Evaluated VR Health Reference Model for Therapeutic Use and Implementation

Output 4.5 of the BGI Project

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The VR Health Reference Model forms the basis for an efficient and successful implementation of VR technology and software in health institutions across the BSR.

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Content

1. Introduction

Within the scope of the “Baltic Game Industry - Empowering a Booster for Regional Development“ (BGI) project, a major aim is to further investigate general framework conditions that have to be met, and provide recommendations, in order to aid the development and implementation of virtual reality (VR) applications in non-game sectors, such as therapeutical settings in a hospital.

In the ongoing BGI project, a VR application was developed and tested for usage in clinical (hospital) settings to gather experience with the development and its implementation as well as potential obstacles impeding successful usage. Every step of the project was exemplified by an application to treat alcohol use disorder: AlcAvoid.

The project is an international research project between three European countries and four participating sites.

The HTW Berlin University of Applied Sciences, worked as the application developer in communication with research experts in the field of addiction (from the three partnering sites, see below). They provided application prototypes for AlcAvoid. These have been successfully implemented and evaluated by the researchers and further personnel (e.g. medical doctors, psychotherapists, psychology students, and a study nurse) from the different hospital sites:

- University Medical Center Hamburg-Eppendorf (UKE) in Hamburg, Germany,
- Pomeranian Medical University (PMU) in Szczecin, Poland
- Unit of Clinical Alcohol Research, Clinical Institute (UCAR) in Odense, Denmark.

The goal for the future is to disseminate developed VR applications and to promote them to a variety of different non-game industries. From the experiences gathered in the present BGI project, a Health Reference Model was derived with different steps to be followed. Along the different steps of the model, the process of successful implementation can be understood and implementation in other non-game sectors might be facilitated. The VR Health Reference Model on the full process of the VR app implementation in healthcare settings elaborates on the full process from developing VR applications to its final on-site implementation and gives an overview of potentials and general barriers. In the present report, we present the developed VR Health Reference Model and elaborate on it.

2. VR Health Reference Model

The VR Health Reference Model (Figure 1) can be divided in three crucial main phases:

1. General preparation
2. On-site preparation
3. On-site implementation.

During the general preparation, the VR software needs to be outlined and developed in close collaboration between the clinicians and software developers. After successful completion of the application development, directed promotion to potential users is key. The second phase involves all issues of on-site preparation for the implementation of the VR hard- and software. This starts with the site taking ethical aspects into account and a review by a local ethical committee. The hardware needs to be acquired and implemented into a fitting location. Furthermore, clinical staff need to be instructed and trained in how to handle the hard- and software in a standardised manner. The third phase consists of the actual implementation of the VR training on site and is a circle of interacting aspects. Patients need to be engaged in the process, whilst sanitation requirements need to be met. Furthermore, data protection is crucial. The three phases of the model are now elaborated in detail.

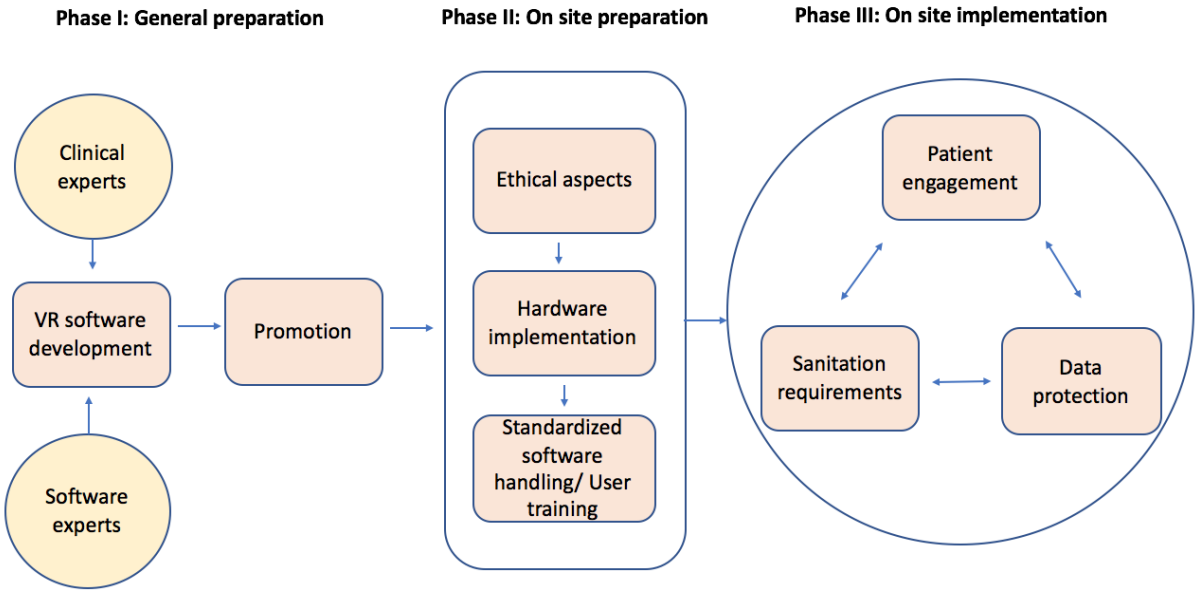

Figure 1: Health Reference Model of Therapeutic Use and Successful Implementation of VR Applications

Phase I:

For the development of a VR software, an established collaboration between the researchers / therapists of the hospital and the VR application developers is key. Experienced medical professionals, psychologists and researchers should be consulted for input regarding important features the app must fulfil that mirror the clinical picture of the targeted psychological disorder and give advice by discussing the mechanisms of the problem-specific therapy.

In this step, it is crucial to combine therapeutic mechanisms with the strength of VR applications. This involves an interdisciplinary process, in which experts exchange their experiences and knowledge and discuss possible options for a successful and efficient implementation. It should be seen as a dialogue, with constant specific written and oral feedback and regular discussions about the progress of the application. To ensure a fruitful implementation circle, it should be considered from the beginning, that the VR application should be designed to run on cost-efficient equipment.

Probably different to the development of VR-applications for the gaming sector, the project showed that it is of vital importance to take country-specific as well as idiosyncratic preferences of the respective patient into account. In a therapeutic context it is crucial to customise and optimise any treatment to the respective patient. In concrete terms, for AlcAvoid it would be desirable that the application contains a library of stimuli from which a therapist could chose adequate stimuli according to a patients' individual and cultural preferences. Also, the environment in which the application is located would ideally be modifiable to a few different settings. Again, in concrete terms, for AlcAvoid this would mean that ideally the beverages are not only to be consumed in a virtual bar, but also in a virtual home environment as this is a realistic location of consumption for many patients.

After the successful development of an application, it is crucial that the process of implementation of VR-technology is widely communicated to medical staff (medical doctors, psychologists, research, or nurses). They should be provided with a step-by-step guide which makes the implementation as easy and smooth as possible. Furthermore, communicating the usefulness in a therapeutic context and its benefits is crucial. A total list including an estimation of all costs accompanying the decision of implementing VR-based therapy should also be made available. Transparency throughout the whole process can enhance acceptability among hospital staff for new interventions. Reaching a wide circle of practitioners can facilitate assistance with patient recruitment through responsible staff. Application-developers should directly address heads of departments or senior researchers at

the hospitals, who are in the position to make extensive decisions and / or are interested in further testing, scientifically evaluating, and using VR-based applications.

Phase II

Once an institution decided on implementing the application, the second step of the model concerns the specific on-site preparation for the VR implementation. It starts with ethical approval by the local ethics board of the site. The preparation of a study / treatment protocol which is then distributed to the local ethics committee is encouraged before implementing the training into clinical settings.

In the second step of phase II, it is crucial that VR developers provide up-to-date lists of products and descriptions of all equipment needed to implement the VR application and advise on how to acquire them. This should include alternative products, to ensure adequate implementation across different sites with different demands and financial resources. One of the main challenges of implementing VR based interventions, is finding a suitable spatial solution to set up the VR system. Unfortunately, often it is not possible to assign a room solely to the use of VR treatments. The most efficient solution would be to have access to portable VR equipment such as gaming laptops and tripods for the sensors for an easy set-up. This way, the multifunctionality of a room can be assured and the VR training application does not collide with other treatments.

Therapist and researchers using the application, must be trained in setting up the equipment, as well as handling the hard- and software. A standardised handbook providing a step by step set up guide should be provided and mock-sessions in which practitioners practice the set-up and implementation of the application are encouraged. The possibility of e-mail / telephone-based tech-support from the software developer should be given. While this is not a generalisable experience, it is worthwhile to report that in Poland, neither legal nor ethical restrictions or barriers occurred during the project phase. Although we cannot issue a “blank cheque” to the present day, we consider it a promising information to be reported.

Phase III

Once the staff is trained in hardware set-up as well as software handling, phase III of the model describes the actual on-site implementation of the VR application. This phase can be seen as a constant interaction between patient engagement, meeting of the sanitation requirements and data protection.

Patients need to be informed about the content and benefits of the VR training by the clinicians and their individual questions and concerns need to be addressed. Test trials can be offered in order to reduce scepticism and for patients to get acquainted to the handling of VR equipment (i.e. controllers, goggles). It should also be communicated, that if patients experience symptoms such as headaches or nausea, the application can always be interrupted, and breaks are always possible.

As with any treatment, potential problems with specific target groups are also relevant for VR-applications. For the use by patients with alcohol addiction, some problems were specifically present. However, the majority of problems such as lack of regularity, frequent change of place of residence, cognitive dysfunctions, and neurological symptoms are intrinsic to the nature of alcohol addiction. Hence, they do not solely apply to the use of VR-applications. For a developer used to developing devices for a gaming sector, it might still be an important, because uncommon aspects of such cross-sectoral efforts are to be duly considered.

For the safety of both patient and instructor, excellent hygiene is crucial in implementing VR trainings. Hand disinfection before and after handling the VR equipment is mandatory for patient and instructor. As the VR goggles and controllers are regularly handled by multiple people, a thorough disinfection of the hardware is imperative. Instructors should wear gloves whilst setting up the hardware and disinfection should take place any time it is touched by another party. Furthermore, disposable VR safety masks are given out to the patients, to minimise direct skin contact with the VR goggles. It is encouraged to follow a strict hygiene protocol, including the observation of local regulations.

Finally, the last aspect of phase III is concerned with the important issue of data protection. Each site should contact their local data protection officer in accordance with the local ethical committee and follow site regulations. No personal data should be stored / and or transmitted during the usage of the VR trainings. Additionally, anonymous IDs should be utilised whilst conducting the training. Written consent needs to be obtained by participants prior to the training sessions. Data should be acquired offline, (i.e. without an internet connection) or an active data blocker (e.g. HTC Firewall Blocker) preventing information to be shared with the hardware producers should be used.

3. Application Use at Home

Focus of the BGI project and, hence, also focus of the present report was the implementation of VR-applications in a hospital setting. However, we find it an interesting result to report that patients were interested in using the VR application at home between regular clinical treatments. No experiences were made in the present project, but the request to use the application at home can first be taken as a strong sign of acceptance of this new way of treatment and, second provide a promising area of even further distributing the VR application. Future projects would need to establish how potential restrictions of VR use by patients in a home setting could be overcome.

4. Dissemination

VR applications bear a great potential for successful implementation in industries other than gaming. However, proactive dissemination and promotion must be considered when planning to expand to non-game sectors as the market is only just emerging and rather than refusal, lack of knowledge seems to be an obstacle on both sides, by patients as well as staff. Hence, dissemination must be explicitly considered when planning to use VR applications.

We created a presentation that can be used at information events for professional audience. The presentation is aimed primarily at professionals in a clinical setting, however, might be used as general template for presentations in other sectors as well.

THE PROJECT

The project 'Baltic Game Industry' (BGI) aims to foster the game industry in the Baltic Sea region - turning an ambitious game developer scene into a competitive and attractive business sector with sound innovation potential and thus making the region a game hotspot with worldwide competitiveness.

The partnership works together on framework condition improvements, on making business support services fit for the special needs of game start-ups and finally on new business opportunities for game developers in other industry sectors, such as health care. The core element is the installation of durable game incubators, programmes and schemes for game start-ups across the region.

BGI effectively combines policy and business development. Tailor-made game business support fosters a durable economic growth of this innovative industry in the whole region. The introduction of VR technologies in non-game industries contributes to boosting innovation beyond games. The common branding of the Baltic Sea region as game innovation hotspot will attract international clients, investors, creative entrepreneurs and qualified workforce.

Read more at www.baltic-games.eu

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