched scene. Generally, in real world the view we see changes when we move our heads. Enforced movement caused by camera's tilt or turn disrupts the feeling and negates the immersion necessary for the therapy to work.

That being said, some camera movements are acceptable. Gentle sways and tilts in appropriate situation can add more realism to the captured scene. For example, when riding elevator or climbing stairs the movement we see is not smooth and seamless. Bounces and shakes are expected, and therefore in the video they are a welcomed addition.

Scenery and Location

Scenery and location of the therapeutic videos, additionally to showing a situation involving heights, should belong to either of the two categories: show a real-life situation viewer is most likely to face on a daily basis or be shot in a calming, relaxing location where these factors would work for the user and help with calming his or hers anxiety.

Examples of a real life situation are: rooftop, balcony, ladder, escalator, elevator, bridge.

Examples of a relaxing location are: park, temple, riverside, mountainside.

Location that depicts viewers daily life has the advantage of directly addressing very specific fears the viewer carries. In contrast to a fully Virtual Reality environment, the viewer, while wearing the Head-Mounted Display is transported to a real place. It makes it easier to relate to the situation and build a set of behaviours on how to cope with it, when it's encountered in real-life.

Additionally, it is important to mention that any clips should be captured during optimal weather conditions and high visibility. Viewer needs to be faced with a situation involving heights where the heights are clearly visible. Nighttime clips, while not impossible, require well-lit conditions.

Video Sound

Sound from the video clip is an important part of the therapeutic experience and an advantage video-based therapy has over other methods researched so far,

including Virtual Reality.

While the video is shot in a daily life situation, in real location, the camera naturally pick up and registered sounds of the environment. Depending on the location chosen, it can be sound of people chattering, cars passing by, trains, wind. The sounds viewer - an acrophobic person is most likely to encounter in a real life situation involving said location.

Sound therapy (and music therapy) are normally used in relaxation and in anxiety treatment. In situation when person experiences panic attack, one of the methods to ground themselves and pull out of the attack is to focus on a number of things person sees, hears, etc. While not all the senses can be easily engaged and not all the sensory informations will fit the video content, having sounds - one of the most dominant sense - match the visuals is a huge help in case therapeutic video viewer faces panic attack while watching the clip. If the clip is shot in a location surrendered by nature - sounds of the nature work for the viewer as relaxation method.

Speed in Aerial Clips

In aerial clips, shot with use of helium balloon or any other method that will take the camera off the ground and in the air, speed of the ascend and descend is important and needs to be noted. Therapeutic videos are not meant to give the viewer adrenaline rush nor leave them exhilarated. Therapeutic videos' purpose is to gently and steadily introduce the viewer to the scene captured, so that they can slowly acclimatise to it. Through the process of acclimatisation, desensitisation process takes place - in other words, viewer gets used to the scenery, sees with their own eyes that nothing dangerous nor traumatising is happening and can therefore start building up resistance and counter-anxiety techniques on how to deal with situations like that.

Unexpected Situations

During clip shooting, sometimes unexpected situations can take place. Someone can start shouting in the background, car with alarm can pass through, etc. In general, situations like this should be avoided and the clip reshoot. Reasons for this are along the same lines as mentioned in previous section.

In therapeutic videos, the point is to not unnecessarily startle the viewer - initial assumption is that person viewing the footage will be anxious enough be-

cause of the fact they are about to face a situation they are actively afraid of - for example look down the bridge, find themselves on the rooftop. Any unexpected factors that enter the footage, loud sudden noise especially, are most likely to only add stress to the situation and instead of lessening the symptoms of the phobia, add to them.

Notes

- 1 VR Jump Tour download page <https://itunes.apple.com/jp/app/vr-jump-tour/>
- 2 Official site of Slender Game <http://slendergame.com/>

Chapter 5

The User Study

5.1 Procedure

User Study for the final system have been conducted from July 25th, 2015 to July 28th, 2015. Deep Observation technique have been used to gather as much information from the Participant as possible. Test have taken place at Participant's home:

- A. To reduce Participant's anxiety by conducting the test and subsequent therapy in an environment familiar and safe for the Participant.
- B. To research how this method of treatment fits into Participant's daily life.

The User Study have been divided into three parts:

Part I - Introductory session has taken place on the first day of the Test, during which Participant has been introduced to the system, learned how to access the prepared content, and has interacted with it for the first time. This part has been conducted with supervision.

Part II - For the 3 consecutive days Participant interacted with the system on their own, without supervision, and recorded their interaction on a camera.

Part III - Meeting and discussion about the system, gathering feedback and measuring results of the test.

Participant

Participant for this test has been a recent college graduate, currently working as a English teacher, age 27, female. She has been screened towards history of panic attacks in situations involving heights (none), as well as history of participating in professional therapy for their acrophobia (no history).

Participant's acrophobia didn't start as a result of a traumatic experience - it's something the Participant dealt with as long as she remembers. The phobia is present in Participant's everyday life - from the background interview conducted

prior to the User Test, Participant admitted to being uncomfortable with standing close to the barrister on the balcony, as well as going up the stairs.

Participant has been given the Acrophobia Questionnaire (AQ) to fill out prior to the User Test and their results have shown a visible trend towards being afraid of situations involving suspension, remaining motionless in a situation involving heights (for example, standing on a ladder) as well as action of ascending - going up (stairs, ladder, etc.). Participant scored 65 and 11 on the AQ test for anxiety and avoidance, respectively.

The participant had no prior to the Test experience of using a hacosco.

Content

6 different 360° videos have been prepared for the User Study and presented to the User Study Participant. Shot in 6 different locations, using various methods, varying in length and targeting different needs and fears the Participant admitted to having in the Acrophobia Questionnaire. Three videos were shot in response to the fear of suspension and remaining in a elevated position for a prolonged amount of time, and three videos responded to Participant's fear of ascension.

- Video 1. Scene captured on a roof, still video feed.
- Video 2. Riding escalator up in a shopping mall.
- Video 3. Flying up in a park, camera on balloon.
- Video 4. Flying up in a building, camera on balloon.
- Video 5. On a bridge over a river, still video feed.
- Video 6. On a terrace near a shrine, still video feed.

Videos have been viewed using a free Kolor Eyes application¹. For the purpose of this User test an account has been created and the aforementioned videos uploaded on the server with Private setting so that only Participant could access them. For the immersive experience a Head-Mounted Display - hacosco² have been used.



Figure 5.1: User Test 360° videos 1 and 2



Figure 5.2: User Test 360° videos 3 and 4

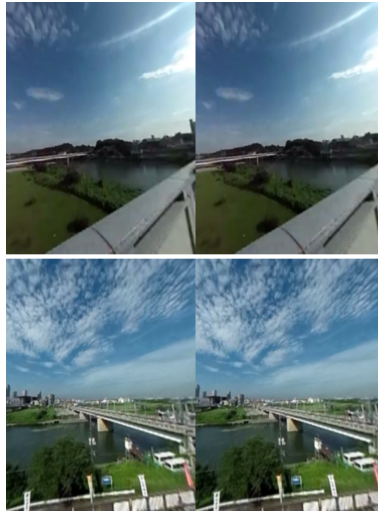


Figure 5.3: User Test 360° videos 5 and 6

5.2 The User Test

Introduction Day

Participant have been introduced to the User Test, by explaining it's purpose and informed about possible risks from undertaking it (dizziness and nausea from using a Head-Mounted Display. After installing the application on Participant's smartphone, instructions on how to use the application and the HMD, the Test have started.



Figure 5.4: Participant learning the system.

Participant have been seated on a swivel chair next to the desk. The have been informed they will be asked to watch 6 videos, for approximately 3 minutes each. They were instructed to look freely around the scenes they were about to view. If at any point they feel any discomfort or the experience gets too intense, they are free to pull out at any time. Participant has been informed to treat the experience as a therapy, to get into a mindset that usually helps with managing a stressful situation involving heights. After expressing readiness, Participant chose a video (Video 1) and for the next few minutes, slowly looked around the scene, focusing mostly on the part of the scenery that showed the street and passing cars. After approximately 3 minutes, Participant have been informed to change the video tot he following one on the list.

The same procedure have been repeated for each video. No negative reaction from Participant have been observed. Pattern for looking in the direction where the height have been most obvious have been noted.

Questions about well-being of Participant and anxiety levels have been asked after finishing the session. Participant admitted to some level of apprehension towards trying out the system and seeing a situation involving heights, though determination to try it helped with. After the first video the anxiety went down in a significant way and allowed to experience the rest of the simulation more calmly.

Participant have been asked to rate the experience using the 0-6 anxiety scale from the Acrophobia Questionnaire (AQ), with 0 for feeling calm and relaxed and 6 for feeling extremely anxious. After the first introductory session Participant rated the experience as 4 - moderately anxious. It lines up with Participants answer in AQ answer sheet for questions relating to scenes the videos presented. In other words, the experience of watching the 360° videos with a HMD was comparable to actually being physically in the situation.

Participant have been asked to use the same scale to rate the experience after each session of the self-treatment period.

Self-Treatment

Participant has been instructed to repeat the procedure - watching the 6 videos for approximately 3 minutes each, on the next day, and for the following two days to find a watching method that suited the Participant the best. The Participant was asked to film herself undergoing the treatment, as well as keep notes of any comments, reactions that occurred during the self-treatment period. Especially

during her everyday activities, the Participant was asked to monitor whether the therapy brings any changes to her perception of heights she encounters on a daily basis and what the changes are.



Figure 5.5: Self-treatment session, day 2.

Best time to watch the videos was the late afternoon, after Participant returned from work (on the weekdays). After the initial required time span for treatment, for the following two days Participant focused on three videos (Videos 1, 2 and 6). Reasons for the choice given by Participant were as follows:

- Video 1. - Showed situation the Participant had trouble in real life, and watching the video was treated as a “training” for the real life situation.
- Video 2. - The same reason as with Video 1.
- Video 6. - The peacefulness of the scene, combined with sounds registered by the camera created a scene that although did make the Participant feel nervous because of the camera positioning, the environment around helped calm the nerves.

Videos have been viewed for approximately 2 minutes each, during each of the daily sessions. Apart from the expected nervousness and anxiety towards facing a phobic situation, the Participant didn’t feel any discomforts from the sessions. As reported by the Participant, this anxiety levels have dropped with each session.



Figure 5.6: Self-treatment session, day 3.

Final Interview

During the final interview on July 29th, 2015 Participant has been asked to take the Acrophobia Questionnaire once again. Overall result after the treatment was 54 for the anxiety scale and 9 for the avoidance test. Questions in which participant changed her answer in response to the effectiveness of the therapy method can be viewed in the following tables (Table 1 and 2).

Questions in which change has occurred after the treatment are in majority the ones Participant rated as the most fearful and anxiety inducing, as well as those for which specific videos have been prepared.

5.3 Results

Overall results of the User Study are satisfactory. The method proposed proved to bring positive results in Participant's case. The positive results, while small, remained within a week from the initial exposure. Tentatively it can be argued there is a high probability the results will remain in a long-term.

Participant didn't report any cases of dizziness nor nausea due to usage of a Head-Mounted Display. Despite the reluctance towards psychotherapy, after the User Test Participant expressed the willingness to continue using the method, after closing the User Test. "It didn't feel like therapy, but it helped a little. I liked that" was the comment received on this matter.

The more interaction user had with videos, the easier it was to face the situ-

Table 5.1: Acrophobia Questionnaire answers, Anxiety Scale. Before and after treatment.

AQ questions	Before	After
3. Looking down a circular stairway from several flights up.	2	1
4. Standing on a ladder leaning against a house, second story.	5	4
5. Sitting in the front of a second balcony of a theatre.	2	1
6. Riding a Ferris wheel.	6	5
9. Standing next to an open window on the third floor.	3	2
11. Driving over a large bridge (Golden Gate, George Washington).	3	2
12. Being away from window in an office on the 15th floor of a building.	3	2
14. Walking over a sidewalk grating.	2	1
15. Standing on the edge of a subway platform.	2	1
17. On the roof of a ten story apartment building.	5	3
Overall results:	65	54

Table 5.2: Acrophobia Questionnaire answers, Avoidance Scale. Before and after treatment.

AQ questions	Before	After
6. Riding a Ferris wheel.	2	1
15. Standing on the edge of a subway platform.	2	1
Overall results:	11	9

ation they depicted. Prolonged exposure to the fearful situation - the stimulus - in a relative safety and comfort of Participant's own home, on Participant's own terms helped with overcoming the fear linked to watched situations. A result that has been transferred to real life, as well. On the second day of the self-treatment Participant tried to go on the roof at her workplace and although still felt anxious about the situation, stepping out on the roof came much easier than before the treatment. According to Participant, although the roof in the video was a different roof than at her workplace, the situation was similar enough that after repeatedly exposing herself to the video it was easier to challenge similar situation in real life.

Major positive points in the method and in the experience for the Participant are listed below:

- Sound - having the sound that matched the situation helped Participant in settling more confidently in the situation and immersing more deeply.
- Ability to look away from stressful situation without the need to break from the immersive environment - videos prepared, those that Participant favoured, showed situations where the stressful scenery was a half of the situation. The other half was showing a relative safety. In other words, from the 360° view, about half was showing situation involving heights - view from the bridge, near the balustrade; while the other half, simultaneously showed the other side of the scene, where no height tigers could be seen. Participant could simply turn around and focus on the "safe" scenery when the view of heights became too much.

Video Ratings

Highest rating have been given videos that directly responded to participant's daily life and real life situations - the roof scene, escalator ride and bridge. These were the videos Participant have watched most frequently and found easiest to identify with. Placed in a real life situation, these videos gave the Participant sense of "realness" that was impossible to find in the lowest rated video no. 3.

These were also the clips that influenced the improvement of Participant's condition, according to the Acrophobia Questionnaire test answers.

Notes

- 1 Application website: <http://eyes.kolor.com>
- 2 Product website: <http://hacosco.com/en/>

Chapter 6

Results and Discussion

6.1 Research Results and Limitations

There have been multiple objectives and goals stated for this research, and they have been reached.

The first and foremost objective was to design a method of therapy that would be accessible to everyone suffering from acrophobia. Second, to make the phobia treatment fun and interesting. And finally, to give an option of receiving a therapeutical help without the need of visiting the therapist's office, even without leaving one's home. Using tools largely available for everyone, items that most people already have or can easily acquire, and using them in combination that brought positive results is a success.

When topics of accessibility in today's modern world comes up, it unfailingly brings to mind new media and technology. It is after all because of these the world seems to be shrieked and possibilities that 50 years ago would belong to science-fiction novels are our reality. It became clear that if the design needs to be easily accessible for everyone, it needs to use the benefits technology gives us.

Starting from the drone racing project, that incidentally carried on the same values - accessibility and openness to everyone, drones and their unique characteristics (ability to fly up in the air) as well as the general enthusiastic response of the public to them, seemed to be the best solution to fulfil the concept. And for a little while, it was. Accidents and accompanying Policy changes that soon followed are not something that can be predicted. While the situation when a project turns out to be half illegal can be discouraging, in the world of design it is more of a motivation to look for a different, maybe even better alternative solution. Even in Mathematics the same result can be often reached with different equations - and as long as the process is not necessarily the focus, if the correct answer is reached it is considered a success.

In this aspect, the research can be certainly considered as at least partly suc-

cessful. A new therapy method have been designed, and at least partially on a smaller scale, it has been proven to be going in the right direction. The Participant who has been tested and asked about the concept expressed their interests in further development, proving that the direction the research has undertaken is most likely the right one. While the results of the test didn't manage to completely ease Participant's fears in each and every situation (as can be read from Acrophobia Questionnaire results), it provided a noticeable relief to at least some of the stressful everyday situations, and therefore brought positive change to Participant's life. It can be argued that with more wide variety of videos more aspects of acrophobia can be addressed.

Finding a tools have been just a part of the results from this research. Developing a guidelines for therapeutic videos and being able to pinpoint which elements are important for phobia treatment for real of heights is another success of this research.

As for the limitations this research, and computerised, media-based therapies have to take into consideration is the health status of potential users. While for this test careful screenings and interviews have been conducted to minimize chance of triggering test users, it's not something that can be done on a larger scale. Releasing an application or a program onto market is an action that immediately makes it available for relatively everyone. Without strict control or distribution through specific channels (action which would immediately oppose to the primary concept of making the game available for everyone), it makes it impossible to be fully aware who are the users, what are their triggers and whether the product won't unintentionally bring more harm.

Phobias, while can be singular, often are unfortunately not. Especially those belonging to the same group, as outlined in Chapter 2, often appear in groups - a fact that makes it difficult to distinguish and therefore to treat. In case of acrophobia - the fear of flying, of speed, of vehicles even are the most common accompanying ones. While there is no rule to which phobias appear in groups, or if a person is suffering from more than one, possibility of such situation certainly needs to be taken into account, especially when a highly specified method of treatment is considered. Is the designed game treating only fear of heights, or maybe it has impact (positive or negative) on the fear of flying the person has? Self-diagnosis is not infallible and while the potential game user with a phobia thinks he or she have fear of height but in reality it's more of fear of speed, for

example - what the effect of such treatment will be.

This research as well as researches that have been reviewed in Chapter 2 of this work certainly show that computerised therapies and therapies using new media are a direction worth exploring in future research and that they might become a fixed part of psychotherapy in the future. Highly specified treatments, like this project's treatment for acrophobia, are an interesting topic to consider, one that with developing technology and growing awareness among the science community, will be most definitely coming back in research in the coming years. This thesis and research therefore, can be considered as an opening of the discussion on the topic of acrophobia and serious game based virtual psychotherapy.

6.2 Future Research

“Don’t adventures ever have an end? I suppose not. Someone else always has to carry on the story.”

- J.R.R. Tolkien, Lord of the Rings. The Two Towers.

First and foremost, the future work for this concept involves more extensive work to be done on the therapy method and videos. The aim of this research is to design a method that will help people with low to moderate level of acrophobia manage their fear.

Every concept and every design have it's limits, and this one is no different. While tentatively it can be said that the research and the method proposed so far have been successful and partly the research objectives have been found, there are limitation of this study that need to be considered for further steps.

Scale of the experiment and user study is one of the limitations that have to be taken into account for the interpretation of data presented. Unbiased experiments on a larger scale should be conducted in order to fully determine the effects videos shot according to the guideline provided have for acrophobia treatment. On the same note, while immediate results gathered are favourable, it is unknown how in the long-term viewing the videos would affect more diverse group of users. An experiment where a diverse group of participants would given access to the system for a predetermined period of time, also with a “prescribed” length of time spend using it is what would bring more unbiased and clearer, more in-depth results.

While the primary concept of the project is about delivering psychotherapeutic help to those individuals who are reluctant to visit therapist's office, the concept

would, and research could be expanded, and adapted as a supportive tool and supplement method for those who undergo the traditional therapy. it is authors belief that - given the indirect method of facing a fearful situation brings positive results, it could be used as an alternative to *in vivo* exposure, especially in cases where directly interacting with a fearful situation would be costly and difficult to arrange.

At present times, the restriction of drone flight in public areas prevents testing other methods of aerial video shooting. As the concept presents a viable option for acrophobia treatment and having a camera strapped to a drone give more variety and more options to shoot appropriate material, once the regulations on the air-traffic and no-fly zones become clear, the science could only benefit from putting the concept to the test.

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Appendices

A Ethnography Informal Interview and Responses

Female, 25, Student

1. Are you afraid of heights?

Yes.

2. From 1 to 10, with 1 being the lowest level and 10 the highest, how would you rate the level of you fear?

6.

3. Do you remember why you started being afraid of the heights?

I think I grew up with it. I remember in 2nd grade of Middle School (8th grade) I think it was we had to climb those ladders that are on the walls in the gym, you know which, right? We had to go up and down, and teacher was timing us. And I just couldn't do it. They were trying to convince me, to motivate me and I just couldn't. I ended up crying for the rest of the class and I remember that because it was the only time I got a bad mark that year. I couldn't explain why I didn't want to climb, so they failed me. It was awfully embarrassing, but it was better to be embarrassed than to climb the ladder.

4. What happens when you are facing a situation involving heights?

I get very anxious, I start breathing fast. My legs turn into jelly, sometimes my hands shake. It's not pleasant.

5. What is happening after you leave the situation involving heights?

I feel relief. Immediately I can breathe deeper.

6. What is the most scary situation for you?

Being suspended in the air. Like crossing a vine bridge? Never in my life you can convince me to do that.

7. Did you ever seek any professional help, therapy? Why?

It's not something anyone ever suggested. I'm not sure if my parents were aware I was that scared. And I learned to live with it, I suppose.

8. If there was a way to cure the fear of heights without appointment with therapist, that could be executed without leaving your home, would you try it?
I would try.

9. If it was a game, would you play it?

Sure, sometimes I play games, so why not. Being in control and in my own chair but playing with a controller would be nice.

10. And simulation where you would have no control, just had to sit through it?
No, that's not something I 'd like. Even at home.

Female, 56, Housewife

1. Are you afraid of heights?

Yes.

2. From 1 to 10, with 1 being the lowest level and 10 the highest, how would you rate the level of your fear?

9.

3. Do you remember why you started being afraid of the heights?

No, not really. I suppose it might have happened when I was small, but I have no memory of any special situation.

4. What happens when you are facing a situation involving heights?

I get very very nervous. My legs turn stiff, wooden. Sometimes I sweat. And I get those headaches that don't leave me till the next day.

5. What is happening after you leave the situation involving heights?

If it was a really bad situation, I have those headaches.

6. What is the most scary situation for you?

Cleaning windows. I live on a second floor in an apartment of flats, and it's awful whenever I have to do it. Usually my husband does it, but when he's at work or sick, I have to and I hate it. I can't really stand escalators, either and with elevators I'm always afraid I will get stuck, so I'm avoiding them. Normal stairs are ok as long as I have something to hold on to, like the handrail. And whenever I can I try to arrange everything to be on the first floor all the time. I like shopping in the market because it's all on the ground floor.

7. Did you ever seek any professional help, therapy? Why?

It wasn't something you did when I was young, going to the "shrink". And now I'm too old, and too used to it. You don't teach an old dog new tricks.

8. If there was a way to cure the fear of heights without appointment with therapist, that could be executed without leaving your home, would you try it?

Maybe. I think I would feel ashamed of being so pathetic if I had to go to a professional, but by myself, I would try.

9. If it was a game, would you play it?

I don't play games, but for this? I would have to think about it. If I knew how to control it, then probably yes. I would try at least.

10. And simulation where you would have no control, just had to sit through it?

No, that's even worse. I would probably just turn my head around, or close my eyes and wait for it to end.

Male, 32, Programmist

1. Are you afraid of heights?

I think so.

2. From 1 to 10, with 1 being the lowest level and 10 the highest, how would you rate the level of you fear?

Around 4, maybe.

3. Do you remember why you started being afraid of the heights?

No, it's not something I pay attention to.

4. What happens when you are facing a situation involving heights?

I get nervous. Easily irritated.

5. What is happening after you leave the situation involving heights?

Usually I just feel better, but there was this one situation. Me and my friends were hiking in the mountains, and suddenly we have to cross the bridge above a river. It was a normal metal bridge, I think even bikes could go through it, but I? I started sweating and panicking like a girl. Luckily no one noticed and I ended up closing my eyes, hand on the handrail and somehow managed to cross. Once I were on the other side? I think I vomited everything since the dinner on the previous day. Everyone thought I just ate something nasty, and I didn't correct them, but man. That was intense. No mountain bridges for me since then.

6. What is the most scary situation for you?

That one, definitely that one.

7. Did you ever seek any professional help, therapy? Why?

No time, to be honest. I'm fine with things as they are.

8. If there was a way to cure the fear of heights without appointment with therapist, that could be executed without leaving your home, would you try it?

Depends. On what would I have to do, how often, things like that.

9. If it was a game, would you play it?

If it was a game, then I would try out of professional curiosity.

10. And simulation where you would have no control, just had to sit through it?

Maybe, although I would ask about the content first.

B Acrophobia Questionnaire

Acrophobia Questionnaire (AQ)—Part 1: Anxiety Scale

Below we have compiled a list of situations involving height. We are interested to know how anxious (tense, uncomfortable) you would feel in each situation nowadays. Please indicate how you would feel by putting one of the following numbers (0, 1, 2, 3, 4, 5, or 6) in the space to the left of each item:

- 0 Not at all anxious; calm and relaxed
 1
 2 Slightly anxious
 3
 4 Moderately anxious
 5
 6 Extremely anxious

- _____ 1. Diving off the low board at a swimming pool.
- _____ 2. Stepping over rocks crossing a stream.
- _____ 3. Looking down a circular stairway from several flights up.
- _____ 4. Standing on a ladder leaning against a house, second story.
- _____ 5. Sitting in the front of a second balcony of a theater.
- _____ 6. Riding a Ferris wheel.
- _____ 7. Walking up a steep incline in country hiking.
- _____ 8. Airplane trip (to San Francisco).
- _____ 9. Standing next to an open window on the third floor.
- _____ 10. Walking on a footbridge over a highway.
- _____ 11. Driving over a large bridge (Golden Gate, George Washington).
- _____ 12. Being away from window in an office on the 15th floor of a building.
- _____ 13. Seeing window washers ten flights up on a scaffold.
- _____ 14. Walking over a sidewalk grating.
- _____ 15. Standing on the edge of a subway platform.
- _____ 16. Climbing up a fire escape to the 3rd floor landing.
- _____ 17. On the roof of a ten story apartment building.
- _____ 18. Riding an elevator to the 50th floor.
- _____ 19. Standing on a chair to get something off a shelf.
- _____ 20. Walking up the gangplank of an ocean liner.

Figure 1: Acrophobia Questionnaire, Part I - Anxiety

Acrophobia Questionnaire (AQ)—Part 2: Avoidance Scale

Now that you have rated each item according to anxiety, we would like you to rate them as to avoidance. Indicate in the space to the left of the items below how much you would now avoid the situation, if it arose.

- 0 Would not avoid doing it
 1 Would try to avoid doing it
 2 Would not do it under any circumstances

- _____ 1. Diving off the low board at a swimming pool.
- _____ 2. Stepping over rocks crossing a stream.
- _____ 3. Looking down a circular stairway from several flights up.
- _____ 4. Standing on a ladder leaning against a house, second story.
- _____ 5. Sitting in the front of a second balcony of a theater.
- _____ 6. Riding a Ferris wheel.
- _____ 7. Walking up a steep incline in country hiking.
- _____ 8. Airplane trip (to San Francisco).
- _____ 9. Standing next to an open window on the third floor.
- _____ 10. Walking on a footbridge over a highway.
- _____ 11. Driving over a large bridge (Golden Gate, George Washington).
- _____ 12. Being away from window in an office on the 15th floor of a building.
- _____ 13. Seeing window washers ten flights up on a scaffold.
- _____ 14. Walking over a sidewalk grating.
- _____ 15. Standing on the edge of a subway platform.
- _____ 16. Climbing up a fire escape to the 3rd floor landing.
- _____ 17. On the roof of a ten story apartment building.
- _____ 18. Riding an elevator to the 50th floor.
- _____ 19. Standing on a chair to get something off a shelf.
- _____ 20. Walking up the gangplank of an ocean liner.

Figure 2: Acrophobia Questionnaire, Part II - Avoidance