MASTER THESIS

Generating Requirements for the Design and Implementation of a VR application for Forensic Mental Healthcare

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MASTER HEALTH SCIENCES
TRACK: MONITORING AND PERSUASIVE COACHING
FACULTY: SCIENCE AND TECHNOLOGY (S&T)

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24-9-2020

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FORENSISCHE GGZ

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Abstract

Introduction: Emerging challenges, such as legal restrictions and the patient population becoming more heterogeneous and complex, result in the need for personalised treatment in the forensic mental healthcare setting. eHealth, such as Virtual Reality (VR), shows potential to fulfil this need for personalisation. VR has several advantages such as being perceived as enjoyable and interesting by users and has already shown successful results in the treatment of different psychological disorders. Previous research focussed on collecting values for VR in the treatment of forensic mental healthcare, which represent the wishes and needs of the stakeholders. These values, translated into functional requirements, must be incorporated into the development of the VR application. The present study aims to generate requirements for the design and implementation of a VR application for forensic mental healthcare.

Method: Multiple studies were performed in which the design of the prototypes was evaluated by formative evaluations, and data sources from earlier research were analysed based on the needs for the implementation. First, prototype version one was evaluated by means of a focus group and a questionnaire focussing on the icons and terminology used in the design. Second, semi-structured interviews with think-aloud were performed with prototype version two. The predefined values were used for deductive and inductive coding. Third, data from earlier research was analysed, in which four domains from the Consolidated Framework for Implementation Research (CFIR) (technology, patient, therapist and organisation) were used to apply deductive and inductive coding. Lastly, attributes were created based on the codes and translated into technical requirements for the design and implementation of the VR application.

Results: In total 49 requirements for the design and implementation were generated. The results of the formative evaluations showed that for the design of the VR application the possibility of involving the patient and setting up a personalised VR session are of importance to the stakeholders. Moreover, the design should contain icons, terminology and clarifying descriptions that allow the therapists to work intuitively and navigate easily through the application. The therapists want to be able to share their knowledge and experience with others on the system and they should be made aware of protecting patient privacy. Research into the implementation showed that factors such as the resistance and appropriateness of the patients should be considered. When implementing VR for the therapists they want to receive support and training from the organisation on how to use VR in the treatment. The organisation should consider creating a protocol for the use of the VR application and attention should be drawn to the possibilities of VR in the treatment. Moreover, a safe and accessible place should be created, to set up the VR system.

Discussion: The results of this study support the use of the CeHRes Roadmap as a framework for the development of VR for forensic mental healthcare. Mainly the stakeholder involvement and the iterative approach used to generate the requirements are of added value. The generated requirements show that the design of the VR application should be intuitive and fit in the current treatment, and that for the implementation multiple factors, such as creating a protocol, need to be considered. Further research should focus on performing additional evaluations and updating and adjusting the requirements based on the results of these evaluations.

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1. Introduction

1.1 Forensic mental healthcare

Forensic mental healthcare can be described as mental health care for adults who have committed or are suspected of committing a criminal offense. Forensic mental healthcare consists of mental healthcare, addiction care and mentally disabled care for adults, mostly imposed as part of judicial punishment, assigned to people who have committed a crime partly or fully due to a psychiatric disorder (Dienst Justitiële Inrichting, 2017; GGZNederland, 2014). Moreover, the treatment for forensic patients focusses on preventing recidivism, which can be referred to as the chronic tendency toward repeating criminal or antisocial behavioural patterns (Zara & Farrington, 2015). Forensic patients are treated by handling and securing, which is a specialized form of healthcare. (Ministerie van Justitie en Veiligheid, 2019).

The patient population of forensic mental healthcare is becoming more heterogeneous and complex, due to the complex differences in diagnoses, legal frameworks, service plans and social-cultural expectations (Naslund, Marsch, McHugo & Bartels, 2015; Völlm et al., 2017). Furthermore, research shows that forensic psychiatric patients often are poorly educated, have low literacy and when mandated to treatment, show limited motivation (Bierbooms et al., 2015). This creates little insight into their health, disease and treatment and might influence the success of the treatment, since the patients have no idea what is wrong with them and how they can be treated. Patients can additionally experience difficulties with visualisation, imagination and conscious reflection since they receive treatment in an artificial environment with no real-world stimuli (Maples-Keller, Bunnell, Kim & Rothbaum, 2017). Moreover, training in an artificial environment can also complicate transferring the learned skills into daily life (Kip, Kelders & van Gemert-Pijnen, 2019b). The treatment in forensic mental healthcare shows success, but more difficulties are experienced due to legal restrictions, such as area prohibition (de Vogel, Schaftenaar & Clercx, 2019). As a result of these legal restrictions, many clinical patients cannot be treated within society and exposure therapy and testing learned skills in realistic situations are impossible (Bierbooms et al., 2015; Barnao & Ward, 2015). There is a need for interventions to deal with the difficulties experienced by the patients and to support the treatment in forensic mental healthcare.

eHealth technologies are one of these promising interventions. eHealth refers to “the use of technologies to improve health, well-being and healthcare” (van Gemert-Pijnen, Kelders, Kip & Sanderman, 2018). Examples of eHealth technologies are web-based learning modules and mobile diary apps (Sudbury-Riley, 2017). Research shows multiple advantages for eHealth in the forensic mental healthcare setting, like providing unique information, such as real-time data from wearables and the possibility of tailoring to the individual patient (Kip et al., 2018). Moreover, eHealth increases access to care and therefore creates the opportunity to lower costs and workload for the therapists (van Gemert-Pijnen et al., 2018). Considering all factors, difficulties and emerging healthcare changes that forensic mental healthcare organisations have

to deal with, results in a need for personalised treatment to the individual patient. Personalisation is very important in the forensic mental healthcare, but it is also challenging to know where it can be applied and how to use it in a systematic way (Kip et al., 2019b; Birgden, 2014). Furthermore, there is a challenge in implementing eHealth into practice since it takes a great effort to succeed. Implementation strategies can support the implementation of eHealth into practice (Varsi et al., 2019). An eHealth technology that can meet the need for support and can be suited for treatment in forensic mental healthcare is Virtual Reality (VR) (Farley, 2018; Kip, Bouman, Kelders & van Gemert-Pijnen, 2018; Kip et al., 2019b).

1.2 Virtual Reality in forensic mental healthcare

As mentioned earlier VR is a promising eHealth technology for forensic mental healthcare. VR uses computer simulation to create a real-world environment experience using for example VR glasses or a 360 area (Freeman et al., 2017). VR offers opportunities in which the physical barriers of the closed setting in regular forensic treatment can be overcome by creating realistic situations in which exposure therapy with the presence of stimuli can take place (North & North, 2016; Kip et al., 2018). VR has the advantage of being perceived as enjoyable and interesting by patients and could thereby increase the treatment motivation of the patients (Kip et al., 2019a). The 360-degree type of VR can be used individually which enlarges the scalability of the users and makes it usable anywhere and everywhere (van Gemert-Pijnen et al., 2018). Besides, with 360-degree VR the same situation can be offered endlessly without the virtual characters getting affected or exhausted (Cornet, den Besten & van Gelder, 2019). The type of VR that can be suited for in the treatment of forensic mental healthcare is the interactive form of VR, which can be controlled by the therapist while the patient is wearing the VR glasses. Moreover, with interactive VR highly personalized real-world scenarios can be built together with and for the patients (Kip et al., 2019b).

All these factors show that VR is a promising eHealth technology for forensic mental healthcare. However, there is little evidence to back these factors due to limited published studies on VR-technology in forensic mental healthcare (Kip et al., 2019a). Previous research focusing on the application of VR in forensic mental healthcare show various outcomes. First, the application of VR for patients with mental disorders can be used in the assessment, treatment and understanding of patients with anxiety disorders, depression, psychoses, substance disorders and eating disorders. Second, VR has already shown successful results in the treatment of different psychological disorders such as anxiety disorders, Post Traumatic Stress Syndrome (PTSS) and psychoses (Rus-Calafell, Garety, Sason, Craig & Valmaggia, 2018; Maples-Keller et al., 2017). Third , research from Marco, Perpiña & Botella (2013) showed the effectiveness of VR in treatment of body image in eating disorders, the participants' body image improved significantly and was maintained during the one-year follow up.

Research from Klein Tuente et al (2020), showed that VR aggression prevention training (VRAPT) in the treatment of forensic patients, displayed indications that VRAPT

temporarily influences anger control skills, impulsivity and hostility, but did not decrease aggressive behaviour. The reason for the low effectiveness on aggressive behaviour could be that the VRAPT was not co-created with the stakeholders, causing a poor fit between the technology and the users. Despite the poor fit between the technology and users, the motivation and learning effect was high among the participants (Klein Tuente et al., 2020). Other research shows that VR can create different perspectives for its users which can help to understand themselves and others better (Kip et al., 2019b; Farley, 2018). Further research into the development should be conducted to make sure a good fit between VR and forensic mental healthcare can be established. A good fit between VR and forensic mental healthcare ensures that the VR application can be embedded properly into the treatment (van Gemert-Pijnen et al., 2011).

1.3 VR development for forensic mental healthcare

Since there has not been a VR application developed for in the treatment of forensic mental healthcare, a thorough and extensive development process should be executed. One way to achieve this is by forming a good fit between technological, human and contextual factors into the development process of an eHealth technology, which contributes to the chance of an eHealth technology reaching its goals (Kip et al, 2018; van Gemert-Pijnen et al., 2018). This can be ensured by involving all stakeholders, such as patients and therapists, in the entire development process (van Gemert-Pijnen et al., 2018). As stated before, eHealth must be developed and adjusted to the character of the forensic patient group and it should be integrated into the personal treatment instead of applying it as a separate addition (Kip et al., 2018). There is little evidence on how VR can be fitted to the forensic patient group due to factors such as the low motivation and poor education. Therefore, the findings on VR in the forensic context need to be specified more to make them applicable. Previous research on the development of VR in the forensic mental healthcare setting used the CeHRes Roadmap. The CeHRes Roadmap is a framework developed to guide the development, implementation and evaluation of eHealth technologies (van Gemert-Pijnen et al., 2018).

Research from Kip et al., using the CeHRes Roadmap, focussed on gathering information for the contextual inquiry and value specification of the development of VR in the forensic mental healthcare setting (Kip et al., 2019a; Kip et al., 2019b). The goal of the contextual inquiry was to find the best fit between technology, its users, other stakeholders and the environment. Furthermore, the added value of VR in forensic mental healthcare was specified during the contextual inquiry (Kip et al., 2018a). The results for the contextual inquiry were used as input for the value specification. During the value specification, it was made more specific in what way VR can be of added value for the stakeholders and what it should be able to do (Kip et al., 2018b). A value is an ideal or interest a (future) end-user or stakeholder aspires to or has (van Velsen, Wentzel & van Gemert-Pijnen, 2013). The collected values translated into functional requirements serve as concrete tools for the development and design of the VR. With this, the wishes and needs of the stakeholders can be incorporated into the development of VR (van

Gemert- Pijnen et al., 2018; Kip et al., 2019a; Kip et al., 2019b). The identified values of earlier research into VR development in this context are shown in Table 1.

Moreover, it must be determined how the VR application can be implemented into the broad range of treatments of forensic mental healthcare. The implementation of eHealth can be referred to as activities that need to be performed to realize the adoption, dissemination and integration of the technology into care (van Gemert-Pijnen et al., 2018). Research shows multiple issues when implementing eHealth into mental healthcare, such as the extent to which the technology is accepted by the therapists and patients and the lack of knowledge on how to use it in the treatment (Doherty, Coyle & Matthews, 2010; van der Vaart, Witting, Riper, Kooistra, Bohlmeijer & van Gemert-Pijnen, 2014). The Consolidated Framework for Implementation Research (CFIR) is a framework that includes the stakeholders and is suited to guide rapid-cycle evaluations when implementing complex health care interventions (Keith, Crosson, O'Malley, Cromp & Taylor, 2017). The CFIR includes five major domains, the intervention characteristics (technology), implementation process (organisation), inner setting, outer setting, the individuals involved (patients & therapists) and the process by which implementation is accomplished. These domains can influence the implementation effectiveness differently and are therefore considered by the framework (Damschroder et al., 2009; Kip, Sieverink, van Gemert-Pijnen, Bouman & Kelders, 2020).

Table 1 Table 1 Values regarding VR for in the treatment of forensic mental healthcare determined by stakeholders in previous research (Kip et al., 2018b).

Values	**Definition**
Aim application	
1. Fit with patient	The VR application should suit the forensic patient population, should be adaptable to the individual patient and the VR application is not used for patient groups it is unsuited for.
2. Bridge between therapy room and outside world	The VR application should be interactive, so the patient can practice and train skills in VR.
3. Insight into behaviour, thoughts and feelings	The VR application should create insight for the therapist in the patient's behaviour, for the patient in his own behaviour and for the patient in the behaviour of others.
4. Improvement of skills	Patients can use the skills they learn in the VR application to improve their behaviour in daily life.
5. Generalization of skills to daily life	The VR application should make the step from the therapy room to the real world smaller for patients.
6. Safety	Patients should be able to use the VR application without causing harm to themselves or their environment
7. Treatment motivation	The VR application should be motivating for patients to use and increase the motivation of patients to participate in their treatment.
Embedment in treatment	

8. Unique addition to current treatment	The VR application should not do something that is already done in treatment or could be done in treatment without VR.
9. Cooperation between patient and therapist	The patient and therapist should both be active participants in making the VR environments and scenarios.
10. Content fits well with current treatment	The VR application should be in line with the current way of treating forensic patients
11. Practically easy to use in current treatment	The VR application should be easy to use and not cost too much time in line with the current way of treating forensic patients
Use application in practice	
12. Constant adaptation of application	During the development and after the implementation of the VR application, the application should be continuously improved to keep the technology and the content of the VR application up to date.
13. Widely applicable	The VR application should be usable for a wide range of patient types: for patients with (the risk of) sexual and aggressive undesirable behaviour and for inpatients and outpatients.
14. Affordability	Developing and using the VR application should fit in the budgets of the forensic mental healthcare organization(s) that develop and use it.

1.4 Research questions

It has been proven that VR has many potential advantages in forensic mental healthcare but there is a lack of optimal use (Fromberger, Meyer, Jordan & Müller, 2018). The current study will build on the results of previous research (Table 1) and starts with the Design phase of the CeHRes Roadmap. In order to further elaborate the values, the specific requirements for the design and implementation of the VR application for forensic mental healthcare will be formulated through performing several methods. For these methods, prototypes of the VR application and data from earlier research of this project will be used. The activities of the current study will be aligned with the principles of the CeHRes Roadmap (van Gemert-pijnen et al., 2018).

The research question of this study is:

"What are the requirements for the design and implementation of a VR application for forensic mental healthcare according to patients, therapists and other stakeholders?"

Sub questions:

1. To what extent are prototypes of the VR application for forensic mental healthcare in line with the previously determined values?
2. What are points of improvement for the prototypes of the design of the dashboard of the VR application for forensic mental healthcare according to the stakeholders?
3. Based on the identified points of improvement, what are the requirements for the design and implementation of the VR application?
4. What are the requirements based on the conditions for implementing VR forensic mental healthcare into practice according to the therapists, patients, the characteristics of the VR application and organisation?

2. Method

2.1 Background & setting

The present study took place at Stichting Transfore. Stichting Transfore is a Dutch organisation that provides in- and outpatient forensic mental healthcare (Transfore, 2020). An interdisciplinary team, 'VooRuit met VR', is since 2016 working on developing a VR system that therapists can use to treat patients in forensic mental healthcare. The project group consists, at the point of writing, of nine different stakeholders from Stichting Transfore: one student, two former patients, one mental health psychologist, one forensic social worker, one psychotherapist, two researchers and one policymaker. Moreover, a mental health psychologist and a researcher from De Waag, a Dutch outpatient forensic mental health centre, are also involved in the project (Transfore, 2020). The development process of the VR application is supported by the CeHRes Roadmap .

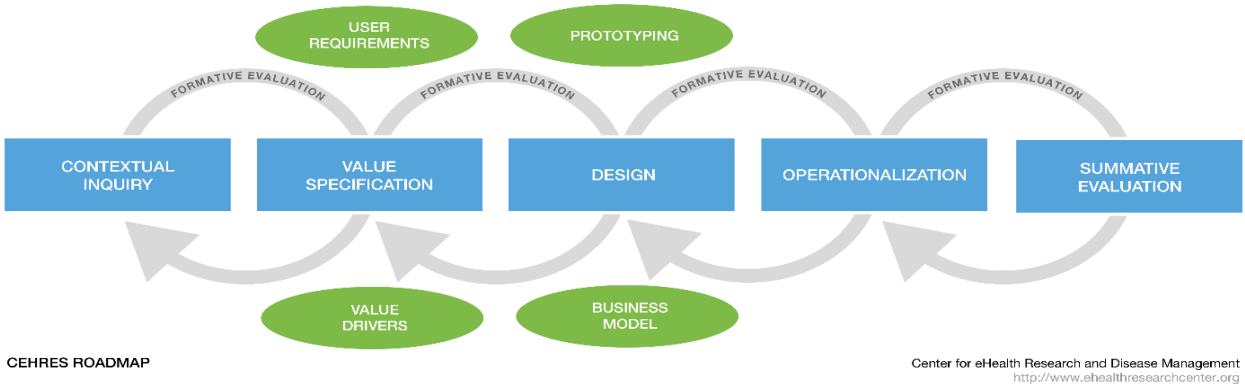


Figure 1 CeHRes Roadmap. Reprinted from: eHealth Research, Theory and Development: A Multi-Disciplinary Approach. Kip & van Gemert-Pijnen. 2018. P.133. New York. Routledge.

The CeHRes Roadmap, shown in Figure 1 (Kip & van Gemert-Pijnen, 2018), serves as a guideline for eHealth development, implementation and evaluation involving all stakeholders. The CeHRes Roadmap consists of five intertwined phases with connecting cycles:

1. Contextual inquiry: This phase is about finding the best fit between technology, its users, other stakeholders and the environment. Furthermore, the added value of the eHealth technology is specified during the contextual inquiry.
2. Value Specification: The results of the Contextual Inquiry are used to specify in what way technology can be of added value for the stakeholders and what it should be able to do.
3. Design: The values determined in the Value Specification translated into functional requirements serve as input for the development. The usability of the prototypes should be tested, and persuasive elements and behaviour change techniques need to be added.
4. Operationalization: Creating a plan to ensure introduction and long-term use in practice. Besides, concrete activities for implementation must be determined.
5. Summative evaluation: The influence and role of the technology on health, the context, behaviour and stakeholders' perspectives are studied via evaluations to research impact and uptake of the technology.

The connecting cycles are formative evaluations in which backward and forward evaluation takes place and the fit between technology, stakeholders and context is ensured (van Gemert-Pijnen et al., 2018).

By co-creating together with different stakeholders and considering the different patient types and stakeholders' values the project group aims to develop a VR application that fits the context of forensic mental healthcare. The development process, in which different stakeholders participated, resulted in an idea for a VR application: Triggers & Helpers. This VR application can be operated using a control panel and the therapist has the option to record the voice of the virtual character. The voice is distorted by special software so that the client does not experience the voice of the therapist. It is also possible to provide guidance and instructions during the VR treatment. With the support of the VR application patients can identify and be exposed to personally relevant triggers for undesired behaviour, such as drugs or specific noises. Once triggers are identified, the patient can practice with 'helpers', which are coping mechanisms that can support them in dealing with these triggers. The VR application allows patients to practice behaviour in a highly personalized way which is a unique addition to the current treatment.

At the point of writing, the project group has come to finalizing the exact design of the VR application together with the developer CleVR. Previous phases of the development process focussed on specifying the added value of VR in forensic mental healthcare and what it should be able to do (Kip et al., 2018a; Kip et al., 2018b). Based on previous research on the benefits of the current treatment, likes, dislikes and suggestions for VR in the forensic mental healthcare setting, a list of values (Table 1) has been drawn up and a first idea is developed. A detailed description of the process for these phases can be found in previous studies (Weerink, 2017; Kuiper, 2018; Kip et al., 2019a; Kip et al., 2019b; Kip et al, 2019c).

2.2 Research design

This study uses a "multi-method design", a multi-method design is the conduct of two or more qualitative and or quantitative research methods (Seawright, 2016). The results of these methods are combined to answer and assess all research questions together. Figure 2 shows all methods used in this study. The formative evaluations are performed to search for points of improvements and identify whether the prototypes are in line with the previously determined values. Previous phases of this project provided input for the Contextual Inquiry and the Value Specification. During these phases multiple methods were performed in which the benefits of the current treatment, likes, dislikes and suggestions for VR in the forensic mental healthcare setting were gathered, a list of values was drawn up and a first idea for the VR application was developed. Additionally, the generation of the requirements is kept central during the research process.

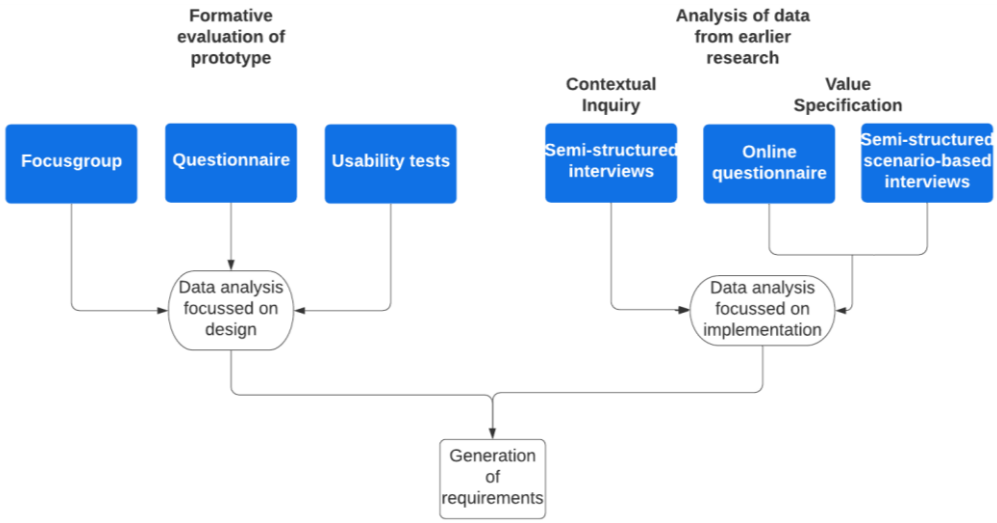


Figure 2 Research Design: All methods used

2.3 Formative evaluation of prototypes

This section contains the reports of the formative evaluations of the prototypes by performing a focus group, a questionnaire and semi-structured interviews with think-aloud.

2.3.1 Focus group

Participants

Seven project group members were present during the project meeting in which the focus group took place. All attendees were from Stichting Transfore: one former patient, one psychologist, one psychotherapist, two researchers, one policymaker and an intern Health Sciences student. Furthermore, two project managers from CleVR, the developer of the VR application, attended the meeting to present the first version of the prototype of the VR application.

Materials & Procedure

Prototype version 1

The first prototype version of the VR application was based on the previously determined values. This prototype of the VR application was delivered by the developer CleVR in the form of a PowerPoint presentation containing screenshots of the design, Appendix A.

The prototype starts with the user choosing between creating a new VR session or use a VR session that was previously used with this patient. When choosing to start a new VR-session the user must fill in several settings, such as the world and the type of session to create a new session. Next, the location in the world in which the VR session will take place has to be chosen. When a location is selected the application views whether and which location elements are available, see Figure 3. Location elements are elements that are only available in certain locations, such as grabbing a bottle of alcohol at the office from the desk drawer. After the location has been chosen, the user can pick which characters will be used during the VR session. The characters can be given a look (hair, clothing, etc), a name, behaviour (neutral, intense, etc) and voice, which can be loaded and saved for future VR sessions. Furthermore, the user can

mark which voices are their favourite. Next, the user can choose the triggers and helpers for the session. Triggers and helpers are events that can influence a patient's behaviour and can be deployed during the VR session, for example, a dog barking or a group of officers walking by. Moreover, the user can search for triggers and helpers and save and load them. The triggers and helpers are divided into folders with three main categories: ambient sounds, music and location elements. After the settings are filled in the VR session can be started. The screen that is viewed during the VR session allows the user to select different emotions, standard actions and specific character actions. Furthermore, location elements can be inserted and there can be searched for other content such as triggers and helpers. Besides, in this screen the character that the therapist speaks through and the perspective of the patient can be switched. Lastly, CleVR added an option for different navigation with pop-ups instead of sequentially as described above.

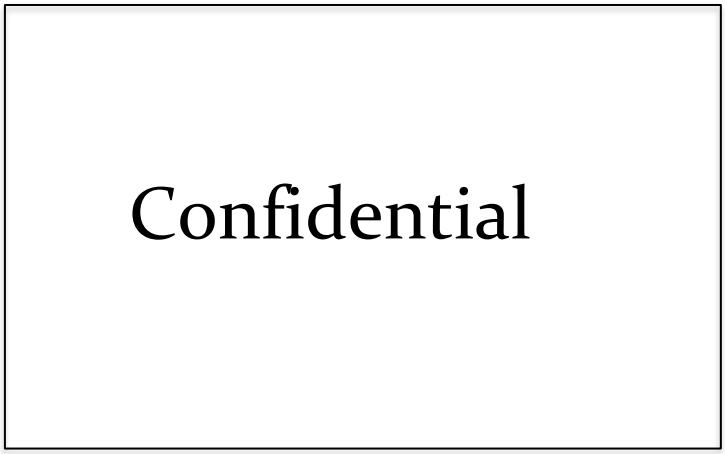


Figure 3 Prototype version 1 (Confidential)

Procedure

A topic list was created before the meeting to discuss all topics. First, the predefined values were repeated and discussed. Next, two project managers from CleVR presented the prototype. The project group was asked to make notes individually during the presentation on unclarities, or points of improvement and things they were satisfied with. After the presentation, the project group was given the opportunity to voice their notes and discuss them with the other project group members and project managers from CleVR. Lasty, recommendations for the next prototype that originated from the notes of the attendees were drawn up. The student present during the meeting made extensive notes of all that was discussed.

Analysis

First, the notes were read and marked based on elements that are relevant to the research question. The marked notes were merged into points of improvement for the design and the things attendees were satisfied with. Then the marked notes were coded and structured under the predefined values. By discussing with a co-researcher, adjustments were made to the existing codes when necessary. A coding scheme was created with all codes, definition of the codes and corresponding fragments from the focus group.

2.3.2 Questionnaire

Participants

The questionnaire on the terminology and icons used in the first prototype version of the VR application was filled in by three members of the project group. One mental health psychologists from Stichting Transfore, one mental health psychologists of De Waag and a researcher from De Waag

Materials & Procedure

Questionnaire

A questionnaire was made through which opinions could be gathered on the terminology and icons used in the first version of the prototype of the VR application. The questionnaire contained screenshots of the first prototype version of the VR system. In these screenshots, the terms and icons that raised unclarity were marked by placing a dot close to the terms and icons. A comment was added to the dots to which the participants could respond, see Figure 4. The questionnaire used for this method can be found in Appendix B.

Figure 4 Questionnaire Terminology & Icon use (Confidential)

Procedure

The participants were asked to respond to the comments regarding whether the terms and icons covered the subject, whether the terms and icons are clear and when necessary what other terms or icons are suggested. At the bottom of the last page, the participants were given the space to give additional comments.

Analysis

For the data analysis, the collected data was transferred into an Excel document. In this document, it was made visible which terms and icons the participants commented on. From here the suggestions were drawn up and an inventory was made of how often the same suggestion was given for a certain term or icon. A table has been created with the old terms and the new suggestions in consultation with a co-researcher and the rest of the project group. Lastly, new codes codes regarding the terminology and icons used in the design of the VR application were created and divided un the predefined values from Table 1 when necessary.

2.3.3 Semi-structured interviews with think-aloud

Participants

Semi-structured interviews with thinking-aloud among six members of the project group were conducted. Four of the six participants where from Stichting Transfore, one researcher, one policymaker, one mental health psychologist and one (ex-) patient. The other two participants work at De Waag one as a mental health psychologist and the other one as a researcher.

Materials & Procedure

Prototype version 2

The second prototype was created by applying the feedback obtained during the previously described focus group and questionnaire in which the first prototype version was discussed, Appendix C. This prototype was also delivered in the form of a PowerPoint presentation with screenshots of the design. Besides, a project manager from CleVR added a recording to the presentation to provide additional explanations on how the design was established.

In this prototype version, the user can start with choosing whether to create a new VR-session ore use an existing template. Templates are fully filled in VR sessions that can be stored and reused. When a template is selected, four squares show the settings of this VR session. Next the setting can be adjusted, using the tabs on the left of the screen, see Figure 5. The user can also choose to "Load world" to start the VR session directly. When the user wants save settings a pop-up shows with which the user can specify the accessibility of the VR session, which are: for this client, this therapist or anyone on the system. First, the type of VR session must be filled in. Next, the user can choose whether to fill in the world or opponents first. For the opponents, the voice distortion profile can be selected, and characters can be added and removed with + and - icons. The user can also give the character a name, behaviour and a voice. Besides, the characters can be loaded and saved. After this, the world must be set. The triggers and helpers can be selected next, the folder icons from the first prototype have been replaced with icons that match the terms. The triggers and helpers can be selected as such, for distinction. Furthermore, the design for the type "walking around the bus" is added to the prototype. The user can fill in the crowdedness of the bus, the bus lay-out and the environmental factors. Next, the settings for social factors are viewed, with settings such as the profile group. The screen during the VR was not altered much, only the amount of triggers en helpers was set to a maximum of eight.

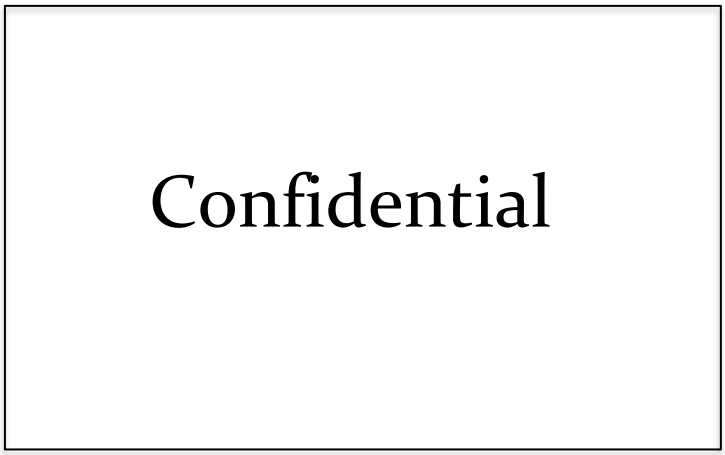


Figure 5 Prototype version 2 (Confidential)

Procedure

Firstly, an email to all project group members individually was sent. This email contained an invitation for an appointment via Teams/Skype to review the second version of the prototype provided by CleVR and the informed consent. The concept designs of the interface of the dashboard of the VR system were delivered in the form of a PowerPoint presentation. Semi-structured interviews with thinking aloud were used to evaluate the second prototype version of the prototype. The interview scheme created for this method included the pre-defined steps

that had to be performed during the interview. Furthermore, questions were added to gain information on the prototype in general. First, a short introduction on where this prototype originated from and what the interviewer wants to gather from this interview was given. The participants did not prepare for the interviews. Second, the screen with the presentation was shared by the interviewer. The participant was allowed to think-aloud whilst viewing the presentation together with the interviewer. After viewing the presentation, the participant was given the opportunity to ask additional questions or give comments. Next, the interviewer asked three general questions: 'What do you think of the design now?', 'What do you like?' and 'What can be improved generally?'. The interview scheme was used but there was room for deviation to gain more additional and detailed information. For example, when the respondent said something interesting or if the researcher does not fully understand what the respondent meant another question on the topic was asked. Finally, the researcher thanked the participant for their time and effort and repeats that a summary of the input of all participants will be made and shared and when necessary a digital appointment with all project members to further discuss certain points will be made. The interviews were recorded via Microsoft Teams or Zoom and lasted between 25 and 50 minutes per interview excluding reading and signing the informed consent, Appendix D. The participants were able to cease the interview voluntarily.

Analysis

The interviews were transcribed verbatim using the audio of the mp4 files. Before starting with coding, the researcher read the transcripts to become more familiar with the content. The transcripts were analysed through deductive and inductive coding. Firstly, deductive coding was applied to the first three interviews in which fragments that were related to the predefined values were marked (Kip et al., 2019b). Next, inductive coding was carried out in which subcodes were created that were not determined in advance but were based on the content of the fragments (Chandra & Liang, 2019). These subcodes were then linked to the predefined values and based on this a coding scheme was created. After this, the other three remaining interviews were coded using the coding scheme. When a fragment did not correspond with one of the subcodes of the existing coding scheme, a new subcode was made. Furthermore, by discussing with a co-researcher, adjustments were made to the existing codes when necessary.

2.4 Earlier research

This study used data sources form earlier research to search for input for requirements for the implementation of a VR application for in the forensic mental healthcare setting, see Figure 2. A detailed description of the methods performed during earlier research, the Contextual Inquiry and Value Specification, can be found in previous studies (Weerink, 2017; Kuiper, 2018; Kip et al., 2019a; Kip et al., 2019b; Kip et al, 2019c).

2.4.1 Contextual Inquiry: Semi-structured interviews

Semi-structured interviews with the key-stakeholders took place by using a variation of the scenario-based method. Eight therapists and three patients of Stichting Transfore were interviewed and asked to create scenarios of treatment situations in which elements from the current treatment program could benefit from VR. This gave more insight into the possible improvements. For more information about the method used in this earlier research, reference is made to the thesis from Weerink (2017) and articles from Kip et al (2019a; 2019b & 2019c).

2.4.2 Value Specification: Online questionnaire

Participants were included in the online questionnaire if they were a patient/ex-patient(n=19) of forensic mental healthcare, a therapist(n=89) of forensic mental healthcare, or another stakeholder(n=37) of VR for forensic mental healthcare. Based on the results of the Contextual Inquiry (Weerink, 2017) the project group created six ideas for possible a VR application with the themes: Triggers & helpers, Observing and interpreting body language, Body language and effect on others, Roleplaying in context, Moments of choice and Crime scenarios. For this research, the answers to three open questions about the ideas were used:

1. What do you find positive, interesting and/or enjoyable about this idea?
2. What do you find negative, less fun and/or disadvantageous about this idea?
3. What suggestions or ideas do you have to make this idea better?

For the analysis all fragments that considered the implementation were selected. Reference is made to the thesis from Kuiper (2018) and articles from Kip et al (2019a; 2019b & 2019c) for more information on this online questionnaire.

2.4.3 Value Specification: Semi-structured scenario-based interviews

Semi-structured scenario-based interviews with ten patients and twelve therapists were conducted to analyse if their values were properly represented within the new more tangible idea, using a Lo-fi prototype and scenarios, for a VR application for forensic mental healthcare. Another aim was to grasp which improvements needed to be made to the tangible idea to make it suited to the values. The interviews consisted of three parts, part one: the more tangible idea was explained, part two: the opinions of the stakeholders about the general idea were asked and part three: improvements for the personalisation options of the idea were discussed. For this study part two and three of the interviews were used to analyse whether and how the implementation of the VR application was considered by the participants. Reference is made to the thesis from Kuiper (2018) and articles from Kip et al (2019a, 2019b & 2019c), for more information on the method used in this earlier research.

2.4.4 Data analysis

Before starting with analysing, the researcher read the data to become more familiar with the content. The data was analysed deductively using the three of the five major domains from the Consolidated Framework for Implementation Research (CFIR), Intervention characteristics (technology), Characteristics of individuals (patients and therapists) and Implementation process (organisation) (Kip et al., 2020). First, all the fragments concerning the implementation were selected, after that the fragments with content that corresponded with three domains from the CFIR were marked. Next, based on the content of the fragments, codes were created inductively. Moreover, by discussing with a co-researcher adjustments were made to the codes when necessary. Together, this created a coding scheme containing input for requirements for the implementation of a VR application for forensic mental healthcare gathered from data in earlier research.

2.5 Data synthesis: requirements generation

For the data synthesis, different data sources were analysed. After completing the two coding schemes for the design and implementation, the codes needed to be translated into requirements. Van Velsen et al (2013) researched designing eHealth via a multidisciplinary requirements development approach, which is in line with the CeHRes Roadmap used as a framework in the development of the VR application for forensic mental healthcare. First, the attributes needed to be determined by the researcher. An attribute is a summary of the need or wish spoken out by the end-user or stakeholder. For this research, all codes found in the formative evaluations and data analysis from earlier research were translated into attributes. The attributes were grouped based on the content of the predefined values. Hereafter, the researcher determined whether the attributes are correct and distinctive and when necessary adjusted them in consultation with a co-researcher. Ultimately, per attribute, one or more requirements were formulated. There are different types of requirements, this study focuses on 'User (stakeholders) requirements', 'Functional requirements', 'Non-functional requirements' and 'Implementation requirements' (IIBA, 2009). A data analysis table is created in which the above is organized. After this, the requirement template (Table 2), with parts from the requirement template from van Velsen et al (2013), is filled in for each requirement.

Table 2 Template for filling in requirements

Requirement #:		**Requirement type:**
Code:		**Attribute:**
Description:		
Source:	**Priority:**	**Conflicts:**

The requirement is given a ***number***, which makes them easier to find and refer to. For this research the values were used as ***requirement types*** to divide the requirements under, which means multiple requirements can belong to the same requirement type. Besides, the template contains the ***code*** it refers to, the ***attribute*** and a ***description*** of the requirement. The requirements were linked to a ***source,*** for this research for example the focus group or Contextual Inquiry. For the priority of the requirements, the MoSCoW method is used. The MoSCoW method can be used to prioritize the importance of the requirements based on the opinion of the stakeholders and consists of four prioritization categories (Must have, Should have, Could have and Won't have) (Vestola, 2010). If applicable, conflicts, suggested by the researcher, are named. The filled-in requirement templates can be used for the development of the VR application.

3. Results

3.1 Formative evaluation of prototypes

3.1.1 Focus group

A coding scheme was created to display the codes found in the focus group, Table 3. Firstly, the terminology & icon usage and the presence of clarifying descriptions were named as important for the design of the VR application. Moreover, the participants of the focus group named the possibility of working intuitively and navigating easily through the application as essential. Furthermore, a new value regarding 'Privacy' was created, since it was named by the participants as an important aspect that the patient privacy needs to be guaranteed when sensitive information from the templates is shared with others on the system.

Table 3 Overview of input for requirements for the design of a VR application for forensic mental healthcare gathered in a focus group with project group VooRuit met VR.

Values	*Subcodes*	Definitions of subcodes and new value *Privacy	*Quotes*
Practically easy to use in current treatment	*Icon usage*	The VR application containing icons in the interface that can support the therapists in recognising the represented functions of the application without the need for extra instruction and fit within the discipline of the therapists.	*"Add icons and colour to indicate which one it is. Overall make sure it is understandable for the therapists".*
	Terminology	The VR application containing terminology that is understandable, fits within the discipline of the therapists and does not overlap with other terms used in the field of the therapists.	*"Use suitable names for the therapists to identify the Triggers and Helpers."*
	Clarifying descriptions	Descriptions providing explanation should clarify images and terms used in the interface of the VR application that are perceived as unclear by the therapists.	*"Adding an explanation of what the user can do in the Triggers and Helpers screen".*
	Working intuitively	The design of the VR application being easy to understand for therapists and operable without explicit instruction.	*"Using folder icons still makes it look very technical, this should be changed into something that is more useful and intuitive for therapists".*
	Flexible navigation through application	When navigating through the VR application, there should be a clear overview of where the user is in the procedure of creating a VR scenario and it needs to be easy to click between screens.	*"The user should be able to go back and forth easily and should also be able to see this easily".*
***Privacy**		The VR application should make it clear that the privacy of the patients is guaranteed.	*"Paying attention to privacy and data protection when creating folders. Direct what the users add and what is visible to the other users".*

* New created and added value

3.1.2 Questionnaire

The results of this questionnaire showed that the icons were perceived as clear, but several terms needed extra attention. Different suggestions for new terms were given by the participants, such as 'Content beheer' which has been replaced by 'Beheer van inhoud', 'Type' which has been replaced by 'Oefening' and 'Custom' which has been replaced by 'Maatwerk'. The terms were discussed with a co-researcher and the rest of the project group. Appendix E shows all terms that were unclear with the new suggestions. No changes were made to the previous coding scheme since the terminology and the use of icons was already included in the coding scheme in response to the focus group.

3.1.3 Semi-structured interviews with think-aloud

The semi-structured interviews with think-aloud aimed to gather input on unclarities, points of improvement, things that were sufficient and the opinion on prototype version two in general. Because the semi-structured interviews with think-aloud focused mostly on the design of the application, subcodes were found for the values 'Cooperation between patient and therapist', 'Practically easy to use in current treatment', Widely applicable' and 'Privacy'. The results of the formative evaluations with prototype version 2 showed that for the design of the VR application the possibility of involving the patient and setting up a personalised VR session are of importance to the stakeholders. Moreover, to create a design for the VR application that is practically easy to use in current treatment, the icon usage, terminology, the presence of clarifying descriptions, working intuitively and flexible navigation through the application should be considered. Furthermore, the VR application should give the therapists the ability to share their knowledge and experience with VR with others on the system and it should be made clear that the therapists need to be made aware of the responsibility in protecting patient privacy. Subcodes for other values such as 'Insight into behaviour, thoughts and feelings' and 'Treatment motivation' were not found. Table 4 shows the coding scheme in which each subcode and newly added main code is explained and substantiated with quotes from the interviews.

Table 4 Overview of input for requirements for the design of a VR application for forensic mental healthcare gathered in semi-structured interviews with think-aloud with members from the project group VooRuit met VR.

Values	*Subcodes*	Definition of subcodes	*Quotes*	Int.
Cooperation between patient and therapist	*Involving patient in creating VR session*	The design of the VR application should allow for the patient to contribute their own input when filling in the settings for the VR scenario, such as the location, the other virtual characters and triggers & helpers, together with the therapist.	"As a therapist, you can, therefore, indicate that you call a character boss Harry or brother Mark. So, that it becomes recognizable to the client and you can say that you are now going to make your boss or your brother." (screen 7)	3/6
	Setting up a personalised session	Introducing VR during a treatment session, in which the therapist and patient can get familiar with the system and all personal influencing factors of the patient for the settings of the VR scenario can be mapped.	"It would be nice to become more familiar with the system before starting to use it, for example when you are gathering the personal input from the patient for the set-up of the VR scenario" (screen 9)	6/6
Practically easy to use in current treatment	*Icon usage*	The VR application containing icons in the interface that can support the therapists in recognising the represented functions of the application without the need for extra instruction and fit within the discipline of the therapists.	"I find the use of icons nice because I noticed when I had a session with a patient, I had chosen for him to stand only when we started the session it became clear that he had to sit. It is nice that there now is an icon showing whether the patient has to sit or stand."(screen 6)	6/6
	Terminology	The VR application containing terminology that is understandable, fits within the common language of the discipline of therapists and does not overlap with other terms used in the field of the therapists.	"The text used in the prototype needs to be reviewed, a little more use of common language and no English terms." (prototype in general)	3/6
	Clarifying descriptions	When terms, icons and images remain unclear for the therapists, descriptions need to be provided to support the use of the application and clarify terms, icons and images used in the interface of the VR application.	"I also see descriptions as an advantage I noticed with practicing with the application that walking around was still difficult. But when I understood what all those options mean and what you can do with them it was clearer. An additional description does provide more clarity then." (screen 13)	5/6
	Working intuitively	The design of the VR application being easy to understand for the therapists and operable	"It does look neat and I imagine it's less intimidating for nontechnical people, the	6/6

		without any practice or knowledge of the application.	therapists just have to use their intuition"(screen 10)	
	Flexible navigation through application	When navigating through the VR application, there should be a clear overview of where the user is in the procedure of creating a VR scenario and it needs to be easy to click between screens.	"I remember that in the first version you had to perform everything step by step, first role-play or walk around and then the rest, there was no menu. Now everything is situated in the left column and there is a bit more coherence."(screen 6)	6/6
Widely applicable	*Sharing knowledge and experience*	Therapists sharing their knowledge and experience by creating and sharing VR sessions, with pre-set settings such as characters and triggers, that other therapists on the system can use in their treatment.	"When I look at our outpatient clinic, some people there are more trained and are more concerned with the application and those people can, for example, also set up a session for the others and in this way colleagues who are less experienced can be helped by offering sessions to try."(screen 5)	4/6
Privacy	*Protecting patient privacy*	Providing clarity to the therapists about their responsibility when sensitive patient information, such as custom-made triggers & helpers and characters, is used to create a VR session that will be shared with other users of the VR application.	"Privacy is an important topic, I think it is very important that as a therapist you must be very aware that you do not use complete names and personal data if this information is also visible to other therapists or even other clients, but that is a responsibility that we all have ourselves."(privacy)	4/6

3.2 Earlier research

The data analysis of earlier research aimed to gather input for the generation of the requirements for the implementation of the VR application. The created subcodes are based on the content of the fragments and divided under four parts of the domains from the CFIR namely the characteristics of the technology, patients, therapists and organisation. These main categories are now referred to as values. The results showed that the relative advantage of the technology for the patients and therapists can influence the implementation of the technology. When the patient is considered that the resistance, appropriateness, necessities for the decision to start with VR and aftercare are important. When implementing VR for the therapists they want to receive technical and training on the content of the intervention. Moreover, the implementation of the VR application in the current treatment needs to be accepted by the therapists. The organisation should consider creating of a protocol for the use of the VR application and attention should be drawn to the possibilities of VR in the treatment of forensic patients. A safe and accessible place should be created by the organisation where the VR system can be set up. Besides, the organisation should offer training and support to therapists that use the VR application. A coding scheme was created to visualize the found subcodes, each subcode is defined and substantiated with quotes from the data from earlier research, Table 5. The three columns on the right of the coding scheme represent the number of interviewees or participants that mentioned something regarding the specific subcode. Since none of the methods were focussed specifically on gathering input for the implementation, the number of participants or interviewees mentioning things regarding implementation is not high.

Table 5 Overview of input for requirements for the implementation of a VR application for forensic mental healthcare gathered from earlier research. (1= Semi-structured interviews, 2*= Online questionnaire & 3*= Semi-structured scenario-based interviews).*

Values	*Subcodes*	Definition	*Quotes*	*1** Int.	*2** Parti.	*3** Int.
Technology	*Relative advantage*	The perception of the therapists and patients on the advantage of the VR application for in the treatment of forensic mental healthcare.	*"I see an advantage in using VR for in the treatment of anxieties since it offers the opportunity to face them in a realistic environment" (Interview VS)*	2/11	3/145	4/22
Patient	*Resistance*	The forensic patient group can have suspicion and fear of what a VR session can cause regarding their mental health problems and treatment motivation, this should be considered when implementing the option for VR in the treatment.	*"I just spoke to a few patients and then it is immediately clear that they get a kind of suspicion, a fear of the unknown. And they do not like to wear such glasses. So I think the threshold to participate is actually quite high."(Interview VS)*	1/11	2/145	3/22
	Appropriateness	When offering VR for the treatment, the quality of VR being suitable for the individual patient needs to be considered, since the forensic patient group has a very heterogeneous character.	*"But I assume that we look very specifically: which patient fits this and which patient does not. Because I think it can be used for many people, but certainly not for everyone." (Interview VS)*	1/11	5/145	15/22
	Necessities for decision to start with VR	Before making the decision to use VR in the treatment, the patients should have a confidential bond with the therapist and receive explicit information and experience VR in advance.	*"I think that it is important that you are included into what the possibilities are and everything that happens when you use it before you start with using it." (Questionnaire VS)*	2/11	-	9/22
	Aftercare	After using VR in treatment, the therapist needs to reflect on the session with the patient and if necessary, deal with negative emotions of the patient.	*"If it really catches on and someone becomes really angry. You shouldn't say go home now, you should pay attention to that, a sort of aftercare with cooling down."(Interview VS)*	-	-	6/22
Therapist	*Technical training*	The therapists that are going to use the VR application in the treatment of their patients should receive technical training on how to use the system in their treatment.	*"Then I think there should be special training courses available for that. Because not everyone is equally handy with such things."(Interview VS)*	2/11	5/145	6/22

	Training on the content of the intervention	The therapists that are going to use the VR application in the treatment of their patients should receive training on the content of the intervention on how to build VR sessions that suits their patients' needs and wishes.	*"It seems difficult to build such a scenario and gathering influencing factors of the patients and knowing which ones to apply into the scenario. There should also be paid attention to this when training the staff."(Interview VS)*	-	1/145	2/22
	Acceptability	In order for the therapists to accept the technology, the first impression and experience with VR and their perception on whether they find VR to be appropriate for in their treatment should be considered.	*"You have staff here, some of them are 60-year-olds, then you shouldn't have to ask them to just use such a thing in their treatment. Because they have always done it their way for 40 years and then they have to use such glasses at once?"(Interview VS)*	-	3/145	5/22
Organisation	*Creating protocol*	The organisation creating a protocol for using VR in the treatment should sustain the embedment of the VR application into the treatment.	*"I think it would be good if possible options or ideas or examples from practice were presented in a protocol. So that you have an idea of how you are going to use that. I think it will be used more then."(Interview VS)*	1/11	-	3/22
	Draw attention	The organisation should pay attention to attracting the therapists and patients to notice the possibilities of VR in the treatment, by putting up posters and appointing promotors.	*"Creating awareness about VR in the treatment among the team is also important. If one person is enthusiastic about it and he or she can get others in the department interested in this then it will be accepted more quickly." (Interview Value Specification)*	-	-	5/22
	Safe accessible place for system	The organisation should create a space were the VR system can be set up, that feels safe for the patients and can be accessed easily by all users.	*"Yes it is easy to use, but then there must be a specific safe space for it, that can also be used and accessed."(Interview VS)*	-	3/145	4/22
	Offering training	Technical and training on the content of the intervention should be offered by the organisation for therapists that want to use the VR application in the treatment of their patients.	*"Then it might be a bit difficult for the practitioners to use the equipment and build those environments. But once they are trained, I think it is all pleasant for the patient." (Interview VS)*	-	2/145	6/22
	Offering support	The organisation should offer support for the therapists who use VR in treatment when there are questions or uncertainties.	*"I think that support among staff must also be good if it is going to be used."(Interview VS)*	-	-	3/22

3.3 Data synthesis: requirement generation

Requirements for the VR application are drawn up based on the generated codes gathered from the focus group, questionnaire, semi-structured interviews with think-aloud and the data analysis of earlier research. For each code using the quotes gathered from the data, the attributes are determined. The attributes are formulated as a very short summary of the stakeholder expression. Per attribute, one or more requirements were formulated, specifying the stakeholder expression into terms a system designer can work with. The requirements are prioritized based on the MoSCoW technique, which bases prioritization on the opinion of the stakeholders (Must have, Should have, Could have and Won't have) (Vestola, 2010) and a first suggestion from the researcher. The template of Van Velsen et al (2013) is used to structure the requirements.

An example of a filled-in requirement template is visualised in Table 6. The filled-in requirement templates for each of the requirements are depicted in Appendix F. This section holds the list containing all the 49 generated requirements with the values, subcodes and attributes they are based on, Table 7 data analysis table.

Table 6 Filled in requirement template: Requirement #1

Requirement#: 1	**Requirement type**: Cooperation between patient and therapist	
Code: Setting up a personalised session	**Attribute**: Identifying deployable influencing factors	
Description: An overview of questions that the patient and therapist must answer together must be drawn up: - Which type will be used? - Which environmental factors will be present? - Which location with location elements will be chosen? - Which and how many characters are present in the scenario? - Which triggers and helpers will be present?		
Source: Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts**: Multiple introducing sessions could be necessary before patient and therapist are ready to use VR. Time-consuming.

Table 7 Data analysis table requirements generation

Values and subcodes	*Attributes*	Requirements
Cooperation between patient and therapist		
Setting up a personalised session	*Identifying deployable influencing factors*	1. An overview of questions that the patient and therapist must answer together must be drawn up: - Which type will be used? - Which environmental factors will be present? - Which location with location elements will be chosen? - Which and how many characters are present in the scenario? - Which triggers and helpers will be present?

	Introducing VR	2. An introductory session, in which all aspects of VR will be discussed, should be scheduled to familiarize the therapist and patient with the system before starting with VR in the treatment.
Practically easy to use in current treatment		
Icon usage	*Icons for support*	3. The VR application should contain icons for the represent functions, such as Saving, Loading, Favourite, Non favourite, Sound effects, Music, Location elements, Trigger, Helper, Posture client and Amount of characters.
Terminology	*Terminology for support*	4. The VR application should contain terminology that is fitting and understandable for the therapists, such as 'Content management', 'Exercise', 'Location' or 'Setting', 'Opponents' or 'Co-players', 'Voice choice' or 'Voice type', 'Attitude', 'Environment characteristics', 'Custom made' or 'Custom made' , 'Center of the room' or 'Central location in the room' and 'Search for Triggers & Helpers'.
Clarifying descriptions	*Descriptions for support*	5. The VR application should contain the option for a button with a question mark icon to assess descriptions for terms that are not intuitive for the therapists. 6. The VR application should contain descriptions for the terms: Environmental factors, Location elements, Profile group, Approach distance and Save (for client, practitioner & everyone).
Flexible navigation through application	*Menu for navigating*	7. The VR application must contain a menu on the left side of the screen with buttons that show where the user is in the system. 8. The VR application must contain a menu on the left side of the screen with buttons that can be clicked to navigate through the settings of the VR sessions.
	Order for filling in settings	9. The VR application should give the therapists the option to choose the order, world or characters first, in which they want to fill in the settings themselves.
	Filling in settings	10. The VR application should allow the therapists to select favourite character voices. 11. The VR application should allow the therapists to select non favourite character voices. 12. The VR application should give the ability to select a maximum of 8 of triggers and helpers. 13. The application should show the selected triggers and helpers in the treatment screen during the VR session. 14. The application should allow the therapist to navigate from the treatment screen used during the VR session back to the dashboard with settings.
Use application in practice		
Sharing knowledge and experience	*Sharing templates*	15. The VR application must allow the therapists to create templates: fully filled in VR-sessions, based on scenarios created together with the patient, that can be immediately reused. 16. The VR application must allow the therapists to share templates with all therapists that have access to the VR system.

	Saving templates	17. The VR application must allow the therapists to save templates so they can only be used by the same therapist again. 18. The VR application must allow the therapists to save templates so they can only be used with the same patient again.
	Deleting templates	19. The VR application must allow the therapists to only delete templates they created themselves. 20. The VR application must allow the therapists to only delete templates that are not used by anyone for over an X number of months.
	Preview of templates	21. The VR application must show a preview of the selected template, containing the type, location, characters and triggers & helpers.
Privacy		
Protecting patient privacy	*Responsibility of therapists*	22. The VR application must make it clear that therapists have a responsibility when sensitive patient information is used in creating a session that will be shared with other therapists.
	Adding privacy terms to folders	23. The VR application should provide a description to the save button with the privacy terms as to which saving the template to a specific folder (for only this patient, only this therapist or all therapists that have access to the system) could affect the patient privacy.
Implementation technology		
Relative advantage	*Advantage for therapists*	24. When offering the VR application for the treatment of forensic patients, the advantages of VR for the therapist should be addressed by giving explanations on posters or via promoters.
	Advantage for patients	25. When offering the VR application for in the treatment of forensic patients, the advantages of VR for the patients should be addressed by the therapist offering them VR for in the treatment.
Implementation patient		
Resistance	*No obligation*	26. When offering the VR application to patients for in the treatment, the resistance of patients should be considered by addressing that VR in the treatment is not an obligation.
	Always possible to stop	27. When offering the VR application to patients for in the treatment, the patients should be made aware that it is always possible to stop using VR in the treatment.
Appropriateness	*Appropriateness for patient groups*	28. The implementation of the VR application must take the appropriateness for the forensic patient group into account, by considering the suitedness (the possibility of worsening condition, fear, aggression or undesirable behaviour) for VR in the treatment of the individual patient.
Necessities for decision to start with VR	*Explicit information in advance*	29. Before making the decision to use VR in the treatment, the patients must receive explicit information about what VR in the treatment consists of in advance by the therapist offering VR for in the treatment.
	First experience VR	30. The patients should first experience VR during a treatment session, before making the decision to use VR in the treatment.

	Trust between patient and therapist	31.The patient should have sufficient trust in the therapist before deciding to use VR in the treatment.
Aftercare	*Cooling down* *Dealing with negative emotions*	32. After using the VR application in the treatment, aftercare should be applied in which a cooling down should take place to deal with possible negative emotions of the patient.
Implementation therapist		
Technical training	*Training before using VR*	33. The therapists that are going to use the VR application in the treatment of their patients must receive technical training on how to use the system.
Training on the content of the intervention	*Building VR session*	34. The therapists that are going to use the VR application in the treatment should receive training on the content of the intervention on how to build a VR session that suits their patients' needs and wishes.
	Integration into treatment protocols	35. The therapists that are going to use the VR application in the treatment should receive training on the content of the intervention on how to integrate VR in the different treatment protocols.
Acceptability	*First experience*	36. To assure that the VR application is accepted by the therapist they first need to experience working with VR in the treatment of their patients.
	Acknowledge perception	37. To assure that the VR application is accepted by the therapists' perception of the VR application needs to be acknowledged by gathering their thoughts on VR in the treatment of their patients. 38. The first experience and perception of therapists on VR should be considered when implementation activities from the organisation, such as offering training and creating a protocol, take place.
Implementation organisation		
Creating protocol	*Creating protocol for use in treatment*	39. The use of the VR application must be sustained by creating a protocol containing a written explanation on how to work with the VR application in the treatment.
	Examples from practice	40. The use of the VR application must be sustained by providing the therapists with examples from practice in the protocol on how to use VR in the treatment.
	Providing images	41. The use of the VR application must be sustained by providing images in the protocol showing how to use the VR application.
Draw attention	*Putting up posters*	42. The organisation should draw attention to the possibilities of VR in the treatment by putting up posters at locations where treatment is given.
	Appoint promotors	43. The organisation should draw attention to the possibilities of VR in the treatment by appointing promoters, who must be available to provide information.
Safe accessible place for system	*Safe place*	44. The organisation must create a safe place where the system can be set up and used.
	Accessibility	45. The organisation must create an accessible place where the system can be set up and used.
Offering training	*Technical training*	46. The organisation must offer technical training to the therapists that want to use VR in the treatment of their patients.

Offering support	*Training on the content of the intervention*	47. The organisation must offer training on the content of the intervention o the therapists that want to use VR in the treatment of their patients.
	Create website	48. The organisation should create a website for the VR application, which can provide support for the therapists who use VR in treatment when there are questions or uncertainties.
	Appoint supervisor	49. The organisation should appoint a supervisor for the VR application who can provide support for the therapists who use VR in treatment when there are questions or uncertainties.

4. Discussion

4.1 Main outcomes

This study aimed to generate requirements for the design and implementation of a VR application for the forensic mental healthcare setting. In total 49 requirements regarding the design and implementation of a VR application for forensic mental healthcare were generated using the results from all methods performed. First, formative evaluations of the prototypes using a focus group, questionnaire and semi-structured interviews with think-aloud were conducted. The predefined values were used as a starting point to create the requirements for the design. The results of the formative evaluations with the prototypes showed that for the design of the VR application the fit with the current treatment and involving the patient in setting up a personalised VR session were of importance to the stakeholders. Moreover, to create a design for the VR application that is practically easy to use in current treatment, the icon and terminology usage should be fitting with the therapists' discipline, and the therapists should be able to work intuitively and navigate easily and flexible through the application. Furthermore, the VR application should give the therapists the ability to share their knowledge and experience in working with VR in the treatment with other therapists on the system and the therapists need to be made aware of the responsibility they have in protecting patient privacy. For the generation of the requirements for the implementation, data gathered in earlier research was used. Attention was paid to the factors regarding the characteristics of the technology, patient, therapist and organisation. The results from the data analysis showed the importance of the relative advantage of the technology for the stakeholders. The resistance of the patients and the appropriateness for the individual patients need to be considered. Moreover, the patients have necessities when deciding to start with VR and aftercare are important. The therapists want to receive technical and training on the content of the intervention on how to use VR in the treatment. Moreover, the VR application for in the treatment of their patients' needs to be accepted by the therapists. For the therapists to accept the VR application for in the treatment of their patients, the perception on whether they find VR to be appropriate for in their treatment should be considered. The organisation should create a protocol for the use of the VR application and attention should be drawn to the possibilities for the patients and therapists when using VR in the treatment. A safe and accessible place to set up the VR system should be created, and the organisation should offer training and support to therapists that use the VR application. In the next section, the main findings of the study will be discussed.

Formative evaluations with stakeholders

The CeHRes Roadmap, which is used as a framework in this study, shows that a successful development process can be realised when all important stakeholders are actively involved in all phases (van Gemert-Pijnen et al., 2018). During the formative evaluations of this study, the prototypes were continuously tested and evaluated with different stakeholders. Performing the methods with different stakeholders, in which the prototypes were tested, provided valuable

insights, such as the use of icon and terminology and being able to navigate flexibly through the application, to improve the design of the VR application. Moreover, it was researched whether the prototypes were in line with the previously determined values and finding points of improvements for the design of the VR application. Continuously evaluating the prototypes is meaningful for other researchers who are designing an eHealth intervention, since it ensures that the needs and wishes of the stakeholders involved are met. Furthermore, using think-aloud as a method allows to find more severe and recurring problems in the design. Most participants already were involved in the project, which meant they were already known with the VR application. Including more naïve participants could have yielded more input from different and lesser informed perspectives.

Importance of VR being practically easy to use and embedment into current treatment

Most subcodes for the design of the VR application were found for the value 'Practically easy to use in the current treatment', which shows the importance of this for the stakeholders. Therefore, the implementation of the VR application should be considered. The therapists want the VR application to be practically easy to use in the current treatment because they do not want to add complicated technologies to their treatments, causing more effort from their already demanding work (Brown et al., 2017). Moreover, when a technology is easy to use and fits well with the current treatment and habits of the therapist it can be of added value instead of taking extra work (Keyworth, Hart, Armitage & Tully, 2018). The stakeholders must be involved in the development process from the start because this results in a design that is developed together with the end-users which will ensure a good fit with the current treatment and habits of these end-users (van Gemert-Pijnen et al., 2018). The semi-interviews with think-aloud regarding the second prototype version showed a progress in ease of use for the therapists compared to the first version. This shows that the recommendations, for the first prototype version, made by the stakeholders contributed to a better fit with the end-users.

This research also shows that the icons, terminology and clarifying descriptions used in the design of the VR application should be understandable and fit within the discipline of the therapists (McAran & Shaw, 2020). By adding these parts to the design of VR the ease of use will increase and it will be less time-consuming and ensure a fast and efficient search for information (Black, 2017; Schulz, Rodrigues, Rector & Chute, 2017). Moreover, the stakeholders found that the navigation through the application was preferred to be logical and flexible instead of sequential. Besides, a poor navigation structure asks for extra effort from the user when clicking through an interface and trying to find relevant information (Earnshaw, Tawfik & Schmidt, 2018). When looking at the implementation of eHealth into practice multiple issues, such as low acceptance of the technology and lack of knowledge on how to use it in the treatment, are experienced (Doherty, Coyle, Matthews, 2010; van der Vaart et al., 2014). This research gathered multiple factors, in the methods performed with different stakeholders, that could contribute to the implementation of eHealth such as the resistance and appropriateness of the patient group,

the training of therapists and the organisation having to create a protocol for the use of the technology and offering support to the therapists.

Reflection on approach

This study used multiple data sources of earlier research to gather input for the requirements of a VR application for in the treatment of forensic mental healthcare. The data was gathered by the semi-structured interviews from the contextual inquiry and the online questionnaire and semi-structured scenario-based interviews from the value specification were coded deductively. For this, three of the five major domains from the Consolidated Framework for Implementation Research (CFIR), Intervention characteristics (technology), Characteristics of individuals (patients and therapists) and Implementation process (organisation), were used (Kip et al., 2020). The domains used from the CFIR supported creating the subcodes. These subcodes helped to create a better understanding of the point of view from the characteristics of the technology, patients, therapists and organisation towards the implementation of a VR application for forensic mental healthcare. The domains 'Inner setting' and Outer setting' from the CFIR were not exposed during this study. Further research into the implementation of the VR application should consider these domains. The generated requirements based on the codes found can be used to adapt implementation guidelines and modify learning and supporting activities which makes them more relevant to the patients and therapists. This is in line with the constructs of an effective implementation associated with the CFIR implementation model (Keith et al., 2017).

4.2 Strengths & Limitations

The CeHRes Roadmap centralises participatory design, which is one of the strengths of the present research (van Gemert-Pijnen et al., 2018). In the contextual inquiry and value specification, all stakeholders were identified and assessed to define the added value of the VR application. Involving stakeholders contributes to keeping their perspectives, needs and wishes central continuously during the whole development process (van Gemert-Pijnen et al., 2018). Moreover, the involvement of stakeholders such as the forensic patients, can increase the social impact of the developed intervention (Abma et al., 2017). During this study a focus group, questionnaire and semi-structured interviews with think-aloud regarding the design of the VR application took place. The end-users, therapists and (ex-)patients and other identified stakeholders, such as a policymaker and researchers participated in the methods. This resulted in outcomes from different stakeholder perspectives, which can be seen in the codes found. Some codes focussed more on the cooperation with the patient whilst others are more targeted to how VR can be embedded into the current treatment.

Due to the restrictions of the COVID-19 virus recruitment of therapists and patients outside of the project group was not feasible, which is a limitation of this study. Therefore, only the input members of the project group VooRuit met VR was gathered and the input of therapists and patients was less than planned in advance. The end-users, consisting of both

therapists and patients, were identified in earlier research as the key-stakeholders (Weerink, 2017). Unfortunately, for the semi-structured interviews with think-aloud, only two therapists and only two former patients were included. This could have created a distorted view on the VR application, due to the limited input from the perspectives of the key-stakeholders. Nevertheless, other stakeholders were interviewed, therefore enough input could be collected which can be seen in the amount of codes found and the number of participants mentioning the same code.

Since the semi-structured interviews with think-aloud could not be performed in person, they were conducted by means of video calling, which made it more difficult to carry out the interviews. Only six project group members participated in the semi-structured interviews with think-aloud since the others were occupied with other activities due to changes emerging from the restrictions of the COVID-19 virus. Even though the interviews were carried out via video calling, this did not have a negative influence on the results and the participants found it to be convenient to perform the interviews via video calling (Lo Iacono, Symonds & Brown, 2016). Moreover, including five to seven participants in formative evaluations is found to be sufficient (van Gemert-Pijnen et al., 2018). In the future, performing interviews via video calling could be the better option for the therapists who are already busy with their general work, which could also increase the willingness to participate in interviews.

Data from earlier research was used to gather input for the implementation of the VR application. This data was gathered by semi-structured interviews, an online questionnaire and semi-structured scenario-based interviews, none of these methods mainly focussed on the implementation of the VR application. Although the implementation was not the main topic, the use in practice the design and implementation are interwoven, so it was discussed anyway. Therefore, useful codes were found that could be used for the generation of the requirements for the implementation.

4.3 Recommendations

The results of this study show that therapists and patients see a need for the ability to create personalised VR sessions that can be adjusted to the needs and wishes of the individual forensic patients. Therefore, the first recommendation is to create a training on the content of the intervention with which the therapists can be trained to gather the right input for creating a personalised scenario together with the patient. In addition, it is recommended to hold intervisions occasionally to discuss the VR application, its use and to encourage treatment fidelity. Moreover, the effectiveness of VR can be enhanced by adding and repeating VR sessions, making VR scenarios closer to real-life situations of the patients and integrating VR with other components of the current treatment (Klein Tuente et al., 2020).

The second recommendation is to develop a protocol for the therapists on how to use the VR application in the treatment. Co-creating the protocol together with the therapists and patients will increase the acceptance and sustainability of the VR application, because higher levels of participation can produce an enhanced customized service experience and increase

productivity (Damali, Miller, Fredendall, Moore & Dye, 2016). This protocol should be tested with stakeholders from different user-groups and adjusted based on the results of these tests.

It is recommended to continuously adjust the generated requirements, based on additional formative evaluations with future prototypes. These additional formative evaluations should be conducted with therapists and (former)patients, to gather valuable input. The final product of the VR application should be evaluated by performing a field test with the actual product users in their natural distribution, which will provide information on how the end-users actually use the design, what their experiences are and how it influences their work processes (van Gemert-Pijnen et al., 2018).

This research shows the importance of personalized VR for the forensic mental healthcare setting due to the heterogeneous patient group, which means each patient has a different level of education and type of psychiatric problem. Since only limited research into the personalisation of VR for forensic mental healthcare has been performed, it is recommended to carry out more additional research on this so that the best fit can be found with each individual patient (Kip et al., 2019b). This can be done by testing the VR application with the patients and look for factors that can enhance the personalisation.

The approach used in this study supported the project group in identifying important aspects for the generation of requirements for the design and implementation of a VR application for forensic mental healthcare. Furthermore, combining multiple data sources created insight from different perspectives, which allowed for a closer understanding of what stakeholders find important for the design and implementation of forensic mental healthcare (Silverman, 2019). Combining the results from different methods can be recommended when generating requirements for eHealth technologies.

4.4 Conclusion

The results of this study provide insight into the generation of requirements that can be used as a foundation for the design and implementation of a VR application for forensic mental healthcare. In total 49 requirements were generated. These requirements were created based on the codes gathered by a combination of multiple data sources. This combination yielded valuable input from different perspectives, which allowed for a closer understanding of what stakeholders find important for the design and implementation for a VR application for in the treatment of forensic mental healthcare. The results of this study support the use of the CeHRes Roadmap as a framework for the development of VR for forensic mental healthcare, mainly due to the stakeholder involvement and the iterative approach used to generate the requirements. The results of the previous phases serving as a base for the following phases added value to the generation of the requirements, since the technology, context and stakeholders are continuously considered throughout the process. Conducting additional evaluations and updating and adjusting the requirements based on these evaluations is recommended.

5. References

Abma T.A., C.T. (2017). Social impact of participatory health research: collaborative non-linear processes of knowledge mobilization. *Educational Action Research*, 489-505.

Barnao, M., & Ward, T. (2015, 5 1). Sailing uncharted seas without a compass: A review of interventions in forensic mental health. *Aggression and Violent Behavior, 22*, 77-86. Elsevier Ltd.

Bierbooms, J. , Bouman, Y., Dijkslag, D., Kimpen, R., Muller, J., & Wieske, R. (2015). *Do's en don'ts van Ehealth in de forensische GGZ.* Retrieved from Wetenschappelijk Onderzoek en Publicaties Dimence Groe: https://www.dimencegroep.nl/onderzoek/publicaties/dos-en-donts-van-ehealth-de-forensische-ggz

Birgden, A. (2004, 9). Therapeutic jurisprudence and responsivity: Finding the will and the way in offender rehabilitation. *Psychology, Crime & Law, 10*(3), 283-295.

Black, A. (2017, 1 12). *Information Design: Research and Practice - Google Boeken*. Retrieved from https://books.google.nl/books?hl=nl&lr=&id=gz8lDwAAQBAJ&oi=fnd&pg=PA315&dq=use+of+icons+in+interface&ots=gkNXIZtK9Z&sig=EdTWXq4rUdxwp3-V8OU2sXiQ-v8&redir_esc=y#v=onepage&q=use%20of%20icons%20in%20interface&f=false

Brown, D., Igoumenou, A., Mortlock, A., Gupta, N., & Das, M. (2017). Work-related stress in forensic mental health professionals: a systematic review. *Journal of Forensic Practice, 19(3)*, 227-238. Emerald Group Publishing Ltd.

Chandra, Y., & Shang, L. (2019). *Qualitative Research Using R: A Systematic Approach.* Springer Singapore.

Cornet L.J.M., den Besten A.L., & van Gelder J.L. (2019). Rapport_VRAR_in_justitie_context-5.

Damali U, M. J. (2018). Co-creating value using customer training and education in a healthcare service design. *Journal of Operations Management*, 80-97.

Damschroder, L., Aron, D., Keith, R., Kirsh, S., Alexander, J., & Lowery, J. (2009, 12 7). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4*(1), 50.

de Vogel V., Schaftenaar P., Clercx Mo (2019). Improving continuity of forensic mental health care. *Journal of Forensic Practice*, 180-189.

Dienst Justitiële Inrichting. (2019). *Handboek Forensische Zorg.*

Doherty, G., Coyle, D., & Matthews, M. (2010, 7). Design and evaluation guidelines for mental health technologies. *Interacting with Computers, 22*(4), 243-252.

Earnshaw Y., Tawfik A. A., & Schmidt M. (2018). User Experience Design - Foundations of Learning and Instructional Design Technology. In Earnshaw Yvonne, Tawfik Andrew A., & SchmidtMatthew.

Farley H. (2018). *Using 3D Worlds in Prison: Driving, Learning and Escape*. Retrieved from https://journals.tdl.org/jvwr/index.php/jvwr/article/view/7304/6420

Freeman, D., Reeve, S., Robinson, A., Ehlers, A., Clark, D., Spanlang, B., & Slater, M. (2017, 10 1). Virtual reality in the assessment, understanding, and treatment of mental health disorders. *Psychological Medicine, 47(14)*, 2393-2400. Cambridge University Press.

Fromberger, P., Meyer, S., Jordan, K., & Müller, J. (2018, 3 6). Behavioral monitoring of sexual offenders against children in virtual risk situations: A feasibility study. *Frontiers in Psychology, 9*(MAR).

GGZNederland. (2014). *Betere zorg, veiliger samenleving visiedocument forensische zorg.*

IIBA. (2009). *IIBA Global Business Analysis Core Standard A Companion to A Guide to the Business Analysis Body of Knowledge ® (BABOK ® Guide).*

Keith, R., Crosson, J., O'Malley, A., Cromp, D., & Taylor, E. (2017, 2 10). Using the Consolidated Framework for Implementation Research (CFIR) to produce actionable findings: A rapid-cycle evaluation approach to improving implementation. *Implementation Science, 12*(1), 1-12.

Keyworth C, H. J. (2018). What maximizes the effectiveness and implementation of technology-based interventions to support healthcare professional practice? A systematic literature review. *BMC Medical Informatics and Decision Making*, 1-21.

Kip, H., Bouman, Y., Kelders, S., & van Gemert-Pijnen, L. (2018, 2 21). eHealth in treatment of offenders in forensic mental health: A review of the current state. *Frontiers in Psychiatry, 9(FEB)*, 42. Frontiers Media S.A.

Kip, H., Kelders, S., & Van Gemert-Pijnen, L. (2019b). Putting the value in VR. *Conference on Human Factors in Computing Systems - Proceedings.* Association for Computing Machinery.

Kip, H., Kelders, S., Bouman, Y., & Van Gemert-Pijnen, L. (2019c, 8 19). The importance of systematically reporting and reflecting on eHealth development: Participatory development process of a virtual reality application for forensic mental health care. *Journal of Medical Internet Research, 21*(8), e12972.

Kip, H., Kelders, S., Weerink, K., Kuiper, A., Brüninghoff, I., Bouman, Y., . . . van Gemert-Pijnen, L. (2019a). Identifying the added value of virtual reality for treatment in forensic mental health: A scenario-based, qualitative approach. *Frontiers in Psychology, 10*(FEB).

Kip, H., Sieverink, F., van Gemert-Pijnen, L., Bouman, Y., & Kelders, S. (2020, 5 26). Integrating People, Context, and Technology in the Implementation of a Web-Based Intervention in Forensic Mental Health Care: Mixed-Methods Study. *Journal of medical Internet research, 22*(5), e16906.

Klein Tuente, S., Bogaerts, S., Bulten, E., Keulen-de Vos, M., Vos, M., Bokern, H., . . . Veling, W. (2020, 7 16). Virtual Reality Aggression Prevention Therapy (VRAPT) versus Waiting

List Control for Forensic Psychiatric Inpatients: A Multicenter Randomized Controlled Trial. *Journal of Clinical Medicine, 9*(7), 2258.

Kuiper, A. (2018). *Value in Virtual Reality The values for Virtual Reality for forensic mental healthcare.*

Lo Iacono D, S. V. (2016). Skype as a Tool for Qualitative Research Interviews. *Sociological Research Online*, 103-117.

Maples-Keller, J., Bunnell, B., Kim, S., & Rothbaum, B. (2017). The use of virtual reality technology in the treatment of anxiety and other psychiatric disorders. *Harvard Review of Psychiatry, 25(3)*, 103-113. Lippincott Williams and Wilkins.

Marco J, Perpña. C, Botella C. (2013). Effectiveness of cognitive behavioral therapy supported by virtual reality in the treatment of body image in eating disorders: One year follow-up. *Psychiatry Research*, 619-625.

McAran, D., & Shaw, N. (2020). Insights from the apple human interface guidelines on intuitive interaction. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics). 12204 LNCS*, pp. 128-140. Springer.

Ministerie van Justitie en Veiligheid. (2019). *Forensische zorg Overzicht behandelinstellingen met verblijf.*

Naslund, J., Marsch, L., McHugo, G., & Bartels, S. (2015, 9 3). Emerging mHealth and eHealth interventions for serious mental illness: A review of the literature. *Journal of Mental Health, 24(5)*, 321-332. Taylor and Francis Ltd.

North M.M. & North S.M. (2016). Chapter 6 - Virtual Reality Therapy. *Computer-Assisted and Web-Based Innovations in Psychology, Special Education, and Health*, 141-156.

Rus-Calafell, M., Garety, P., Sason, E., Craig, T., & Valmaggia, L. (2018, 2 1). Virtual reality in the assessment and treatment of psychosis: A systematic review of its utility, acceptability and effectiveness. *Psychological Medicine, 48*(3), 362-391.

Schulz, S., Rodrigues, J., Rector, A., & Chute, C. (2017). Interface terminologies, reference terminologies and aggregation terminologies: A strategy for better integration. *Studies in Health Technology and Informatics. 245*, pp. 940-944. IOS Press.

Seawright, J. (2016). Integrative Multi-Method Research. In J. Seawright, *Multi-Method Social Science* (pp. 1-18). Cambridge University Press.

Silverman, D. (2015). *Interpreting Qualitative Data* . Retrieved from https://books.google.nl/books?hl=nl&lr=&id=nse4DwAAQBAJ&oi=fnd&pg=PP1&dq=combining+qualitative+data+sources&ots=NNobInbEvG&sig=fHG3AWaGCoQ_NmVttak_dr8ecMA#v=onepage&q=combining%20qualitative%20data%20sources&f=false

Sudbury-Riley, L. (2017). *eHealth Technologies: The Faster We Go, the More We Leave Behind? - European Medical Journal*. Retrieved from

https://www.emjreviews.com/innovations/article/ehealth-technologies-the-faster-we-go-the-more-we-leave-behind/

Transfore. (2020). *Transfore |*. Retrieved from https://www.transfore.nl/

van der Vaart, R., Witting, M., Riper, H., Kooistra, L., Bohlmeijer, E., & van Gemert-Pijnen, L. (2014, 12 14). Blending online therapy into regular face-to-face therapy for depression: Content, ratio and preconditions according to patients and therapists using a Delphi study. *BMC Psychiatry, 14*(1), 355.

van Gemert-Pijnen, J., Nijland, N., van Limburg, M., Ossebaard, H., Kelders, S., Eysenbach, G., & Seydel, E. (2011). A holistic framework to improve the uptake and impact of eHealth technologies. *Journal of medical Internet research, 13(4)*. JMIR Publications Inc.

van Gemert-Pijnen, L., Kelders, S., Kip, H., & Sanderman, R. (2018). *eHealth Research, Theory and Development: A Multi-Disciplinary Approach.* Routledge.

Van Velsen, L., Wentzel, J., & Van Gemert-Pijnen, J. (2013, 6 24). Designing eHealth that Matters via a Multidisciplinary Requirements Development Approach. *JMIR research protocols, 2*(1), e21.

Varsi, C., Nes, L., Kristjansdottir, O., Kelders, S., Stenberg, U., Zangi, H., . . . Eide, H. (2019, 9 1). Implementation strategies to enhance the implementation of eHealth programs for patients with chronic illnesses: Realist systematic review. *Journal of Medical Internet Research, 21(9)*, e14255. JMIR Publications.

Vestola, M. (2010). *A Comparison of Nine Basic Techniques for Requirements Prioritization.*

Völlm, B., Edworthy, R., Holley, J., Talbot, E., Majid, S., Duggan, C., . . . McDonald, R. (2017). A mixed-methods study exploring the characteristics and needs of long-stay patients in high and medium secure settings in England: implications for service organisation.

Weerink, K. (2017). *Developing Virtual Reality in Forensic Mental Healthcare: a contextual inquiry.*

Zara G, & Farrington D.P. (2015). *Criminal Recidivism: Explanation, prediction and prevention | Request PDF*. Retrieved from https://www.researchgate.net/publication/307593283_Criminal_Recidivism_Explanation_prediction_and_prevention

Appendix A: Prototype Version 1

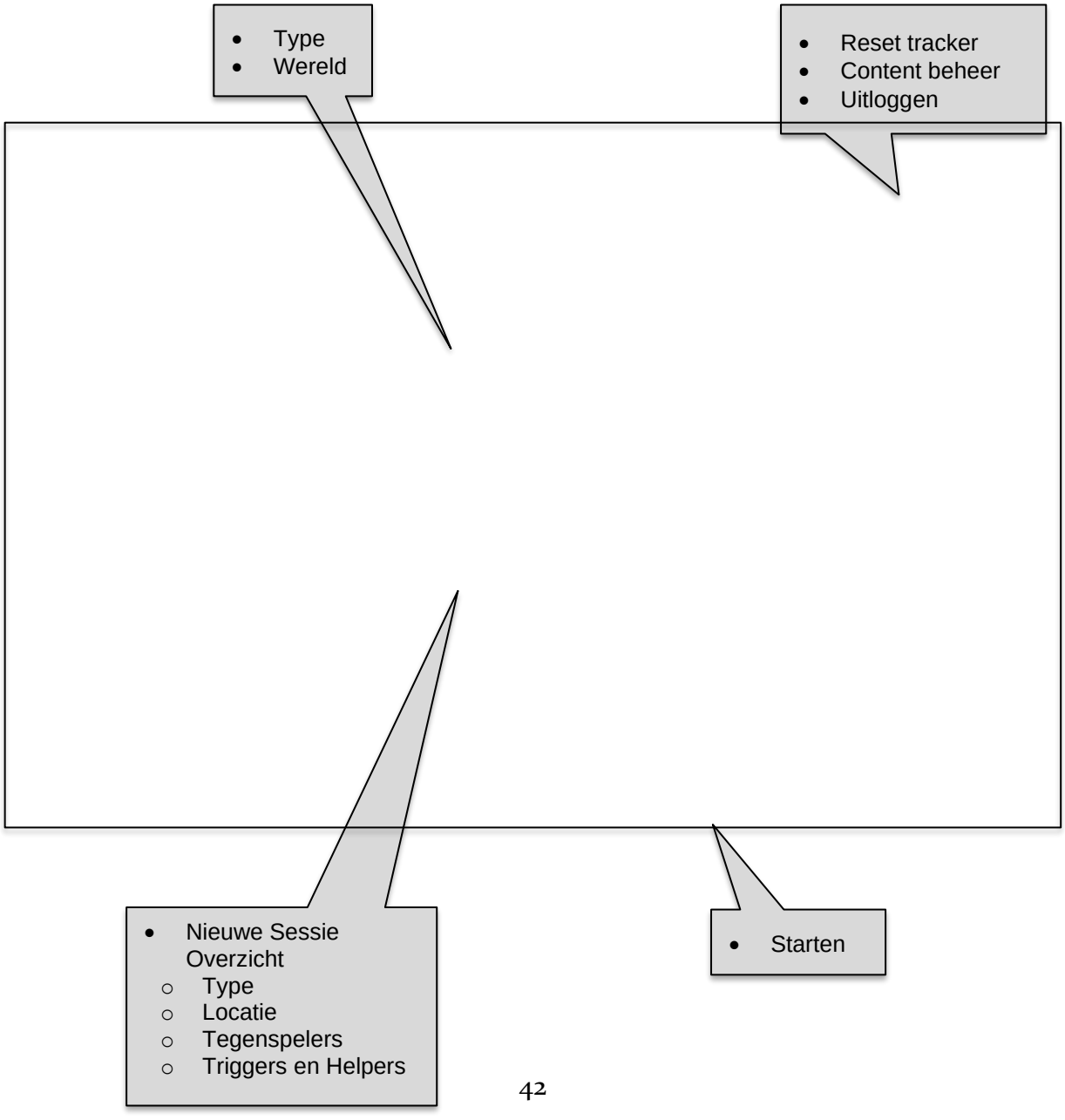
(Due to copyright, the screenshots in this Appendix cannot be added to the public version of the thesis)

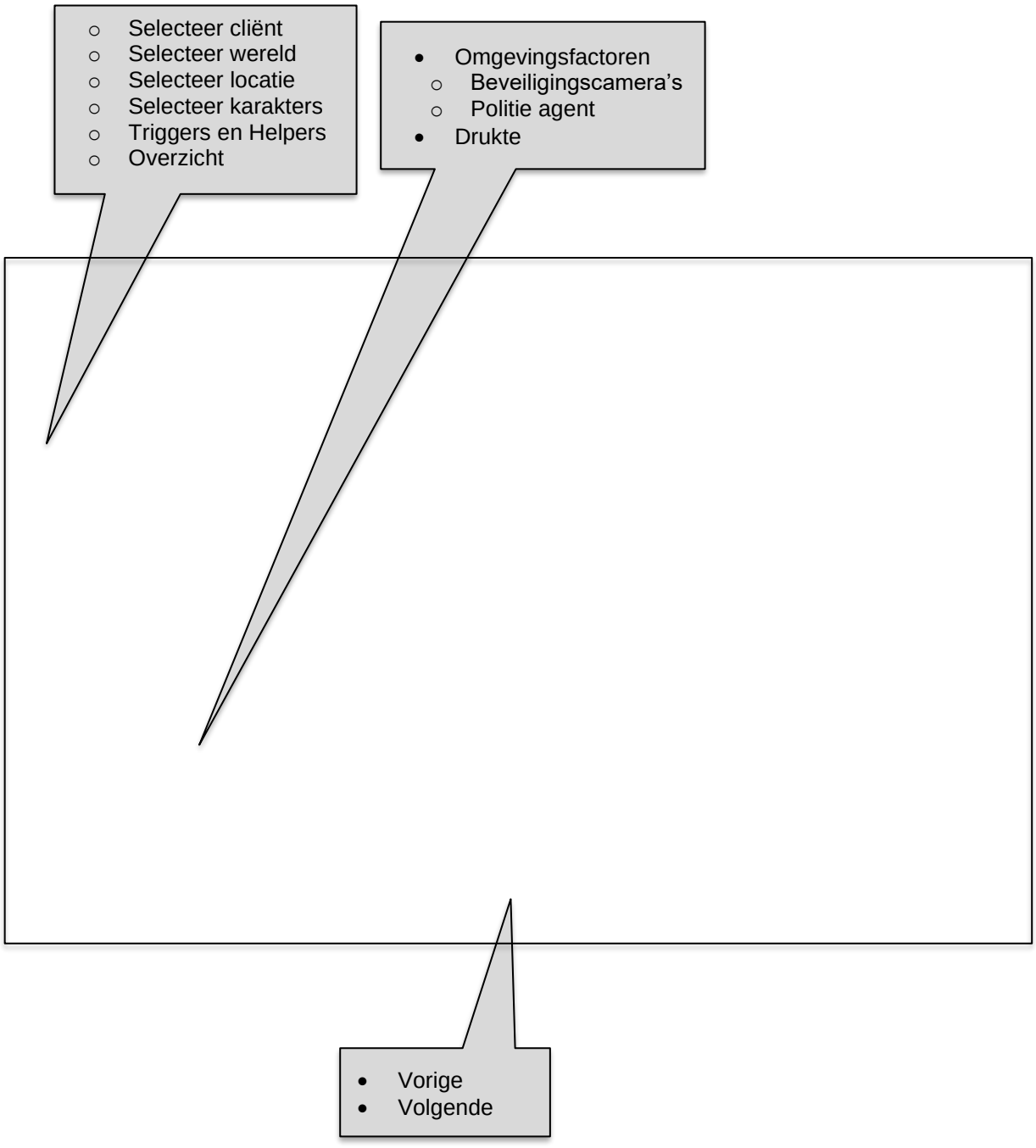
Appendix B: Questionnaire Terminology

(Due to copyright, the screenshots in this Appendix cannot be added to the public version of the thesis)

Door middel van dit document willen we gaan kijken naar de termen die worden gebruikt in het prototype dat is ontwikkeld door CleVR. Uit de vorige bijeenkomst naar voren kwam dat hier ruimte voor verbetering is. Daarnaast was er bij enkele schermen ook onduidelijkheid over symbolen.

Bij de termen waar een puntje met een opmerking/comment staat, zou ik graag willen weten of deze de lading dekt, of het helder genoeg is en hoe we (indien nodig) een andere term kunnen gebruiken. Je kunt je mening over de gebruikte termen geven door op de opmerking te reageren. Je mag zo uitgebreid of beknopt reageren als je zelf wilt. Aanvullende opmerkingen kunnen onderaan de laatste pagina gegeven worden. Ik ontvang graag uiterlijk vrijdag 17 april reactie. Mocht je het fijn vinden is het mogelijk om samen met mij de screenshots via skype door te lopen, dit kunnen we dan via de mail afspreken.

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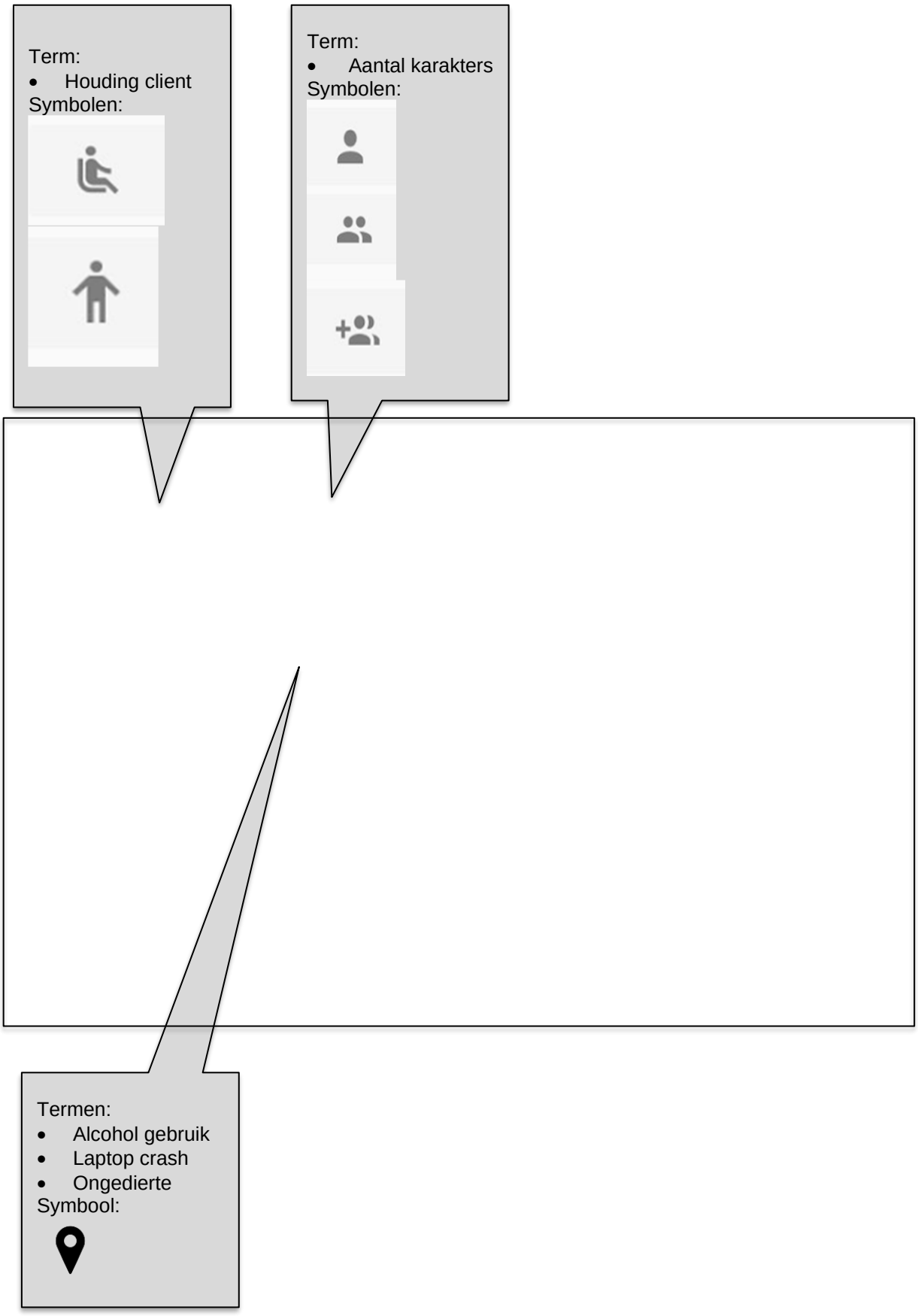
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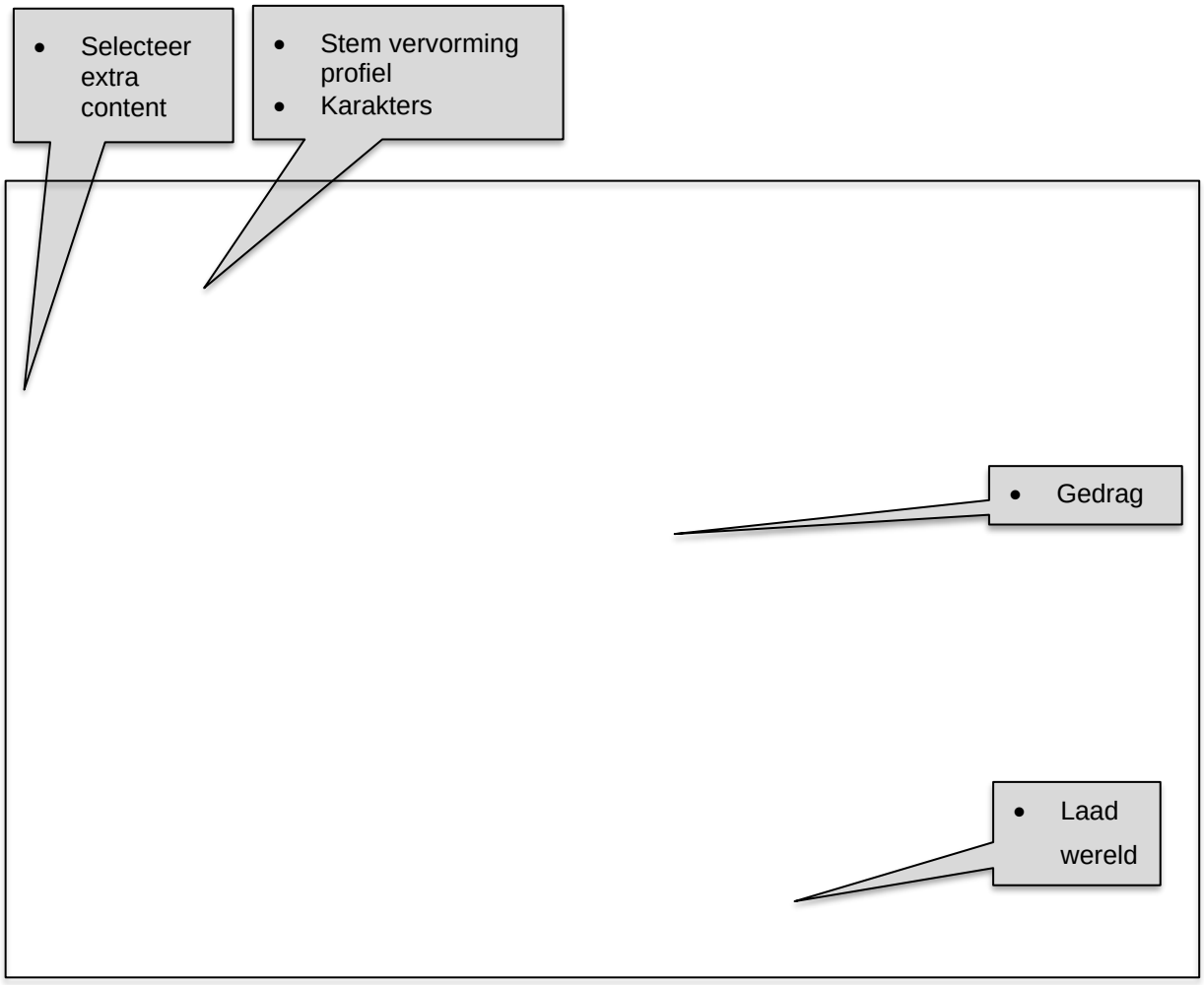
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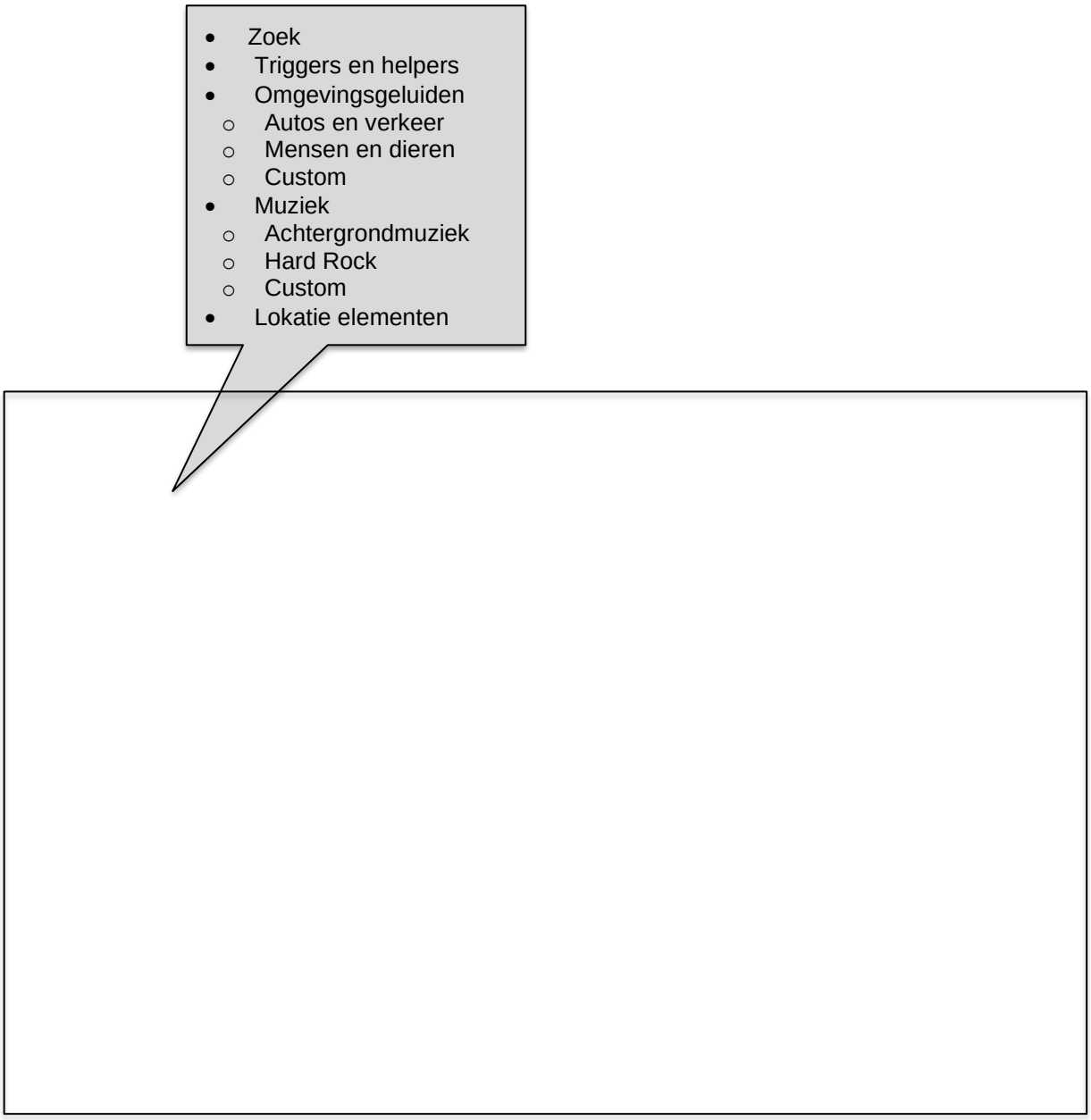
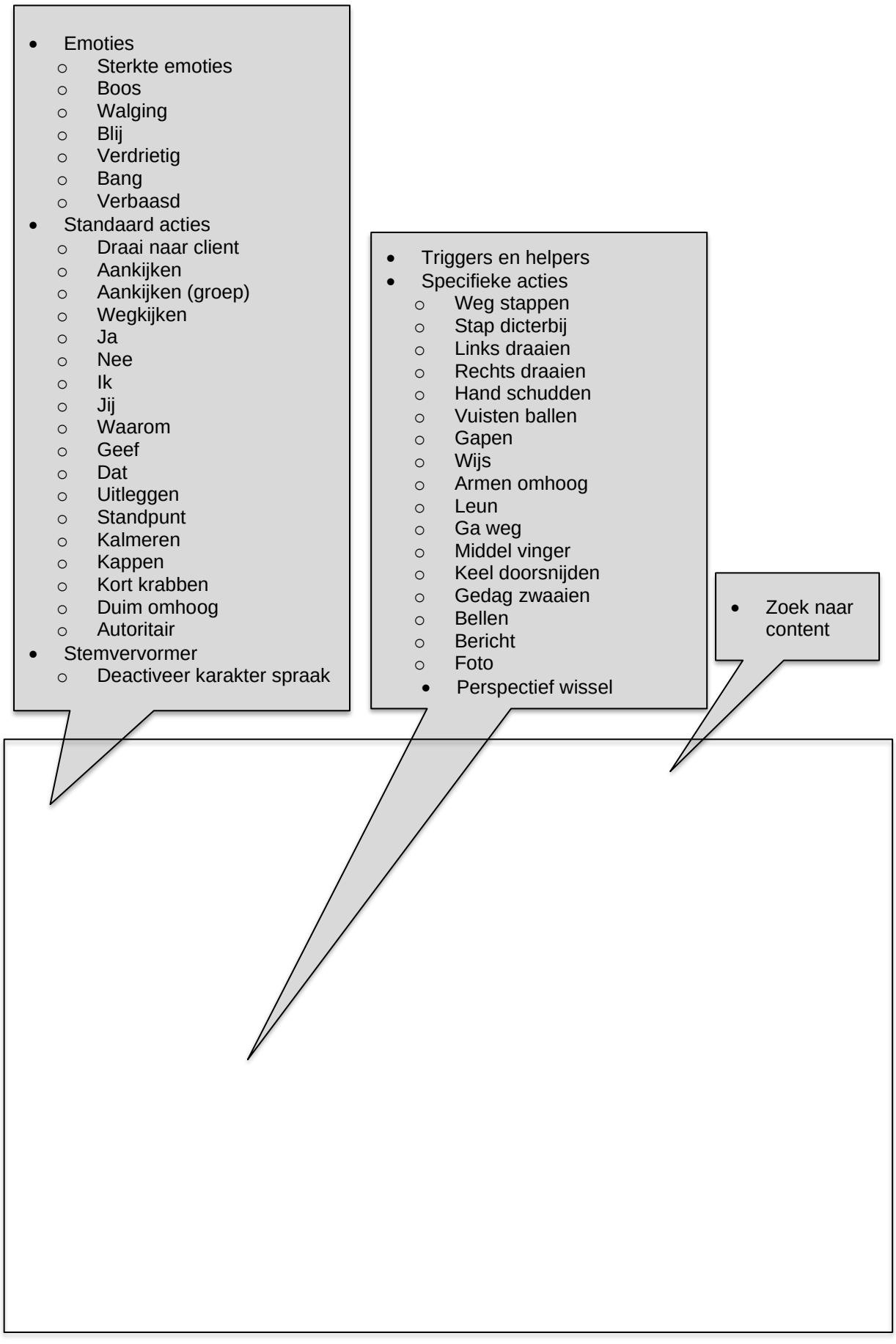
Er is geconcludeerd dat het onderstaande scherm qua design aangepast moet worden, maar daar zullen we op een ander moment gedetailleerder op in gaan. Voor nu graag met name letten op de formulering van begrippen. Indien je uitgebreide ideeën/suggesties hebt deze graag delen aan het eind van het document.

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Stap dicterbij
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Rechts draaien
Hand schudden
Vuisten ballen
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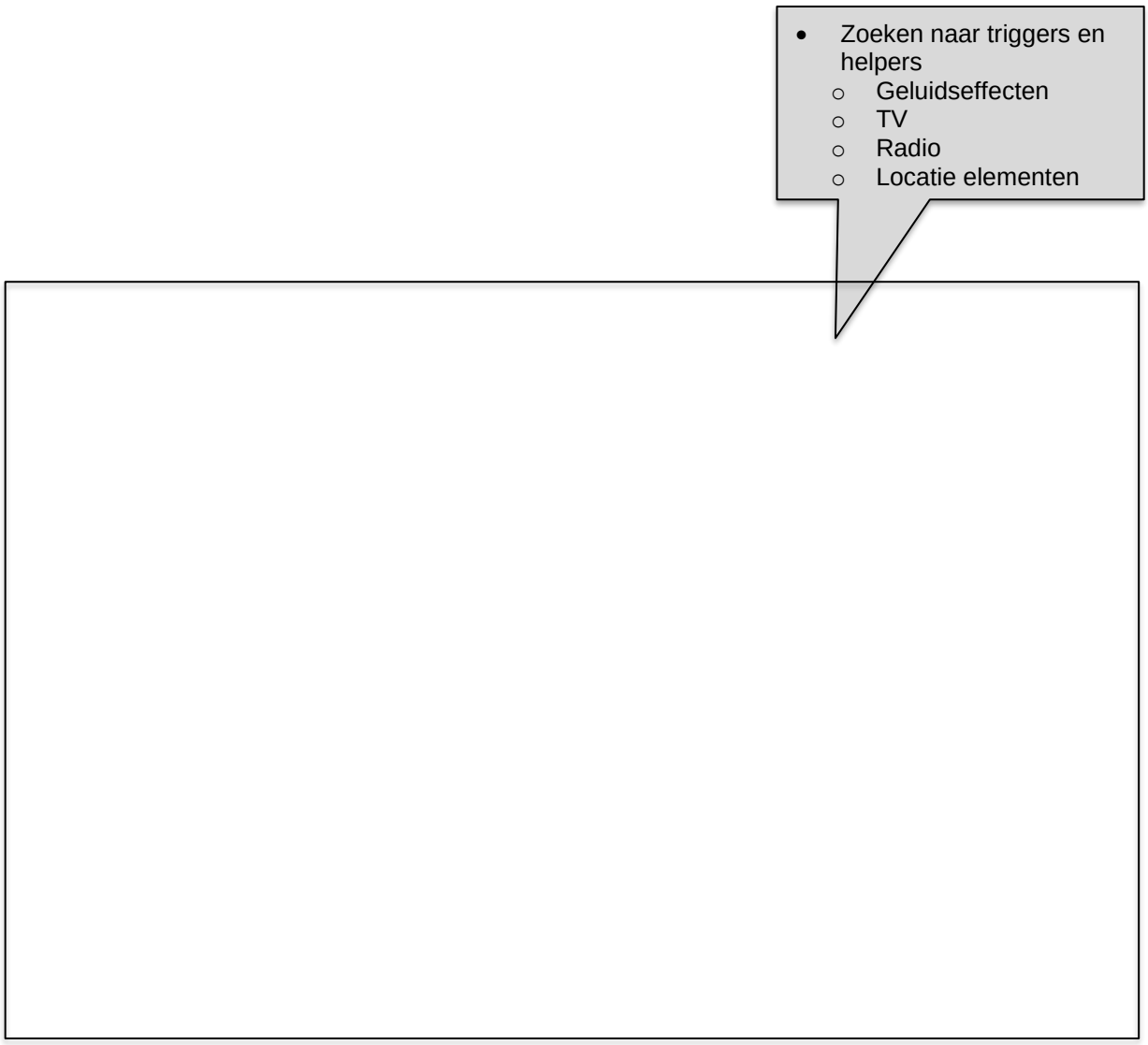

Aanvullende opmerkingen:

Appendix C: Prototype Version 2

(Due to copyright, the screenshots in this Appendix cannot be added to the public version of the thesis)

Appendix D: Informed Consent

Informatieblad voor onderzoek 'Design of an implementable VR application for forensic mental healthcare'

Doel van het onderzoek

Dit onderzoek wordt uitgevoerd door Julia van Calis en begeleid door Hanneke Kip.
Het doel van dit onderzoek is om informatie te vergaren over hoe het design van een VR applicatie voor de forensische gezondheidszorg er uit moet zien en wat belangrijk is voor de implementatie van deze applicatie.

Hoe gaan we te werk?

U neemt deel aan een onderzoek waarbij we informatie zullen vergaren door:

- U te interviewen en uw antwoorden te noteren/op te nemen via een video- opname. Er zal ook een transcript worden uitgewerkt van het interview.

Potentiële risico's en ongemakken

- Er zijn geen fysieke, juridische of economische risico's verbonden aan uw deelname aan deze studie. U hoeft geen vragen te beantwoorden die u niet wilt beantwoorden. Uw deelname is vrijwillig en u kunt uw deelname op elk gewenst moment stoppen.

Vertrouwelijkheid van gegevens

Wij doen er alles aan uw privacy zo goed mogelijk te beschermen. Er wordt op geen enkele wijze vertrouwelijke informatie of persoonsgegevens van of over u naar buiten gebracht, waardoor iemand u zal kunnen herkennen.
Voordat onze onderzoeksgegevens naar buiten gebracht worden, worden uw gegevens zoveel mogelijk geanonimiseerd, tenzij u in ons toestemmingsformulier expliciet toestemming heeft gegeven voor het vermelden van uw naam, bijvoorbeeld bij een quote.

In een publicatie zullen anonieme gegevens of pseudoniemen worden gebruikt. De audio-opnamen, formulieren en andere documenten die in het kader van deze studie worden gemaakt of verzameld, worden opgeslagen op een beveiligde locatie bij de Universiteit Twente en op de beveiligde (versleutelde) gegevensdragers van de onderzoekers.
De onderzoeksgegevens worden bewaard voor een periode van 10 jaar. Uiterlijk na het verstrijken van deze termijn zullen de gegevens worden verwijderd of worden geanonimiseerd zodat ze niet meer te herleiden zijn tot een persoon.
De onderzoeksgegevens worden indien nodig (bijvoorbeeld voor een controle op wetenschappelijke integriteit) en alleen in anonieme vorm ter beschikking gesteld aan personen buiten de onderzoeksgroep.

Tot slot is dit onderzoek beoordeeld en goedgekeurd door de ethische commissie van de faculteit TNW.

Vrijwilligheid

Deelname aan dit onderzoek is geheel vrijwillig. U kunt als deelnemer uw medewerking aan het onderzoek te allen tijde stoppen, of weigeren dat uw gegevens voor het onderzoek mogen worden gebruikt, zonder opgaaf van redenen. Het stopzetten van deelname heeft geen nadelige gevolgen voor u of de eventueel reeds ontvangen vergoeding. Als u tijdens het onderzoek besluit om uw

medewerking te staken, zullen de gegevens die u reeds hebt verstrekt tot het moment van intrekking van de toestemming in het onderzoek gebruikt worden. Wilt u stoppen met het onderzoek, of heeft u vragen en/of klachten? Neem dan contact op met de onderzoeksleider.

Julia van Calis
j.vancalis@transfore.nl

Tot slot heeft u het recht een verzoek tot inzage, wijziging, verwijdering of aanpassing van uw gegevens te doen bij de Onderzoeksleider.

Door dit toestemmingsformulier te ondertekenen erken ik het volgende:

Ik neem vrijwillig deel aan dit onderzoek. Er is geen expliciete of impliciete dwang voor mij om aan dit onderzoek deel te nemen. Het is mij duidelijk dat ik deelname aan het onderzoek op elk moment, zonder opgaaf van reden, kan beëindigen. Ik hoef een vraag niet te beantwoorden als ik dat niet wil.
Naast het bovenstaande is het hieronder mogelijk voor verschillende onderdelen van het onderzoek specifiek toestemming te geven. U kunt er per onderdeel voor kiezen wel of geen toestemming te geven. Indien u voor alles toestemming wil geven, is dat mogelijk via de aanvinkbox onderaan de stellingen.

	JA	NEE
1. Ik geef toestemming om tijdens het interview opnames (geluid/beeld) te maken en mijn antwoorden uit te werken in een transcript.	□	□
2. Ik geef toestemming om mijn antwoorden te gebruiken voor quotes in de onderzoekspublicaties.	□	□
3. Ik geef toestemming om de bij mij verzamelde onderzoeksdata te bewaren en te gebruiken voor toekomstig onderzoek en voor onderwijsdoeleinden.	□	□
Ik geef toestemming voor alles dat hierboven beschreven staat.	□	

Naam Deelnemer: Naam Onderzoeker:

Handtekening: Handtekening:

Datum: Datum:

Appendix E: Results Questionnaire Terminology

Old terms	**Suggestions**
'Content beheer'	*'Beheer van inhoud'*
'Type'	*'Oefening'*
'Wereld'	*'Locatie' or 'Setting'*
'Karakters'	*'Tegenspelers' or 'Medespelers'*
'Stem vervorming profiel'	*'Stem keuze' or 'Stem soort'*
'Gedrag'	*'Houding'*
'Omgevingsfactoren'	*'Omgevingskenmerken'*
'Custom'	*'Op maat gemaakt or Maatwerk'*
'Centraal'	*'Midden van de ruimte' or 'Centrale plek in de ruimte'*
'Zoek naar content'	*'Zoek naar Triggers & Helpers'*

Appendix F: Requirements

Requirement#: 1	**Requirement type**: Cooperation between patient and therapist	
Code: Setting up a personalised session	**Attribute:** Identifying deployable influencing factors	
Description: An overview of questions that the patient and therapist must answer together must be drawn up: - Which type will be used? - Which environmental factors will be present? - Which location with location elements will be chosen? - Which and how many characters are present in the scenario? - Which triggers and helpers will be present?		
Source: Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts**: Multiple introducing sessions could be necessary before patient and therapist are ready to use VR. Time-consuming.

Requirement#: 2	**Requirement type**: Cooperation between patient and therapist	
Code: Setting up a personalised session	**Attribute:** Introducing VR	
Description: An introductory session, in which all aspects of VR will be discussed, should be scheduled to familiarize the therapist and patient with the system before starting with VR in the treatment.		
Source: Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts**: Multiple introducing sessions could be necessary before patient and therapist are ready to use VR. Time-consuming.

Requirement#: 3	**Requirement type**: Practically easy to use in current treatment	
Code: Icon usage	**Attribute:** Icons for support	
Description: The VR application should contain icons for the represent functions, such as: Saving, Loading, Favourite, Non favourite, Sound effects, Music, Location elements, Trigger, Helper, Posture client and Amount of characters.		
Source: Focus group, Questionnaire, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts**: The icons must be understandable for all users.

Requirement#: 4	**Requirement type**: Practically easy to use in current treatment
Code: Terminology	**Attribute:** Terminology for support
Description: The VR application should contain terminology that is fitting and understandable for the therapists, such as 'Beheer van inhoud', 'Oefening', 'Locatie' or 'Setting', 'Tegenspelers' or 'Medespelers,	

'Stem keuze' or 'Stem soort', 'Houding', 'Omgevingskenmerken', 'Op maat gemaakt or Maatwerk', 'Midden van de ruimte' or 'Centrale plek in de ruimte' and 'Zoek naar Triggers & Helpers'.		
Source: Focus group, Questionnaire, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** The terminology must be understandable for all users.

Requirement#: 5	**Requirement type**: Practically easy to use in current treatment	
Code: Clarifying descriptions	**Attribute:** Descriptions for support	
Description: The VR application should contain the option for a button with a question mark icon to assess descriptions for terms that are not intuitive for the therapists.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Descriptions must be understandable for the users.

Requirement#: 6	**Requirement type**: Practically easy to use in current treatment	
Code: Clarifying descriptions	**Attribute:** Descriptions for support	
Description: The VR application should contain descriptions for the terms: Omgevingsfactoren, Locatie elementen, Profielgroep, Benaderafstand and Opslaan (for client, behandelaar & iedereen).		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Descriptions must be understandable for the users.

Requirement#: 7	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Menu for navigating	
Description: The VR application must contain a menu on the left side of the screen with buttons that show where the user is in the system.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Set a maximum number of buttons to maintain clarity.

Requirement#: 8	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Menu for navigating	
Description: The VR application must contain a menu on the left side of the screen with buttons that can be clicked to navigate through the settings of the VR sessions.		

Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Giving therapist to much freedom in choosing order could make it less logical to fill in.

Requirement#: 9	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Order for filling in settings	
Description: The VR application should give the therapists the option to choose the order, world or characters first, in which they want to fill in the settings themselves.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Giving therapist to much freedom in choosing order could make it less logical to fill in.

Requirement#: 10	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Filling in settings	
Description: The VR application should allow the therapists to select favourite character voices.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Selecting to many favourite characters voices, could cause sprawl of favourite characters voices.

Requirement#: 11	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Filling in settings	
Description: The VR application should allow the therapists to select non favourite character voices.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Selecting to many non-favourite character voices, could cause sprawl of non-favourite character voices.

Requirement#: 12	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Filling in settings	
Description: The VR application should give the ability to select a maximum of 8 of triggers and helpers.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** More than 8 triggers or helpers, could be applicable to certain cases.

Requirement#: 13	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Filling in settings	
Description: The application should show the selected triggers and helpers in the treatment screen during the VR session.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** X

Requirement#: 14	**Requirement type**: Practically easy to use in current treatment	
Code: Flexible navigation through application	**Attribute:** Filling in settings	
Description: The application should allow the therapist to navigate from the treatment screen used during the VR session back to the dashboard with settings.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** X

Requirement#: 15	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Sharing templates	
Description: 15. The VR application must allow the therapists to create templates: fully filled in VR-sessions, based on scenario's created together with the patient, that can be immediately reused.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Patient privacy sensitivity.

Requirement#: 16	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Sharing templates	
Description: The VR application must allow the therapists to share templates with all therapists that have access to the VR system.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Patient privacy sensitivity.

Requirement#: 17	**Requirement type**: Use application in practice
Code: Sharing knowledge and experience	**Attribute:** Saving templates

Description: The VR application must allow the therapists to save templates so they can only be used by the same therapist again.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** X

Requirement#: 18	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Saving templates	
Description: The VR application must allow the therapists to save templates so they can only be used with the same patient again.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** X

Requirement#: 19	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Deleting templates	
Description: The VR application must allow the therapists to only delete templates they created themselves.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Sprawl off too may templates.

Requirement#: 20	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Deleting templates	
Description: The VR application must allow the therapists to only delete templates that are not used by anyone for over a X number of months.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Sprawl off too may templates.

Requirement#: 21	**Requirement type**: Use application in practice	
Code: Sharing knowledge and experience	**Attribute:** Preview of templates	
Description: The VR application must show a preview of the selected template, containing the type, location, characters and triggers & helpers.		
Source: Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** When not all settings filled in no preview available.

Requirement#: 22	**Requirement type**: Privacy	
Code: Protecting patient privacy	**Attribute:** Responsibility of therapists	
Description: The VR application must show a preview of the selected template, containing the type, location, characters and triggers & helpers.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Must have	**Conflicts:** Unawareness on what is sensitive patient information and what is not.

Requirement#: 23	**Requirement type**: Privacy	
Code: Protecting patient privacy	**Attribute:** Adding privacy terms to folders	
Description: The VR application should provide a description to the save button with the privacy terms as to which saving the template to a specific folder (for only this patient, only this therapist or all therapists that have access to the system) could affect the patient privacy.		
Source: Focus group, Semi-structured interviews with think-aloud	**Priority**: Should have	**Conflicts:** Users do not read the descriptions.

Requirement#: 24	**Requirement type**: Implementation technology	
Code: Relative advantage	**Attribute:** Advantage for therapists	
Description: When offering the VR application for the treatment of forensic patients, the advantages of VR for the therapist should be addressed by giving explanations on posters or via promoters.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** Every therapist has different advantages

Requirement#: 25	**Requirement type**: Implementation technology	
Code: Relative advantage	**Attribute:** Advantage for patient	
Description: When offering the VR application for in the treatment of forensic patients, the advantages of VR for the patients should be addressed by the therapist offering them VR for in the treatment.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** Every patient has different advantages

Requirement#: 26	**Requirement type**: Implementation patient
Code: Resistance	**Attribute:** No obligation

Description: When offering the VR application to patients for in the treatment, the resistance of patients should be considered by addressing that VR in the treatment is not an obligation.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** The resistance will differ per patient.

Requirement#: 27	**Requirement type**: Implementation patient	
Code: Resistance	**Attribute:** Always possible to stop	
Description: When offering the VR application to patients for in the treatment, the patients should be made aware that it is always possible to stop with using VR in the treatment.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** The resistance will differ per patient.

Requirement#: 28	**Requirement type**: Implementation patient	
Code: Appropriateness	**Attribute:** Appropriateness for patient groups	
Description: The implementation of the VR application must take the appropriateness for the forensic patient group into account, by considering the suitedness (the possibility of worsening condition, fear, aggression or undesirable behaviour) for VR in the treatment of the individual patient.		
Source: Value Specification, Contextual Inquiry	**Priority**: Must have	**Conflicts:** The appropriateness will differ per patient.

Requirement#: 29	**Requirement type**: Implementation patient	
Code: Necessities for decision to start with VR	**Attribute:** Explicit information in advance	
Description: Before making the decision to use VR in the treatment, the patients must receive explicit information about what VR in the treatment consists of in advance by the therapist offering VR for in the treatment.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** The information needs to be understandable for the patient for them to be able to decide.

Requirement#: 30	**Requirement type**: Implementation patient	
Code: Necessities for decision to start with VR	**Attribute:** First experience VR	
Description: The patients should first experience VR during a treatment session, before making the decision to use VR in the treatment.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Time-consuming

Requirement#: 31	**Requirement type**: Implementation patient	
Code: Necessities for decision to start with VR	**Attribute:** Trust between patient and therapist	
Description: The patient should have a sufficient trust in the therapist before deciding to use VR in the treatment.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** No measurement for trust, so it is unclear when the bond is confidential enough.

Requirement#: 32	**Requirement type**: Implementation patient	
Code: Aftercare	**Attribute:** Cooling down & Dealing with negative emotions	
Description: After using the VR application in the treatment, aftercare should be applied in which a cooling down should take place to deal with possible negative emotions of the patient.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Time-consuming.

Requirement#: 33	**Requirement type**: Implementation therapist	
Code: Technical training	**Attribute:** Training before using VR	
Description: The therapists that are going to use the VR application in the treatment of their patients must receive technical training on how to use the system.		
Source: Value Specification, Contextual Inquiry	**Priority**: Must have	**Conflicts:** Willingness of therapist to follow training. Time-consuming.

Requirement#: 34	**Requirement type**: Implementation therapist	
Code: Training on the content of the intervention	**Attribute:** Building VR session	
Description: The therapists that are going to use the VR application in the treatment should receive training on the content of the intervention on how to build a VR session that suits their patients' needs and wishes.		
Source: Value Specification, Contextual Inquiry	**Priority**: Must have	**Conflicts:** Willingness of therapist to follow training. Time-consuming.

Requirement#: 35	**Requirement type**: Implementation therapist	
Code: Training on the content of the intervention	**Attribute:** Integration into treatment protocols	
Description: The therapists that are going to use the VR application in the treatment should receive training on the content of the intervention on how to integrate VR in the different treatment protocols.		

Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** Willingness of therapist to follow training. Time-consuming.

Requirement#: 36	**Requirement type**: Implementation therapist	
Code: Acceptability	**Attribute:** First experience	
Description: To assure that the VR application is accepted by the therapist they first need to experience working with VR in the treatment of their patients.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Bad first experience.

Requirement#: 37	**Requirement type**: Implementation therapist	
Code: Acceptability	**Attribute:** Acknowledge perception	
Description: To assure that the VR application is accepted by the therapists' perception of the VR application should be acknowledged by gathering their thoughts on VR in the treatment of their patients.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** Adjustment of current treatment.

Requirement#: 38	**Requirement type**: Implementation therapist	
Code: Acceptability	**Attribute:** Acknowledge perception	
Description: The first experience and perception of therapists on VR should be considered when implementation activities from the organisation, such as offering training and creating a protocol, take place.		
Source: Value Specification, Contextual Inquiry	**Priority**: Should have	**Conflicts:** Different first experiences and perceptions.

Requirement#: 39	**Requirement type**: Implementation organisation	
Code: Creating protocol	**Attribute:** Creating protocol for use in treatment	
Description: The use of the VR application must be sustained by creating a protocol containing a written explanation on how to work with the VR application in the treatment.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Whether the therapists are going to use the protocol.

Requirement#: 40	**Requirement type**: Implementation organisation
Code: Creating protocol	**Attribute:** Examples from practice

Description: The use of the VR application must be sustained by providing the therapists with examples from practice in the protocol on how to use VR in the treatment.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Examples from practice need to be gathered first.

Requirement#: 41	**Requirement type**: Implementation organisation	
Code: Creating protocol	**Attribute:** Providing images	
Description: The use of the VR application must be sustained by providing images in the protocol showing how to use the VR application.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** A lot of options possible, which will be documented?

Requirement#: 42	**Requirement type**: Implementation organisation	
Code: Draw attention	**Attribute:** Putting up posters	
Description: The organisation should draw attention to the possibilities of VR in the treatment by putting up posters at locations where treatment is given.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Costs. Time-consuming.

Requirement#: 43	**Requirement type**: Implementation organisation	
Code: Draw attention	**Attribute:** Appoint promoters	
Description: The organisation should draw attention to the possibilities of VR in the treatment by appointing promoters, who must be available to provide information.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Costs. Time-consuming.

Requirement#: 44	**Requirement type**: Implementation organisation	
Code: Safe accessible place for system	**Attribute:** Safe place	
Description: The organisation must create a safe place where the system can be set up and used.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Different locations where the VR system wants to be used.

Requirement#: 45	**Requirement type**: Implementation organisation
Code: Safe accessible place for system	**Attribute:** Accessibility

Description: The organisation must create an accessible place where the system can be set up and used.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Different locations where the VR system wants to be used.

Requirement#: 46	**Requirement type**: Implementation organisation	
Code: Offering training	**Attribute:** Technical training	
Description: The organisation must offer technical training to the therapists that want to use VR in the treatment of their patients.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Costs. Time-consuming.

Requirement#: 47	**Requirement type**: Implementation organisation	
Code: Offering training	**Attribute:** Training on the content of the intervention	
Description: The organisation must offer training on the content of the intervention o the therapists that want to use VR in the treatment of their patients.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Costs. Time-consuming.

Requirement#: 48	**Requirement type**: Implementation organisation	
Code: Offering support	**Attribute:** Create website	
Description: The organisation should create a website for the VR application, which can provide support for the therapists who use VR in treatment when there are questions or uncertainties.		
Source: Value Specification	**Priority**: Must have	**Conflicts:** Website needs to be created and sustained.

Requirement#: 49	**Requirement type**: Implementation organisation	
Code: Offering support	**Attribute:** Appoint supervisor	
Description: The organisation should appoint a supervisor for the VR application who can provide support for the therapists who use VR in treatment when there are questions or uncertainties.		
Source: Value Specification	**Priority**: Should have	**Conflicts:** Availability of supervisor