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# **Project Proposal: Evaluating the Impact of Phobia Motivated Experiences delivered through a Virtual Environment**

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# Background and Motivation

Since the release of the first virtual reality headsets in 1960s, VR technology has been evolving and progressing all over the world [1]. Now, there are more affordable headsets, such as Google Daydream, Oculus Go and others on the market which interest many researchers, especially in the healthcare industry [2]. Considering that first VR interactions were introduced more than 50 years ago, there is still a lot of potential to grow in the terms of helping patients and doctors in the field. VR systems and Virtual Reality Environments (VRE) are becoming more common in the healthcare applications for training professionals, educating the staff and treating patients [3].

Distinctive changes in the healthcare over the world significantly affected on the education of healthcare professionals. Recent studies show that on average they take up to 30 years in the field of study to achieve the position in medical treatment [2]. However, the advances in the technology offers new innovative tools and makes it more reliable when it comes to the education in the healthcare. Virtual reality is now used in various fields of medical treatment, including professional education/training, surgery training and diagnostic assistance for health staff [4]. It is also used for patients in rehabilitation and various mental treatments.

Anatomy has been always one of the most significant aspects in the healthcare [5]. For the past 5 years, almost 90% of the applications on VR were made to simulate surgery, treating patients mental activity and precisely diagnosing various mental diseases [6]. However, there are still not many applications that are present on the market that actually help to analyze the problem and the diseases. The study of brain activity has been one of the biggest interests in the VR healthcare industry for past 10 years [5]. Almost all of the brain activity research in VR is concentrated on human feelings that can be achieved virtually, such as fear or stress. Considering recent studies, it is confirmed that more than 90% of people have various phobias, and it is important to know how to analyze and treat them [5].

Searching through the VR healthcare applications that are on the market now, we can conclude that there are not many products available which address phobia motivated experiences. Limbix VR library shows that it is very important for the patient to completely immerse in the situation of fear and try to present it as real as possible [7]. There are several applications, such as Limbix [7] and C2phobia [8], which provide the necessary experiences, but none of them collect any personal data to evaluate the impact of virtual phobia environment. The problem behind virtual phobias is the lack of proper system which would help healthcare professionals to analyze the world of phobias and to assist their patients according to the proper diagnoses.

Unfortunately, the applications like Limbix[7] and C2Care[8] do not evaluate the impact of phobias motivated experiences. As it was mentioned before, they do not collect any personal data from the patients and only provide virtual reality environments. However, there are products on the market that are serving specifically for the purpose of data collection. Qardio [9] is the arm monitor which provides all of the necessary details for the users about their health, such as heart rate, blood pressure and others. It is an example of wearable technology connected with phone application to display data. However, Qardio only functions as a standalone measurement tool and does not include any VR environment to be tested with. Therefore, it is worth to investigate wearable technology combined with virtual reality environments as the way to evaluate the impact of phobia motivated experiences.

# Aims and Objectives

The main objective of this project is to create a system capable of providing virtual reality environment for the user with phobia(s) and deliver the patient's data to the healthcare professional using wearable technology. The system would also come with necessary hardware and software tools to help evaluate the impact of user's phobia motivated experience.

The key objectives of this research are:

1. Investigate previous and current methods that are used to treat patients with phobia(s).
2. Design a comprehensive system of cooperating hardware and software tools to display virtual reality environment addressing phobia(s).
3. Develop an Android application communicating with wearable technology which would send and display the patient's information to the healthcare professionals.
4. Test, collect data and analyze the results that the application provides to evaluate the impact of phobia motivated experiences.

# Project Plan

Project development starts with collecting necessary hardware and software tools. Then, it leads to the implementation of VR application to display phobia(s) and Android application to collect data. The development of the applications will take the most significant part of the project because it requires most of the code writing. Testing and data analyzing with corresponding ethics approvals would also take a significant part of project development time considering the Ethics Committee approval time estimates.

The Gantt chart below describes the project plan. Using Waterfall methodology, I plan to conclude testing on each major stage of software implementation. Some of the tasks can be combined due to the importance levels, risk management and wait time for other various tasks that do not depend on the developer, such as ethics forms approval. Moreover, the spread of the workload is laid more on the first half of the year because of the amount of credits put in each semester. Considering that the fall semester takes less time for classes, I plan to finish the implementation of required software before the end of Spring Festival.

- A. Write and submit the proposal
- B. Prepare and submit necessary ethics forms
- C. Gather necessary literature and research phobia examples
- D. Collect all of hardware and software required for the project completion
- E. Develop the VR application displaying various phobia motivated experiences
- F. Test the environments
- G. Write the Interim Report (deadline 16th Decemeber, 2019, 16:00)

- H. Gather software feedback and update the system according to the requirements
- I. Decrease weekly set time for the project due to exam preparations
- J. Update the market research and available VR systems
- K. Implement the Android application to collect data from the patient using wearable technology
- L. Get ethical approvals for final evaluations
- M. Start full system testing and data collection
- N. Conclude the research and provide outcome analysis
- O. Finish Dissertation (deadline 20th April, 2020, 16:00)

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Weeks	14/10/19	21/10/19	28/10/19	04/11/19	11/11/19	18/11/19	25/11/19	02/12/19	09/12/19	16/12/19	23/12/19	Exams	Exams	Holiday	Holiday	27/01/20	03/02/20	10/02/20	17/02/20	24/02/20	02/03/20	09/03/20	16/03/20	23/03/20	30/03/20	06/04/20	13/04/20
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## References

- [1] P. Cipresso, I. A. C. Giglioli, M. A. Raya, and G. Riva, “The past, present, and future of virtual and augmented reality research: A network and cluster analysis of the literature,” *Frontiers in Psychology*, vol. 9, Jun. 2018. DOI: 10.3389/fpsyg.2018.02086.
- [2] F. Mantovani, G. Castelnuovo, A. Gaggioli, and G. Riva, “Virtual reality training for health-care professionals,” *CyberPsychology & Behavior*, vol. 6, no. 4, pp. 389–395, 2003. DOI: 10.1089/109493103322278772.
- [3] A. S. Pillai and P. S. Mathew, “Impact of virtual reality in healthcare,” *Advances in Psychology, Mental Health, and Behavioral Studies Virtual and Augmented Reality in Mental Health Treatment*, pp. 17–31, DOI: 10.4018/978-1-5225-7168-1.ch002.
- [4] N. Ichalkaranje and A. Ichalkaranje, *Intelligent paradigms for assistive and preventive healthcare*. Springer, 2011.
- [5] K. Srivastava, S. Chaudhury, and R. Das, “Virtual reality applications in mental health: Challenges and perspectives,” *Industrial Psychiatry Journal*, vol. 23, no. 2, p. 83, 2014. DOI: 10.4103/0972-6748.151666.
- [6] C. S. Lányi, “Virtual reality in healthcare,” *Intelligent Paradigms for Assistive and Preventive Healthcare Studies in Computational Intelligence*, pp. 87–116, DOI: 10.1007/11418337\_3.
- [7] Limbix, *About Limbix*, <https://www.limbix.com/about>, [Online; accessed 24-October-2019].
- [8] Rus-Calafell, *C2Phobia - Treating phobias in virtual reality*, <https://www.c2.care/en/c2phobia-treating-phobias-in-virtual-reality/>, [Online; accessed 24-October-2019].
- [9] Qardio, *About Us*, <https://www.getqardio.com/about-us/>, [Online; accessed 24-October-2019].