Finding a solution against loneliness among the elderly living in a senior housing complex with the help of co-design on a distance

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Abstract

Loneliness among elderly is a growing problem that can cause many health related issues, like depression, anxiety, and malnutrition. Though it seems like living in a senior housing complex can be beneficial to decreasing loneliness, it can also do the exact opposite. With the help of co-design a new product was thought of that can be used as a tool in order to stay connected for elderly living in a senior housing complex. The final product designed in this thesis is a virtual environment which can be used as a service in a senior housing complex. Residents will be able to make virtual trips together, as well as have a chat with one another in the virtual coffee corner. Though physical human contact remains important, this thesis shows how a virtual environment can help elderly staying connected on a distance.

Acknowledgements

First of all, I would like to thank my supervisor Femke Nijboer and my critical observer Alma Schaafstal for their supervision and their feedback during this graduation project. I would also like to thank fellow students Sefora Tunç and Maxim de Leeuw for their constant help and feedback during our weekly meetings.

I cannot express enough thanks to Corrie Voortman for all her help as a co-designer in this thesis. All her input and feedback helped greatly in the design of the product. Other participants of the usability testing were also of great help in finalizing the prototype, which I am very grateful for.

I would also like to thank the Tubantia for giving us the opportunity to publish our research. All readers that have responded to the article have been of great help.

Lastly, I would like to thank my family and friends that have always supported me during my studies. Their continuous support is what kept me motivated.

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1. Introduction

This chapter will provide a brief description about loneliness among elderly and the consequences of it. Objectives and challenges of this given problem will be given next, followed by the research question of this thesis.

1.1 Background

The last decades there has been a change in EU demographics. Consistently low birth rates and higher life expectancy resulted in a much older population structure. Between 2008 and 2018, the share of the population of age 65 or over in the EU grew with more than 2.5% (Population structure and ageing, 2020). Although the life expectancy has become higher, health related issues among the elderly still remain.

Social isolation, loneliness, and social vulnerability are common in older adults and are associated with considerable morbidity and mortality (Freedman & Nicolle, 2020). There have been multiple interventions addressing loneliness and social isolation with different types of technologies, however, current evidence of effectiveness is limited (Freedman & Nicolle, 2020).

The subject of loneliness among elderly has become of even bigger importance as a consequence of COVID-19. Older adults are at a significantly increased risk of severe disease following infection from COVID-19 (Kluge, 2020), which is why it is even more important to self-isolate for elderly. A side effect of this self-isolation is that the elderly become even more lonely, since they are not able to meet with family and friends.

1.2 Objectives and Challenges

The goal of this study is to find a creative solution to help decrease loneliness among the elderly living in a senior housing complex. The focus will be on people aged around 65+ that are living independently in a building meant for elderly. Although people aged 65 to 70 years old might not be the biggest target audience for this audience, they should still be concluded. In most places people aged 65+ are eligible for a senior home (Wanneer kom ik in aanmerking voor een seniorenwoning?, sd). Since this paper is focused on people living in senior housing complexes, all ages of people living in those building should be included. One of the challenges of this study is thus to find a solution that matches the needs of all different users from different ages. People around the age of 65 might not experience any difficulty with current technologies, however, suffering from loneliness can happen to everyone.

Due to the current situation with COVID-19 the study will mostly be done through literature study and co-design. It will not be possible to meet and interview older people due to the health concerns it

brings, which is why remote co-design will be used. In co-design the end-user plays an active role in all the hardware and software project phases, even initially, by proposing ideas and providing suggestions under different forms (Rocetti, Prandi, Mirri, & Salomoni, 2020).

1.3 Research Questions

The research question that is being answered in this bachelor thesis is: *How can co-design on a distance be used to decrease feelings of loneliness among the elderly aged 65+ living in a senior housing complex?*

The research question will be answered with the help of several sub-questions:

- How does loneliness influence the health of the elderly?
- What innovations currently exist to help decrease loneliness?
  - Why are or are they not working
  - What could be done to improve them?
- How can co-designing be used in the design process of a product to decrease feelings of loneliness among the elderly?

1.4 Report Structure

The structure of this study will be as follows: First, a context analysis will be done. This will contain literature research about the subject and answer the sub-research-questions. Secondly, the methods will be discussed. In methods a detailed description of the research will be given and in what way data will be collected. Thereafter, the collected results will be discussed, which will finally lead to the conclusion and a discussion about the study.

2. Literature research

This section covers literature studies on the causes and consequences of loneliness among the elderly. Different types of loneliness will be described with their different causes, followed by information about health-related consequences. Both physical- and mental health will be discussed. Then, the topic of co-designing will be addressed, and how co-designing on a distance can be used for this project.
A short overview of current state of the art will be given and what is still lacking. The review will be concluded with a clear overview of what is needed in a solution for the problem of loneliness among elderly, and why finding a solution is important.

2.1 Causes of loneliness among the elderly

Loneliness is more than just the feeling of being lonely. A definition of loneliness developed by de Jong Gierveld (de Jong Gierveld, 1998)*:*

> *"Loneliness is a situation experienced by the individual as one where there is an unpleasant or inadmissible lack of (quality of) certain relationships. This includes situations in which the number of existing relationships is smaller than is considered desirable or admissible, as well as situations where the intimacy one wishes for has not been realized. Thus loneliness is seen to involve the manner in which the person perceives, experiences, and evaluates his or her isolation and lack of communication with other people."*

There are different ways in which loneliness can be explained. In addition to the difference between loneliness and social isolation, loneliness itself can also be defined in different ways.

First, the topic of social isolation will be discussed. As a result of the exponential growth of the aging population, social isolation has become a growing problem (Grenade & Boldy, 2008). We talk about someone being socially isolated when there is a reduction in social network size and paucity of social contact (Steptoe, Shankar, Demakakos, & Wardle, 2012). Social isolation can be caused when social contacts are limited as a result of, for example, decreased economic resources, mobility impairment, and the death of contemporaries (Steptoe, Shankar, Demakakos, & Wardle, 2012). In the paper written by Wu and Sheng, social isolation is defined as the absence of a support system or having reduced social interactions or relationships with family and friends at an individual level, and with a general, low-level of social participation in community life (Wu & Sheng, 2019).

Different from social isolation, loneliness is more about the psychological state of an individual. As stated by Peplau and Perlman (Peplau & Perlman, 1982), "Loneliness is often the psychological

embodiment of social isolation, reflecting the individual's experienced dissatisfaction with the frequency and closeness of their contact or the discrepancy between the relationships they have and the relationships they would like to have".

In the paper by Bekhet and Zauszniewski three different definitions of loneliness are given. The first one is a state-related form of loneliness. This form of loneliness can be influenced by situational and social factors and can be a result of social isolation. The second category is a trait of personality-related loneliness. Loneliness does not have to a result of a current change; it can also be a personal trait that could have arisen from maternal problems of early childhood attachment. In the last category, loneliness is seen as an inevitable condition of existence with a basic sense of existential loneliness (Bekhet & Zauszniewski, 2013).

Despite the industrialization of society and globalization, there is evidence that the quantity and/or quality of social relationships has decreased. Instead of connecting people, new technologies are possibly doing the opposite and people are becoming increasingly more socially isolated (Holt-Lunstad, Smith, & Bradley Layton, 2010).

Although loneliness can be experienced by everyone, demographics do influence the likeliness of experiencing it. The older people become, the more likely they are to experience the loss of age peers (Dykstra, van Tilburg, & de Jong Gierveld, 2005). The loss of the spouse has been found to be a major risk factor for loneliness in the later stages of life (Allen, Blieszner, & Roberto, 2000). Next to the increased risk of losing their spouse, people of advanced ages are also increasingly likely to outlive friends and siblings (Gold, 1987).

In conclusion, there are different causes of loneliness and social isolation. Loneliness is more than just the feeling of being lonely and should not be underestimated.

2.2 Influence of living in a senior housing complex on loneliness

Most of the current studies of loneliness among the elderly has been conducted among community-dwelling elderly that do not live in a senior housing complex (Taylor, Wang, & Morrow-Howell, 2019). Although it might seem that loneliness among the elderly living in these senior housing complexes will be lower, this is not necessarily true. The elderly living in senior housing complexes might have more health-related issues, are living alone, or have a lower income (Shin, Sims, Bradley, Pohlig, & Harrison, 2014). Additionally, to this, the housing complexes might be further away from their family and friends, which results in less visits and thus social contact. These factors can all influence the feeling of loneliness and social isolation among the elderly (Taylor, Wang, & Morrow-Howell, 2019).

Although senior housing complexes might have some benefits to the elderly living there, it can also have a negative influence on their social life. Often the more vulnerable elderly are living in the senior housing complexes, which makes them more likely to become socially isolated or experience the feeling of loneliness. Lastly, moving to a senior housing complex might influence loneliness among the elderly if they are moving further away from family and friends, which makes it harder for them to visit.

2.3 Possible health consequences of loneliness for the elderly

In the research done by Bekhet and Zauszniewski (Bekhet & Zauszniewski, 2013) the consequences of loneliness on both physical and mental health were being measured. Considered under physical health are a number of chronic cases, such as arthritis, hypertension, diabetes and heart disease, and functional status. Functional status describes the functioning of the elderly in their daily life, how they are able to do tasks that are considered normal (dressing and grooming, eating, walking, hygiene, etc.). Mental health was measured by anxiety and depressive symptoms.

It was shown that loneliness greatly influenced the mental health of the elderly. Elders that experienced loneliness had higher depressive symptom scored than those who reported not feeling lonely. The same was found for anxiety; Elders that experienced loneliness were more often found with anxiety problems than elders that did not experience loneliness. The findings of several other studies (Coyle & Dugan, 2012) were in accordance with this. Not only was it found that socially isolated elders were of higher risk of depression and anxiety, but loneliness was also associated with stress (Coyle & Dugan, 2012), the progression of Alzheimer's disease (Wilson, et al., 2007) and sleep issues (Cacioppo & Hawkley, 2003).

Although Bekhet and Zauszniewski did not find a relation between loneliness and the physical health of the elderly, several other studies did find a relation between loneliness and the physical health. For example, in the study done by Eskelinen et al, it was found that there is a relation between loneliness among older people and malnutrition, and thus the physical health (Eskelinen, Hartikainen, & Nykänen, 2016). Malnutrition refers to deficiencies, excesses, or imbalances in the intake of energy and/or nutrients of a person. Both undernutrition and overnutrition fall within malnutrition. Undernutrition can result in being underweight and/or an insufficient vitamin and mineral intake. Overnutrition, on the other hand, might result in obesity and diet-related noncommunicable diseases (heart disease, stroke, diabetes, and cancer) (What is Malnutrition?, 2016). In a study by Eskelinen, Hartikainen, and Nykänen (Eskelinen, Hartikainen, & Nykänen, 2016), it was shown that subjective feelings of loneliness were associated with a risk of malnutrition. In the paper, it was stated that "Feelings of loneliness may affect appetite and the intake of nutrients through a decline I mood,

declining physical functioning, or declining cognition." Elders that experience loneliness are more likely to eat poorly, which might result in them suffering from malnutrition.

Undernutrition is a major health concern particularly in vulnerably older adults and is associated with a reduced functional status, poor quality of life, mental health problems, increased length of hospital stay and overall increased morbidity and mortality (van der Pols-Vrijlbrief, Wijnhoven, & Visser, 2017). A big problem concerning malnutrition is that it is often under-recognized. More than half the patients at risk of malnutrition are not getting recognized, which results in them not getting the necessary treatment (Elia, Zellipour, & Stratton, 2005).

Thus, it can be said that loneliness can have a large impact on the mental- and physical health of the elderly. It can cause mental problems like depression and anxiety, and it might also lead to malnutrition which can endanger the physical health.

2.4 Co-design

Co-design is growing in popularity in many businesses and organizations (Binder, Brandt, & Gregory, 2008). To understand its growing popularity, is it necessary to understand the definition of co-design. Sanders and Stappers (2008) described co-design as a way were collective creativity is applied across the whole span of a design process. To move from user-centred design to co-design, the roles of the players in the design process must change. In user-centred design the researcher, designer, and user all play a different role: The researcher brings and develops knowledge, which the designer uses in the creation of new ideas and concept. The user is not a part of the initial design process. Co-design uses a different approach, where the roles get mixed up. In co-design, the user plays a big part in the design process in collaboration with the researcher and designer (Sanders & Stappers, 2008). Figure 1 gives a clear explanation about the difference between user-centred design and co-design.

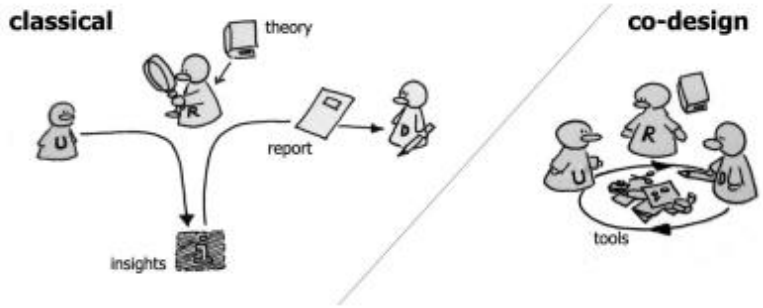

Figure 1: Classical roles of users, researchers, and designers (left) and co-design (right)

Though co-design has a lot of advantages, co-design with elderly brings some challenges (Lindsay, Jackson, Schofield, & Olivier, 2012). First of all, it might be a struggle for elderly to envision the newer technologies. This makes it important to respect individual's contributions to the design process, since some elderly might be better in articulating their needs than others. Engaging with the elderly as early as possible in the design process can make it easier for them to acknowledge their importance in the project. As stated by Lindsay et al, if a designer starts down a path that any participant does not feel is valuable to them, they will struggle to engage with the process or feel like they are being taken seriously (Lindsay, Jackson, Schofield, & Olivier, 2012). Enabling elderly to discuss their own experiences in great detail will make them feel delighted and keeps them engaged in the project.

Co-design improves the idea generation. Designers and customers work together, which brings new ideas and views on the design process. Not only will creativity improve, there will also be a better understanding about the needs of the customer. A result of this is that innovations become more successful. It was shown that co-design caused a higher satisfaction and loyalty of customers due to a better relation between service provider and customer (Steen, Manschot, & De Koning).

2.5 State of the art

Technology can bring people together. It allows people to stay connected and thus avoid social isolation. As mentioned previously, staying connected can be a very important aspect in the life of elderly, and might improve their quality of life. Several innovations have already been developed in order to keep people connected. However, since some elderly are not fully capable of understanding the newest technology it is important to look at their different needs. When looking at already existing innovations, they can be separated in different groups: More physical innovations that support physical contact of people, smartphone apps, and other technical products. In this sub-chapter, examples of all innovations will be given.

Humanitas Deventer

Humanitas Deventer is a residential- and care group, where students and elderly live together. Students are able to live for free in the residential group, in exchange for 30 hours a month where they do small chores and give attention to the elderly. Daily contact with the students helps fight against social isolation and loneliness among the elderly living in the residential group (Humanitas Deventer, sd).

Amintro

Amintro is an online app designed to combat loneliness and social isolation experienced by older adults. Although it looks like a dating app meant for elderly, its main goal is to foster platonic friendships. The app can introduce you to new people with the same interests, and might result in a new on- or offline friendship (Sign Up, sd).

HiLois

HiLois is a private social network centered around a family member, who may be feeling disconnected and may have challenges with technology; the VIP. The app allows other members of the family to send messages and photos to the VIP. No action from the VIP is required, the photos and messages enter into a slide-like carrousel that can run continuously (HiLois, sd).

KOMP

KOMP is a product of Norwegian company No-Isolation. No knowledge about technologies required, which makes it a good solution for elderly that do not like to use a smartphone. KOMP is a small device (figure 2), which children and grandchildren can send pictures and videos to. It is similar to HiLois, however, KOMP has an extra function were the elderly are also able to video chat with their family (No Isolation, sd).

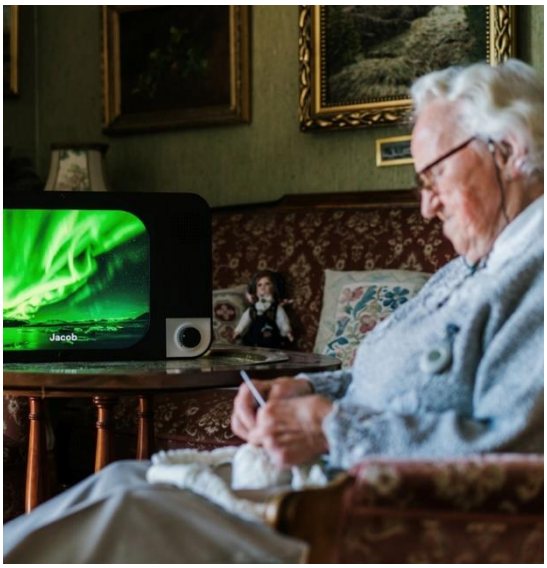

Figure 2: KOMP device (No Isolation, sd)

Paro

Paro is a therapeutic robot seal aimed primarily at elderly who desire company. The robot is equipped with five sensors that allow the robot to perceive people and its environment, recognise voices and even respond to certain words. It was designed as a tool among the elderly and those suffering from dementia. It was found that interacting with Paro can help people reduce stress and anxiety, improve their mood, and encourage social interaction. Unfortunately, this innovative technology comes at a price of $5.000, which makes it less affordable and not for a big audience (Paro, sd).

ElliQ

Intuition robotics designed a robot called ElliQ (figure 3). The robot is designed to help older adults avoid loneliness and social isolation. ElliQ is a proactive cognitive artificial intelligence that initiates conversation to help the elderly say in touch with family or loved ones. Besides being able to just say things like "good morning" and check the weather, it can also remind the elderly to go for a walk. Loved ones can interact with the robot as well by sending photos through the app which are then shown to the elderly on a screen (Halpert, 2019).

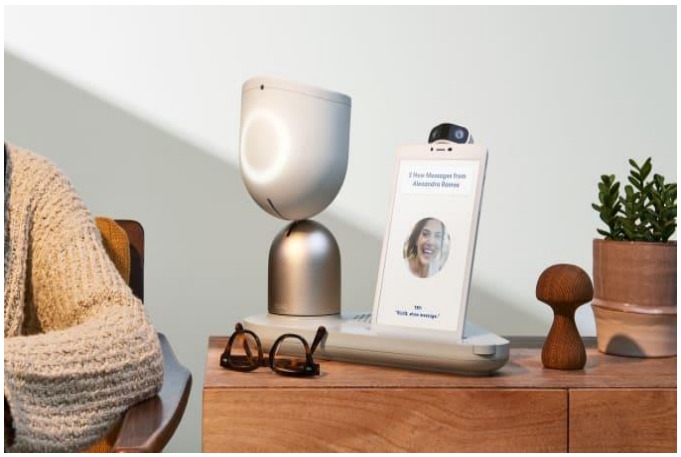

Figure 3: The ElliQ robot, product from Intuition Robotics (Halpert, 2019)

Joy For All

Joy For All is a line of robotic cats and pups, an example can be seen in figure 4. Sensors in the pets allow them to interact with a human companion as they would do with a normal pet. The pets respond to touch, cats can make purring sounds and roll over, and the heartbeat of a puppy will slow down when the companion places a hand on its back (Halpert, 2019).

Figure 4: One of the Joy For All robotic pups (Halpert, 2019)

Rendever

Rendever is a VR program designed for residents of an assisted-living facility. The VR-headset allow the elderly to relive their past, get inspired, and reconnect. They can relive their past by visiting their childhood home, wedding location, or any other important location. The headset also provides opportunities for the residents to (virtually) leave the four walls of their community to do things they have always wanted to do, but never thought possible. In order to help fight loneliness, the elderly using the headset are able to create new friendships through the power of shared experience (About Rendever, sd).

Pepper

Pepper is a social service-robot, that is designed to stimulate social interaction. The robot has features like facial- and speech recognition, and artificial intelligence, which makes it possible for the robot to read emotions and adequately respond to these emotions. Pepper can communicate with users through speech and a screen. At the current moment, the robot is designed especially for the use in health-care and businesses to assist in the workplace (Pepper robot, sd).

2.6 Conclusion literature research

There is a difference between loneliness and social isolation. Although they might influence one another, they are not the same. Social isolation can be seen as a lack of social network, whereas loneliness (and feeling lonely) could be seen as a mental state. Loneliness itself can be divided in three subcategories: A state-related form of loneliness (1), a trait of personality (2), and as an inevitable condition of existence with a basic sense of existential loneliness (3). The first state can be influenced by the environment, the second state could have arisen from maternal problems of early childhood attachment, and the last one speaks for itself.

Senior housing complexes might have a negative influence on loneliness and social isolation among the elderly living there. The elderly living in senior housing complexes might already suffer from health-related issues or financial problems or are single (due to the loss of a partner), which makes them more likely to become socially isolated and lonely. Another way living in a senior housing complex can cause loneliness is because the elderly might have to move further away from their family and friends, which might result in fewer visits.

Loneliness and social isolation can have several consequences on the health of the elderly. They might not result in a direct change on the physical health of the elderly, however, loneliness and social isolation might cause malnutrition. Since malnutrition is often under-recognised and people do not get the right treatment. Though loneliness and social isolation might not have a direct impact on physical health, an insufficient intake of nutrients and vitamins will.

Another way loneliness might influence elderly is through their mental health. People that experience loneliness and self-isolation are of higher risk for depressive symptoms, anxiety, stress, sleep issues and the progression of Alzheimer's disease. Knowing this, it is safe to say that loneliness and self-isolation have a negative influence on the health of the elderly.

Finding a solution for the problem of loneliness that can be used by everyone is a challenge. There is a big difference between elderly, where some are fully capable of using the newest technology and some are not. Current innovations often focus on one of those two groups, elderly that are experienced in

using a smartphone or other technologies can use apps to communicate with people, and elderly that are less experienced with technology can use products like HiLois and KOMP to stay connected to their family. Both HiLois and KOMP are good innovations, but they might lack in making elderly able to really communicate, since they only receive messages. The innovations can also be quite expensive, as can be seen with Paro, which makes them less accessible.

Current innovations are mainly focused on individuals, and not on people that are living in, for instance, a senior housing complex. In this research the goal is to find a solution that will help decrease loneliness in a senior housing complex. The aim is to think of an innovation that will increase social cohesion among the residents, and through this, decrease loneliness and social isolation.

Co-design can be used as a tool to think of an innovation that can help decrease loneliness among elderly living in a senior housing complex. In co-design, the customers helps in the design process. This will give a better view on the needs of the customer and might give a different perspective on the problem. Talking about what is lacking in the already existing technologies will prevent the same mistakes to happen again, and to come up with a better product.

3. Methods

This chapter will explain the methods used in this thesis. All different phases of the research will be discussed shortly. As mentioned before, remote co-design will be used to develop a new product that will help decrease loneliness in senior housing complexes. This co-designing will be done with a resident of one of such buildings; Corrie. Corrie lives in a housing complex in Enschede together with her husband. The apartment building is meant mainly for seniors. Although Corrie herself does not experience loneliness, loneliness is not uncommon under other residents of the complex. The past years Corrie has been actively trying to organise activities for the people living in the flat building, however, not everyone feels the need to participate in them, or is not able to participate due to health issues. Since Corrie wants to help find a way to decrease loneliness among the residents of her flat building, she is a good candidate in the co-design process. In Appendix A the informed consent form can be found, which will be signed by Corrie.

Most contact will be held with the use of emails and phone calls in later stages. Since emails are a fairly easy way to keep contact, and are useful for the retrieval of older conversations, it will be the main form of communication. Phone calls might be used in later stages of the design process.

Phase 1: Discussing state of the art

As a first step of creating a new product, it was important to take a close look at the already existing products that are currently on the market. Getting the perspective of an elderly on these products and knowing what the pros and cons are in their eyes, will help in the process of designing a new product.

A list with state of the art will be sent by e-mail to the co-designer. The co-designer will get some time to think about their own ideas about the products, and what could be done to improve them. In the end, a list will be made with pros and cons of current state of the art. From this list it will be derived what is needed in a new product.

Phase 2: Ideation

2.1: Ideation session about new product with co-designers

In the ideation phase the goal is to think of many new products. This will again be done with the help of the co-designer. Phase 1 will help with knowledge about possibilities and knowing what the requirements of a new product should be. As stated by Amabile, creative thinking refers to how people approach problems and solutions, and using their capacity to put existing ideas together in new combinations (Amabile, 1998). This shows the importance of acknowledging the state of the art and using it to come up with new and better ideas.

No specifics of what should be included in the product are given, it is important to not steer the co-

designer in a specific direction, instead, the co-designer (and researcher) gets all the freedom needed to come up with new and creative ideas. The outcome of this ideation phase will be discussed, and a choice for the final product will be made.
To help the co-designer know about what the possibilities might be, a short presentation was made which can be found in appendix B. In the presentation, different technologies are discussed and some examples of products that use those technologies are shown. The presentation will also give the co-designer more information about what is expected from this phase.

2.2: Ideation session with the help of the local newspaper

Together with supervisor dr. Femke Nijboer, and co-graduating students Sefora Tunc (master student) and Maxim de Leeuw (bachelor student), a collaboration with the local newspaper Tubantia was established. In this collaboration, the newspaper will publish several articles about the research. One of these articles will describe a few scenarios, written by Sefora Tunc, that fit the subjects of the three studies (scenario about loneliness can be found in Appendix C) (Timmers, 2020). The newspaper will ask its readers to help in the research, by telling their stories and coming up with their own ideas for a new product. Respondents might be used in later interviews with one of the researchers, or their story might get a follow up in the newspaper.

This collaboration will help in getting more perspectives from elderly, carer givers, or anyone else who is close to the subject. Since the co-design session will be done with one or two participants, this collaboration will help broaden the research. Simple stories written by readers of the newspaper might give new information about needs and requirements and could lead to new ideas.

Phase 3: Prototyping

From the outcome of the second phase, the prototyping will start. This part of the design process will also be done with the help of the co-designer. The co-designer will especially help in the non-technical aspects, like the UI design. The researcher will now give the co-designer more information about possibilities surrounding the technologies that will be used. In the same document, examples of some designs will be shown to give the co-designer a better idea of what the product might look like. The document used can be found in Appendix D.
The co-designer will help make decisions about what the UI should look like, and what the other requirements might be. There will also be the possibility for the co-designer to come up with some own designs, but this is not mandatory.

Phase 4: Usability testing

After the first prototypes have been made, it is time to test the product. This will be done in several interviews with elderly and experts in the field of technology designed for elderly.

4.1 Goal of the usability testing

The goal of the usability testing is to test the user experience and make changes where necessary. Testing the product with representative users will help in identifying any usability problems, collect qualitative and quantitative data and determine the participant's satisfaction with the product (Usability Testing, sd).

4.2 Set up

The interviews will be semi-structured. This means that the questions will be open-ended, and the interviewer will not strictly follow a formalized list of questions. A semi-structured interview allows for a discussion with the interviewee rather than a straightforward question and answer format (Doyle, sd).

Although a semi-structured interview brings a lot of positives, there are also some disadvantages. Semi-structured interviews are quite time consuming and labour intensive compared to structured interviews (Adams, 2015). Though structured interviews might increase the quantity of information, semi-structured interviews provide more quality information that will be useful during the evaluation.

Due to Covid-19 the interviews will be done from home. For the safety of both researcher and interviewee, no physical contact will take place during the interviews. Interviews will be conducted through emails and video calls. In emails pictures and videos of the product can be shown, and in video calls live footage can be shown. Since video calls are preferred over emails for this usability testing, most interviewees will be conducted over skype, google hangout, or any other platform that allows video calls and screen sharing. Emails can be considered for usability testing when the participant is not able to participate in a video call.

4.3 Selection of participants

For this usability testing the only requirement for possible participants is their age. As mentioned in the introduction, at most housing corporations people aged 60+ are eligible for housing in a senior housing complex. Thus, the required age of participants in this usability testing should be no younger than 60 years old. Participants of the usability test are asked to fill in the consent form, which can be found in Appendix A. Participation in the usability test is voluntary and participant can opt out at any given moment.

Phase 5: Revised product

From the first user evaluations it will be made clear what could be improved in the product. During this phase, small improvements to the product will be made, so that they can be tested in later user evaluations. Improvements will be made along the way, according to the improvement cycle shown in figure 5; When a new problem is identified, a new plan will be made. The new plan for improvement will be executed in the new prototype, which will then be reviewed again. This is a continuous cycle that will keep improving the product, until the evaluation results are satisfactory.

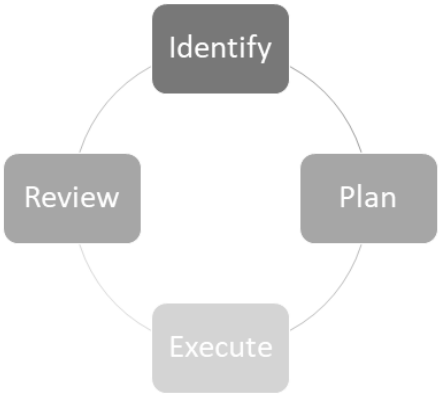

Figure 5: The design cycle

4. Results

This chapter will discuss some of the results discussed in chapter 3. The usability testing and evaluation will be discussed in chapter 5.

Phase 1: Discussing state of the art

From discussing the state of the art a few things could be concluded. First of all, a new product should not need too much personal information. Social apps like Facebook and Instagram require quite some personal information, which the co-designer disliked. Not everyone wants to share personal information online, and a new online friendship was not seen as a good solution to fight loneliness. Secondly, the idea of a robot might work well for some people, but for people who are still quite active and have the ability to use current technologies, it will not be the perfect fit.
Products that received positive feedback were mostly products that gave the user the option to video chat with friends and family or receive videos and photos from them. It will give users the opportunity to feel connected with their loved ones without having to leave their homes. After discussing the state of the art and the literature review, a list of requirements was made:

Accessibility

First of all, the accessibility is an important aspect. Since the product is designed for elderly living independently in a senior housing complex (no care facility), the elderly have to be able to use the product by themselves. As stated in the introduction, there is a big difference between technology usage of elderly. Although some do not experience any problems using current technologies, there are still some elderly that have more difficulties using for example a smartphone or computer. The product should not be too difficult in use, to make it accessible for all elderly. This brings us to the next requirement: A good User Interface (UI) design.

Good UI design

Elderly possibly suffer from some disabilities as a result of aging. Vision loss is the most commons disability reported in adults in the United States (Polyuk, sd), a good UI design should take this into account. The obvious design choice that will be made when designing for elderly is increasing the *font-size*. Just increasing the font-size might not be the best option, it would be better to give the user the option to adjust the font-size themselves. Besides the size of the text, the *font* itself should also be considered. Overall, Sans Serifs fonts are the best to use in the UI. Another important aspect of UI design for elderly is the *colour* of certain things. Shades of blue should be avoided in important interface elements, and try to use high contrast in colours. Although colour might be a nice design feature and will help with the aesthetics, colours should not be used to convey a message (Accessible Design: Designing for the Elderly, 2019).

Icons can be a very effective way to improve visual interest and grab the user's attention, and will also help guide the users while they are navigating a page (Lenaerts, 2014). When using icons in an UI designed for elderly, it should be considered that not everyone will understand these icons. To avoid confusion among the users, icons should also be labelled with text whenever possible (Polyuk, sd). Users that do not need the helpful text are not likely to be offended by it, and those who do need it will have a better experience using the product.

Customization to personal needs

Since all users might experience different health-related-issues, there should be a possibility to customize a product wherever possible. This is dependent on what type of product will be made, and will be discussed more in later phases.

Privacy

During the literature research and after talking to the co-designer, it was clear that privacy is an important issue among the elderly. Not everyone is interested in sharing all their personal information on social media or anywhere else on the internet. The product designed should thus not require too much personal information in order to work. Since a product will be designed for a senior housing complex, there could for example be a system that only shares the given information (name and house number) to other users living in the same building. This way there is still some personalisation and the possibility of interaction between neighbours, but there is less of a privacy issue. Since different products can require different personal data (or lack thereof), this is another requirement that should be discussed more in depth after the ideation phase.

Materials

It is important that the product is of good quality. Breakable objects should be avoided, to increase the durability of the product. The material used should be comfortable to use, depending on the product.

Price

Lastly the price is an important aspect. In the state of the art, the products at a higher price point were found less attractive. Since the user will not know if the product will be used often before buying it, a higher price might discourage the elderly from buying it. Thus, a product of a lower price will have a higher chance of succeeding.

Phase 2: Ideation

2.1: Ideation session about new product with co-designer

The ideation session with the co-designer resulted in a few interesting ideas:

Robot buddy

A robot that will help someone feel less lonely. The robot will be kept at home and has different types of features. The robot will be able to have conversations with the user all day long with the help of an AI. If needed, it will give reminders to the user to take medication, go to an activity, or anything else that is on the schedule. With a smart system, the robot is able to connect with robots from other residents of the same building and can connect the different users with each other. They can chat with each other through the robot, send each other pictures, or plan activities.

VR Coffee Corner

The VR Coffee Corner is a good place for residents that are scared or unable to leave their home. It will allow people to stay connected with other residents of the complex, without having to leave the comfort of their own home. Due to the current pandemic, people are afraid to go see their friends and want to keep their distance. Virtual reality will make it possible to still meet up with friends for a chat, while social distancing.

Online game

An online game in which players from the same housing complex stay connected. The game could for example be an online community where everyone can design their own house. Visiting others, in real life or in-game, will give the player extra points/money to buy stuff. This will encourage users to not only play the game all day but also to stay in contact with other residents of the building.

App that connects elderly with photographers

As mentioned in the literature research, living in a senior housing complex might cause loneliness due to residents having to move away from the place where they grew up. Seeing pictures and videos from the place they grew up might help the user feel less lonely. A system could be made where elderly request pictures or videos from a special location, and in return the photographer will receive stories about that place.

2.2: Ideation session with the help of the local newspaper

The newspaper received quite some responses. One of the biggest issues people were having was that they did not want technology to replace human contact. Besides this issue, there were many great ideas. One of the most recurring ideas was the sharing of stories and pictures, with loved ones or online. Two of the more creative and interesting ideas will be described below.

Virtual road trip

Gerard came up with the idea of a virtual road trip; An old bus/car with screens on the inside. When using, it would feel like you were sitting inside a car. The screens can display different locations, to make it look like you are in a different environment. This will give people that are not able to travel far from home the opportunity to make fun trips with others, without actually going anywhere. The old bus/car could be parked right outside the housing complex, or when available inside the garage. The whole story can be found in Appendix E.

Talking device

Another interesting idea came from Dinie. Her idea is a "talking device" where people can communicate with each other by sending pictures and spoken messages. On the tablet, the picture is shown, and the user can play the spoken message whenever he has time. This helps people feel a little bit closer to one another, without having to make time for a video call. Simply record a message when you have time, to let your friend or loved ones know you are thinking about them.

2.3 Final idea

The final product idea from the ideation is a program in which residents of a senior housing complex can travel in virtual reality. There are different possibilities for the users; They can go to a special location or make a trip to a place they have never been or go to the virtual coffee corner. The virtual coffee corner is an online room that is always available to the residents. They can join whenever they feel like it and see who is there. The coffee corner is meant for residents to chat with each other from the comfort of their own home with the use of a headset and microphone. They are able to stay connected and see each other, instead of just talking on the phone.

The other option is to go to another location. First, the user has to decide whether he wants to go alone, or if he wants to invite other people to join. In the location menu, there will be the option to fill in an address or to pick one of the pre-selected locations. These pre-selected locations are all over the world and might take the user on an unexpected adventure.

Requirements Virtual Reality program

In the results of phase 1 most requirements for a new product were given. When designing a Virtual Reality program, some additional aspects should be taken into consideration:

Privacy

Since privacy might be a big concern for some end users, no personalized information will be collected in order to use the virtual reality program. It should be able to use the program anonymously, with only a nickname and maybe an avatar so other users are still able to find you. This way, no personal data will be collected and put on the internet.

Materials

There are different types of virtual reality products at different price points. Users of the program can choose themselves what kind of equipment they want to use. A simple VR-cardboard can be used for users that just want to see the world. Other users that want to move more and be able to talk and listen to others could decide to use a more advanced VR-set. Thus, customization to personal needs can mostly be done by getting different materials to use the program with.

The program itself can be made available for different types of technology, no new device has to be purchased. Since the program is designed to connect residents of a senior housing complex, it will be an available service to such housing complexes. A unique login code will be linked to a housing complex, which the residents can use to connect to their server. This way, each housing complex will have its own server in which residents can communicate with one another. The coffee corner can only be visited by residents from the housing complex, and virtual trips can be made with other residents that are online.

Since the program does not require the purchase of new devices, and it can be used by all residents of the housing complexes, the costs of the product can be kept on the lower side. The low costs will make it more interesting for stakeholders to try out the program, since it does not require them to spend a large amount of money in order to use the program. If the housing complex already has the service at its disposal, residents can try it out by just using technologies they already own (smartphone, tablet, etc.). Other products like a VR-headset can be bought after trying out the program.

The low costs of the product will make the program very accessible to residents of a senior housing complex. Trying the program does not bring any risks; if the product does not satisfy the user their needs it can simply choose to uninstall the program from their own devices. Seeing other residents of the housing complex and hearing about their experiences using the program might make them more curious in trying out the program for themselves. Especially for newer residents, or residents that find

it hard to get in contact with other people living in the same building, the program can be an easy first step to meet other residents.

Phase 3: Prototyping

The prototype will be a unity program that will represent a virtual reality program. A simple interface has to make sure that the program is easily operable for people of all ages. Users will be able to navigate to the two different options: going for a virtual trip (1) and going to the virtual coffee corner (2). In figures 6 to 8 screenshots of the first prototype can be seen. After the evaluations, some changes can still be made depending on the response on the usability testing.

Figure 6 Welcome screen

The first scene (figure 6) is a welcome page providing the user with a small introduction to the program. All requirements mentioned in the results of phase 1 are here taken into account; text-size is enlarged, the font is Sans Serif, and the use of icons is avoided. The extra explanation and instructions on what button to press will make the program more user friendly for elderly that are less familiar with current technologies.

Figure 7 Menu screen

After pressing the "start" button in the first scene, the program will open the menu page (figure 7). Here it will give the user the opportunity to choose if he wants to go on a trip or go to the coffee corner. There are three buttons: "together" if the user wants to make a trip and invite friends (1), "alone" if the user wants to make a trip by himself (2), and "coffee corner" if the user wants to go to the coffee corner and see who is online (3). In the top left corner, there is a return button, which uses both icon and text. This button will be used in all further scenes to make it easily recognizable.

Figure 8 Location screen

The first two buttons ("together" and "alone") will take the user to the scene shown above in figure 8. In this scene, the user gets to choose the destination of the trip. It gives the user the possibility to type an address, or pick one of the pre-selected locations.

Figure 9 Example of pre-selected location

On figure 9 above one example of the pre-selected locations can be seen. In the prototype, a 360° image is used to give the illusion of a virtual environment the user can walk around in.

Figure 10 Virtual coffee corner

When choosing for the coffee corner the user will end up in the virtual living room shown in figure 10. The user can walk around in this living room and see other users that are online. For both the coffee corner and the 360° images in the pre-selected locations assets from the unity asset store were used. A completed list of used assets can be found in Appendix F. All code used in the program can be found in Appendix G.

Phase 4: User testing

During the usability testing, five interviews were conducted. The participants of the testing were all elderly, aged 60+. Three interviews were conducted over skype to use the screen share feature. The other interviews were held over phone, images and screen recordings of the prototype were sent over email beforehand. The overall response on the prototype was very positive, however, there was still some room for improvement.

During the first interview with the co-designer, the only negative feedback was on the coffee corner. Although the co-designer liked the idea of the room, the execution was not considered good enough. The room shown in figure 10 was lacking personality and needed a new design. Before the other interviews were conducted a new coffee corner was made in unity, which can be seen in figure 11 below.

Figure 11 Improved coffee corner

The second participant liked the idea of the virtual environment and could see how it could work for some people. However, she did note the importance of real human contact and how this should not replace it. The program looked quite clear, but since she only received images and screen recordings, she could not tell for sure if she could use it on her own. She mentioned that it might take people some time to learn how to use the program, but that is more dependent on the technical skills of the user. The interface looked clear, and she could not think of anything to make it better.

During the third interview, a lot of small interface design aspects were discussed, together with the explanatory texts in each scene. Together with the interviewee, different options were discussed for a better interface design. The following points were changed:

Welcome text

The welcome text on the first screen was changed to give users a better understanding of the program, and what the different possibilities are (image 12). The changes made the text clearer and more positive.

Travel alone or together

In the first prototype, the user got to choose if he wanted to go travel to a location alone or together or go to the coffee corner. Instead of giving all three options, the interviewee said it would be better to give the users two options at first: Travel to a location or go to the virtual coffee corner. When choosing the first option to go to a special location, the options of going alone or together will be given (image 13, 14).

Possibilities virtual trips

Although the program now is only a prototype, different possibilities for the virtual trip were discussed. The interviewee asked what could be done at the locations, if it is just looking around or if it was possible to go on an excursion as well. Secondly, the interviewee said that elderly might want to travel to other places that are more personal. He gave the example of grandchildren going to Disneyland, and the grandparent being able to take a look at Disneyland from home. What could be added is the possibility for family and friends to upload their videos and pictures, which then can be seen in the program.

In the last interviews, no new points came to light. The interface was found clear, the participants of the testing knew what buttons to use and where it would take them. The explanatory texts on each screen were found useful, it gave the participants a good understanding of the product and they did not ask any questions about what button they had to press. Thus, no further changes to the prototype were made.

Figure 12 Improved welcome screen

Figure 13 Improved menu screen

Figure 14 Extra screen, where decision is made to travel together or alone

6. Future improvements

In this chapter, some future improvements for the product will be discussed. The prototype as described in chapter 5 is still quite simple since the main focus was to build a good interface.

6.1 Add locations

In the prototype, only a few simple options were given of different travel locations: the option to put in an address yourself or choose one of the 6 pre-selected locations. Together with the co-designer and participants of the usability testing, some options were discussed about the travel locations, and how these could be improved.

Personalized locations

Users might be interested in more personalized locations instead of the pre-selected locations. Locations could be based on trips the family is making, like the example discussed in the previous chapter. In this example, the grandchildren of a user go on a trip to Disneyland. The user wants to know what they are seeing and uses the app so take a look at Disneyland. Either standard pictures and videos of the locations could be used that already exist on the internet, or pictures and videos can be uploaded by their family. This way, the user can feel more connected to their family since the program can give them some insights into their experiences.

Excursions

Another option for virtual trips is to add excursions. Instead of going to one of those virtual locations to look and walk around, the option of different excursions could be added. A virtual guide could be added that gives information about where the user is, and what the user is looking at. There are many different possibilities with this; a simple walking-, bus- or boat tour, a museum tour, or any other already existing excursions that could be done in virtual reality. These excursions can enhance the experience on the virtual trip since the user will now see and learn more about different locations.

Commissions with photographers / videographers

The program could also have a function where photo- and videographers can be hired to take photos and videos of special locations, in exchange for a small amount of money. This can lead to a higher quality of photos and videos used in the virtual trips. The photo- and videographers might also be able to make more personalized content, for example, by going to very personal locations like places the users grew up, or maybe graveyards where their parents or other family members were buried. This can especially be of great added value for vulnerable elderly that are less mobile and not able to make trips to important locations themselves. Besides professional or hobby photo- and videographers, elderly can also ask friends and/or family members to send them photos and videos of special

locations (like in the example with personalized locations, where family members can upload pictures and videos of their trip to Disneyland)

6.2 Add games

Another addition that could be made to the program is different games that could be played in the virtual coffee corner. Simple games that can be played online will give the users something to do when visiting the virtual coffee corner besides having a chat with other residents.

7. Discussion

In this section the research question as stated in the introduction will be answered. Literature research as well as own findings will be discussed shortly in the conclusion. Next to this, limitations and recommendations for future research will be discussed.

7.1 Conclusion

The goal of this research was to find a solution to decrease loneliness among elderly living in senior housing complexes with the help of remote co-design. Loneliness can be caused by many things and can be experienced by everyone. During the literature study it was found that although living in a senior housing complex has its benefits, it might increase the chances of experiencing loneliness and social isolation. Current products developed to decrease loneliness in elderly are designed for a specific user and does not necessarily focus on improving contact between different individuals.

During interviews with elderly it was found that elderly is indeed a growing problem, however, people do not like to admit that they are experiencing any kind of loneliness or social isolation. Because of the changing demographics causing a much older population structure, loneliness among the elderly will keep growing and is a problem that should be tackled.

Literature research was done to find out more about different causes of loneliness and how living in a senior housing complex influences this. Another important aspect of this literature study was about the consequences of loneliness and social isolation on the physical- and mental health of elderly. It was found that loneliness and social isolation can have a big effect on the physical- and mental health, which makes it even more important to help reduce the chances of loneliness.

In this research, a new product was made that will help connect residents of the same building. Staying connected is very important in order to reduce the chances of loneliness, even more, when physical human contact is not possible. A virtual environment was designed where the users can travel around the world or visit the coffee corner. The virtual coffee corner is open to all residents of a housing complex, it is a place where they can have a chat with each other without leaving their own home. The other option of making a virtual trip around the world can be done alone or with others. The user can decide to invite friends and explore new places together in virtual reality or visit places that are close to one’s heart.

Although virtual environments have been made before, this program is expected to be more usable. Though some additional user testing has to be performed in order to draw conclusions about the usability of the product, the first usability tests showed very promising results. Since co-design was used during the whole design process, the program was developed. Some elderly might not be very

familiar with newer technologies and can experience a lot of difficulties trying to use one of those products. This virtual environment is designed for everyone, also those that are less experienced technology users. The interface design was kept simple, few buttons were added and, on each screen,, a clear explanation was added on what was happening and what to do next. During the usability testing, it was found that the overall interface design was very user friendly and straightforward. Some small changes were made in the explanatory texts after the usability testing, after which the final prototype was ready. The usability testing showed promising results and might help reduce loneliness amongst elderly living in senior housing complexes.

Thus, to answer the question "*How can loneliness among elderly aged 60+ living in a senior housing complex be reduced with a new product designed with the help of remote co-design?",* loneliness among elderly aged 60+ living in a senior housing complex can be reduced with the help of the virtual reality program designed during this research. Though this solution will not solve the problem of loneliness among elderly, the product can be used as a tool for the elderly to make it easier to stay connected. The virtual program makes it possible for elderly to meet with other residents online and go on trips together without having to leave their own house. This not only makes it easier to get in contact for people that have less mobility, but it will also make communicating with other residents more approachable. Co-design helped in a better understanding of the different needs of all users and helped in making a more accessible product.

7.2 Limitations

During this research, some things did not go as planned as a result of circumstances surrounding Covid-19. These circumstances might have influenced the research and the outcomes of it in several ways, which will be discussed in this chapter.

First of all, co-designing on a distance might have been a good solution during this quarantine, but it might not have been the best fit for this user group. Remote co-designing made communication between researcher and co-designer harder. The explanations over email were done very extensively, however, discussing and explaining the project in person would have been easier. Having co-design sessions in person would have made it easier to discuss and give the co-designer more space to ask questions about the given instructions.

Another limitation was found during the usability testing. First of all, it was harder to find participants for the usability testing. This resulted in a small number of participants for the usability testing, which meant less user feedback. Not all participants of the usability testing are currently living in a senior housing complex, nor did they all experience loneliness. A bigger sample size with participants that experiences loneliness or social isolation would have given a more reliable outcome.

Lastly, remote usability testing also had its limitations. Instead of interacting with the program themselves, the interaction was done by the interviewer. Interviews were preferably held over skype, however, not all participants were familiar with skype or familiar programs, which is why some interviews were conducted over normal phone calls. In the usability tests where skype was being used, screen sharing was used to give the interviewee live images of the program. Though interaction with the program still had to be done by the interviewer, the participant was able to tell what to do next. With the interviews that were conducted over phone calls, only screenshots and video of the program was shown to the interviewee. The interviewee had no say in what button to press next, which made the outcome of the usability test less trustworthy. Thus, remote usability testing should be avoided in familiar test situations if possible.

7.3 Future research

Some recommendations have been created for future research. Although the current prototype of the program looks promising, some additions can make the product even better. Future possibilities that are previously discussed in chapter 6 could be researched, to see what additions will improve the product. A good focal point is possible travel locations, and how this could be personalized. Is the quantity of available travel locations more important? Or do users care more about the quality, and do they rather visit locations with personal meaning.

Secondly, the addition of VR glasses should be researched further. During this usability testing, it was shown that the VR glasses are not particularly necessary in order to use the program. However, VR glasses could add to the experience by making it more realistic. Keeping the option to use the program on computer/tablet/smartphone or with the use of VR glasses might make the product more accessible to all users, since obtaining the VR glasses is not mandatory in order to use the product.

Thus, the current prototype looks promising already. Future research might show that other additions to the program can further improve the product.

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Appendices

Appendix A: Informed consent form

Geïnformeerde toestemming

Onderzoek naar eenzaamheid onder ouderen in een seniorencomplex

In deze scriptie zal er onderzoek worden gedaan naar eenzaamheid onder ouderen wonend in een seniorencomplex. Het doel is om een nieuw product te ontwikkelen wat hierin kan helpen, met behulp van co-design op afstand. In het co-design proces, is het behulpzaam om hulp te krijgen van een bewoner een seniorencomplex, die ervaren is met eenzaamheid. Hiervoor is het niet nodig dat de deelnemer zichzelf eenzaam voelt.

Op ethische gronden is het verplicht om de deelnemer te vragen of het duidelijk is aan welk project wordt deelgenomen, en wat hier van verwacht kan worden. Ook moet het duidelijk zijn dat deze deelname volledig vrijwillig is, en dat deelname op elk moment stopgezet kan worden. Terugtrekken van deelname, zonder een reden te noemen, is altijd mogelijk.

Uw deelname zal bestaan uit het helpen in de ontwerpfase van een nieuw product. Hiervoor zal contact plaatsvinden via e-mail en / of telefoon. Van eventuele telefoongesprekken zullen notities worden gemaakt, zodat deze later gebruikt kunnen worden als vorm van data. Ook informatie komend uit e-mails zullen gebruikt worden als vorm van data in de scriptie. Persoonlijke informatie zal niet gebruikt worden in het onderzoek, en zal ook niet verspreid worden naar derden.

Door dit toestemmingsformulier te ondertekenen erken in het volgende:

1. Ik ben voldoende geïnformeerd over het onderzoek, en heb de mogelijkheid gehad om extra vragen te kunnen stellen. Deze vragen zijn voldoende beantwoord

2. 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.

3. Ik geef toestemming om de gegevens die gedurende het onderzoek bij mij worden verzameld te verwerken zoals beschreven in bovenstaande informatie.

Naam deelnemer:	Naam onderzoeker:
Handtekening deelnemer:	Handtekening onderzoeker:
Datum:	Datum:

Appendix B: Presentation ideation phase

Hoe?

Op de volgende slides staan verschillende (bestaande) technologieën. Aan ons twee de taak om deze te gebruiken bij het bedenken van (zoveel mogelijk) nieuwe ideeën. Ideeën mogen heel stom en simpel zijn, zo creatief mogelijk!

Probeer vooral te denken aan hoe een product in een flatgebouw of seniorencomplex gebruikt kan worden, om de bewoners in contact te brengen en minder eenzaam te laten voelen.

In deze powerpoint staan eerst een aantal technologieën die gebruikt zouden kunnen worden (hoeft niet, zijn alleen maar voorbeelden). Daarna zal ik een paar van mijn eigen brainstorm ideeën neerzetten en kort uitleggen.

Virtual Reality

Virtuele werkelijkheid of schijnwerkelijkheid simuleert een omgeving via een computer. De meeste VR brillen laten een omgeving zien met bijpassende geluiden. De omgeving kan van alles zijn, het kan gebruikt worden in spellen, maar het kan ook een realistische omgeving laten zien. Als het online gebruikt wordt, kunnen ook meerdere mensen deelnemen aan dezelfde wereld.

Spel apps

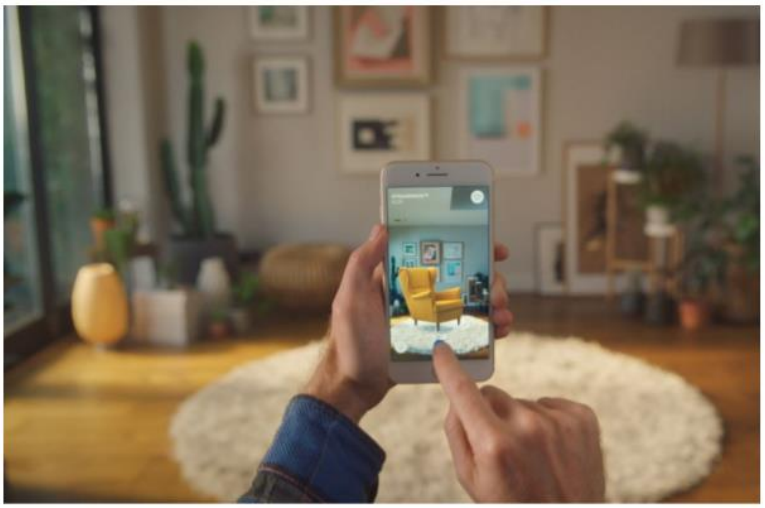
Spelletjes voor op de telefoon of tablet (of ander soort computer) kunnen ook goed gebruikt worden om mensen met elkaar in contact te brengen.

Een voorbeeld van zo'n sociale spel app is animal crossing, waarin elke speler zijn eigen eilandje heeft. Spelers kunnen bij elkaar op bezoek en spullen aan elkaar verkopen.

Een spel wat spelers actiever maakt, en zorgt dat spelers vaker naar buiten gaan is pokémon go. Spelers kunnen buiten pokémons vangen, en met andere spelers battlen.

Augmented Reality

Of wel Aangevulde Realiteit. Dit is een direct beeld van de werkelijkheid waaraan elementen worden toegevoegd door een computer of telefoon. Op de foto hiernaast wordt het bijvoorbeeld gebruikt om te kijken of een nieuwe stoel in de woonkamer zou passen.



Draagbare technologie

Draagbare technologie kan van alles zijn. Een bekend voorbeeld van draagbare technologie is de smartwatch, een horloge met meerdere functies. De smartwatch kan in combinatie werken met de telefoon, waardoor het berichtjes kan laten zien. Vaak wordt een smartwatch ook gebruikt tijdens het sporten, om bijvoorbeeld de hartslag of aantal stappen bij te houden.

Kleding en accessoires kunnen beide gebruikt worden voor draagbare technologie.

Robot

Robots kunnen goed gebruikt worden om eenzaamheid tegen te gaan. Er zijn veel verschillende mogelijkheden in wat de robot zou kunnen doen, en hoe de robot eruit ziet.

Een robot kan van alles zijn, bijvoorbeeld een huisdier, een pop die terug kan praten, of een robot die berichten van familieleden afspeelt.

Mijn brainstorm ideeën

Hieronder een aantal van mijn ideetjes. Zoals ik al eerder had genoemd gaat het vooral om creativiteit en het bedenken van zoveel mogelijk ideeën. Ik zou het erg leuk vinden als u ook met wat ideetjes komt. Hiervoor mag u de technologieën gebruiken die ik hierboven heb beschreven, maar dit moet niet!

Robot maatje

Een persoonlijke robot voor elke bewoner. De robot kan gesprekjes voeren met de bewoner, en nog veel meer! De robots in de flat zijn met elkaar verbonden, en kunnen zo de bewoners met elkaar in contact brengen. Bewoners kunnen bijvoorbeeld aangeven dat ze samen met iemand een kopje koffie willen drinken of een rondje willen fietsen. Zo zijn personen minder eenzaam in hun flat omdat ze altijd met iemand kunnen praten, maar hebben ze ook de mogelijkheid om meer met andere bewoners in contact te komen

Online spel

Zoals beschreven in een van de vorige slides zou er een online spel gemaakt kunnen worden voor op de telefoon of tablet. Het spel zou bijvoorbeeld een online gemeenschap kunnen zijn, waarin mensen hun eigen huisje kunnen bouwen en inrichten. Op bezoek gaan bij mensen in de flat (in het echte leven, niet in het spel), zou extra punten kunnen geven voor in het spel. Hiermee worden mensen dus aangemoedigd om niet alleen online contact te houden, maar ook echt een keer bij elkaar langs te gaan.

https://www.zorgvannu.nl/oplossingen/ontspannen-met-een-vr-bril

Online koffiekamer

Met de hulp van een VR bril kunnen mensen in de tijd van corona toch bij elkaar op bezoek. Er zou een virtuele koffiekamer (of knutselkamer) kunnen worden ingericht, waarin bewoners van de flat samen kunnen komen. Je zet de bril op en je bevindt je in een nieuwe omgeving met andere bewoners. Je kan met elkaar kletsen over van alles en nog wat, zonder je huis uit te hoeven.

Appendix C: Scenario loneliness (from tubantia)

Written by: Sefora Tunc

Eenzaamheid

Lisette woont sinds de dood van haar man, een half jaar geleden, alleen. Om zich minder eenzaam te voelen probeert zij vaak met haar vriendinnen eropuit te gaan, bijvoorbeeld naar schilderles. Maar zodra zij weer thuis is, voelt Lisette dat zij alleen is; er is niemand om over haar dag te vertellen.

Zij zou haar dochter kunnen bellen, maar die wil ze niet zo vaak lastigvallen. Lisette droomt van een manier om haar verhalen met haar dochter te delen.

Hoe wordt Lisettes droom werkelijkheid? Hoe deelt zij haar verhalen en hoe kan haar dochter daar, op een moment dat het voor haar uitkomt, op reageren? Welke oplossing zou moeder én dochter ondersteunen?

Appendix D: Co-design document phase 3

Virtuele gemeenschap

In tijden van Corona is het lastig om het gewenste sociale contact te hebben met vrienden, familie, en buren. Omdat sociaal contact erg belangrijk is om eenzaamheid te voorkomen, wil ik met de hulp van virtuele realiteit een soort virtuele gemeenschap maken. Voor het ontwerpen van zo'n virtuele gemeenschap heb ik uw hulp nodig! Ik vraag u om (creatief) mee te denken over het ontwerp. Als u opmerkingen heeft over iets wat beter kan, of een ander idee heeft voor het ontwerp hoor ik het graag.

Wat is Virtuele Realiteit? Virtuele realiteit is een soort schijnwerkelijkheid wat een omgeving simuleert via een computer (telefoon, tablet, ander beeldscherm). Verschillende zintuigen van de gebruiken worden ondergedompeld in een ervaring, waardoor het meer is dan alleen een foto of video op een schermpje. De meeste VR omgevingen zijn visueel en auditief. VR is op dit moment vooral bekend onder gamers. In speciale VR omgevingen kunnen gamers samen komen. Ze kunnen rondlopen door een online omgeving, en met elkaar praten.

Voor mijn afstudeeronderzoek wil ik een simpele versie maken van virtuele realiteit, speciaal ontworpen voor ouderen mensen. In deze virtuele omgeving kunnen ze contact blijven houden met familie, vrienden en buren. Zo zou bijvoorbeeld een virtuele (online) koffiekamer kunnen worden gemaakt. Wanneer iemand niet in staat is om zijn of haar huis uit te gaan, maar toch een kopje koffie met iemand wil drinken, kan deze persoon naar de virtuele koffiekamer gaan. Aangezien alles online via een computer gaat, zijn er bijna geen grenzen aan hoe het eruit zou moeten komen te zien. Een ander idee is om met behulp van Virtuele Realiteit plekken te bezoeken, waar je zelf niet meer snel kan komen. U kunt zo bijvoorbeeld de plek waar u bent opgegroeid bezoeken, alleen of samen met andere mensen (die vanuit hun eigen woning mee kunnen reizen in de schijnwerkelijkheid).

Bril + controllers voor handen. Zulke brillen worden vooral gebruikt in games. Je kunt om je heen kijken, makkelijk rondlopen, en dingen oppakken met de controllers. Aangezien het op dit moment ook al wordt gebruikt voor (online) games, waarin meerdere mensen met elkaar spelen, is het dus ook mogelijk om zo virtueel, vanuit eigen huis, op stap te gaan met andere mensen (die thuis ook zo'n bril hebben).

Simpele (goedkope) bril waar bijvoorbeeld een telefoon het scherm is. Dit is een wat simpelere ervaring, maar met de bril is het een stukje echter. Er kunnen speciale video's gemaakt worden voor mensen die zo'n bril gebruiken, waardoor de virtuele omgeving net echt lijkt (anders dan een normale video). Het is lastiger om zo'n bril te gebruiken voor een online gemeenschap, aangezien er geen besturingssysteem aan vast zit (geen afstandsbediening of andere knopjes waarmee je dingen kan instellen).

Kamer / ruimte ingericht met schermen. Op deze schermen kan een andere omgeving worden weergeven, waardoor het lijkt alsof je daar echt bent. Hiervoor zou een speciale ruimte in een gebouw moeten worden ingericht. Rondlopen in de virtuele omgeving is ook lastig, aangezien er (net zoals bij de kartonnen bril) geen controller is.

Hier nog het idee van een lezer van de Tubantia, wat vergelijkbaar is met zo'n kamer:

Virtueel op stap.
Als middel tegen verveling, eentonigheid en eenzaamheid. Wat ik bij meerdere oudere mensen en mensen met een beperking merk, is dat ze graag een ritje in de auto of busje maken. Onze zoon vindt dat ook prettig. Nu kan ik me voorstellen dat er niet altijd mogelijkheden zijn om zomaar met een persoon of groepje op weg te gaan. Dus lijkt me het volgende wel interessant. Schaf een oud afgekeurd busje aan en richt dat zó in dat er binnenin genoeg ruimte is om lekker te kunnen zitten en er ook ruimte en inrijmogelijkheid voor rolstoelers is. Voorzie alle ramen van beeldschermen en laat hierop opnames zien van een tour door de omgeving. Produceer er ook autogeluiden bij, laat de bus licht bewegen en bij bochten ook iets hellen (alsof er echt gereden wordt), zodat er maximale beleving is. Eventueel een lekker muziekje op de autoradio of een eigen koptelefoon. De chauffeur kan onderweg ook iets uitleggen.
In feite kost dit qua onderhoud alleen maar een camera voor toezicht, geen benzinekosten, geen milieuvervuiling en toch is de trip compleet. Mensen zijn er even uit geweest, het alledaagse ritme is doorbroken, ze kunnen erover vertellen en er ook naar uitkijken. Omdat het een veilige rit is, zou het waarschijnlijk ook voor iemand die b.v. incontinent is tot de mogelijkheden behoren

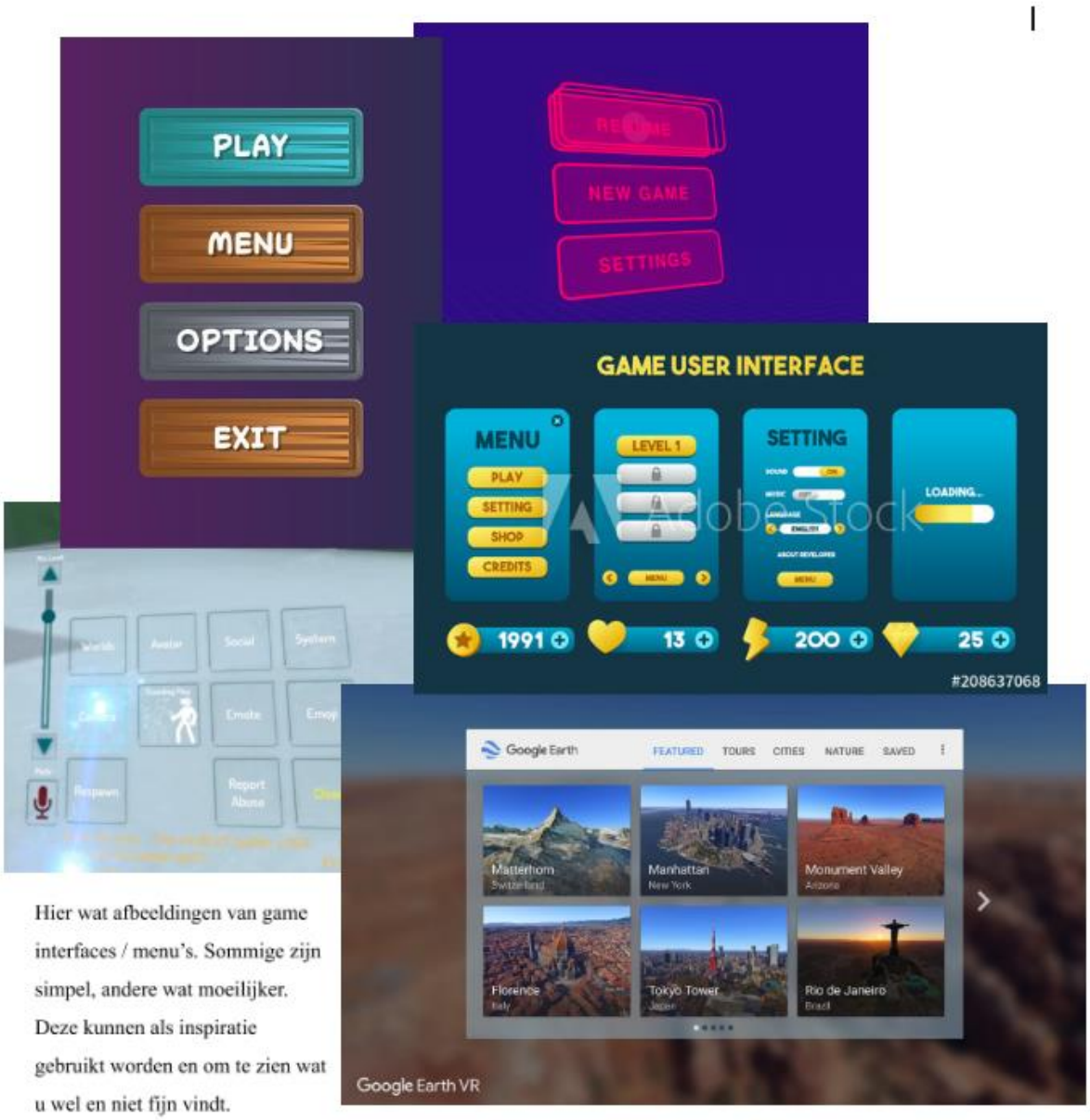
Hoe kunt u mij helpen?
Het idee is dus om een virtuele omgeving te maken voor ouderen mensen, waarin ze samen kunnen komen met andere mensen. Hoe dit eruit gaat zien, weet ik nog niet precies. Hiervoor heb ik uw hulp nodig. Probeer met de informatie die ik u heb gegeven, en veel creativiteit, na te denken over hoe u zou willen dat zo'n virtuele omgeving eruit zou komen te zien. Dit mag heel kort met een aantal punten uitgelegd worden, of langer met een verhaaltje (zoals hierboven over het busje).
Een belangrijk onderdeel van iets virtueels is de interface, hoe gebruikers het moeten gebruiken. De knoppen waar ze op moeten drukken om in de virtuele wereld te duiken, waar ze heen gaan en met wie. Aangezien er een groot verschil zit tussen ouderen die wel en geen verstand hebben van technologie, is het belangrijk dat het voor iedereen toegankelijk is. Op de volgende pagina staan een aantal voorbeelden van menu's die online spellen gebruiken, deze kunnen als voorbeeld gebruikt worden als u zelf iets gaat ontwerpen. Ik zal zelf ook een aantal schetsen maken en deze toevoegen.

Denk bij het ontwerpen dus goed na over:

- Wat voor technologie zou u willen gebruiken? (ruimte met schermen, simpele bril, of bril met controllers, zoals beschreven op vorige pagina's)
- Hoe ziet de virtuele wereld eruit? Wat voor omgevingen zou u willen zien? Waar wilt u naar toe reizen?
- Wat kunnen mensen in de virtuele wereld doen? Alleen rondreizen? Kunnen ze met elkaar praten? Kunnen ze spelletjes spelen?

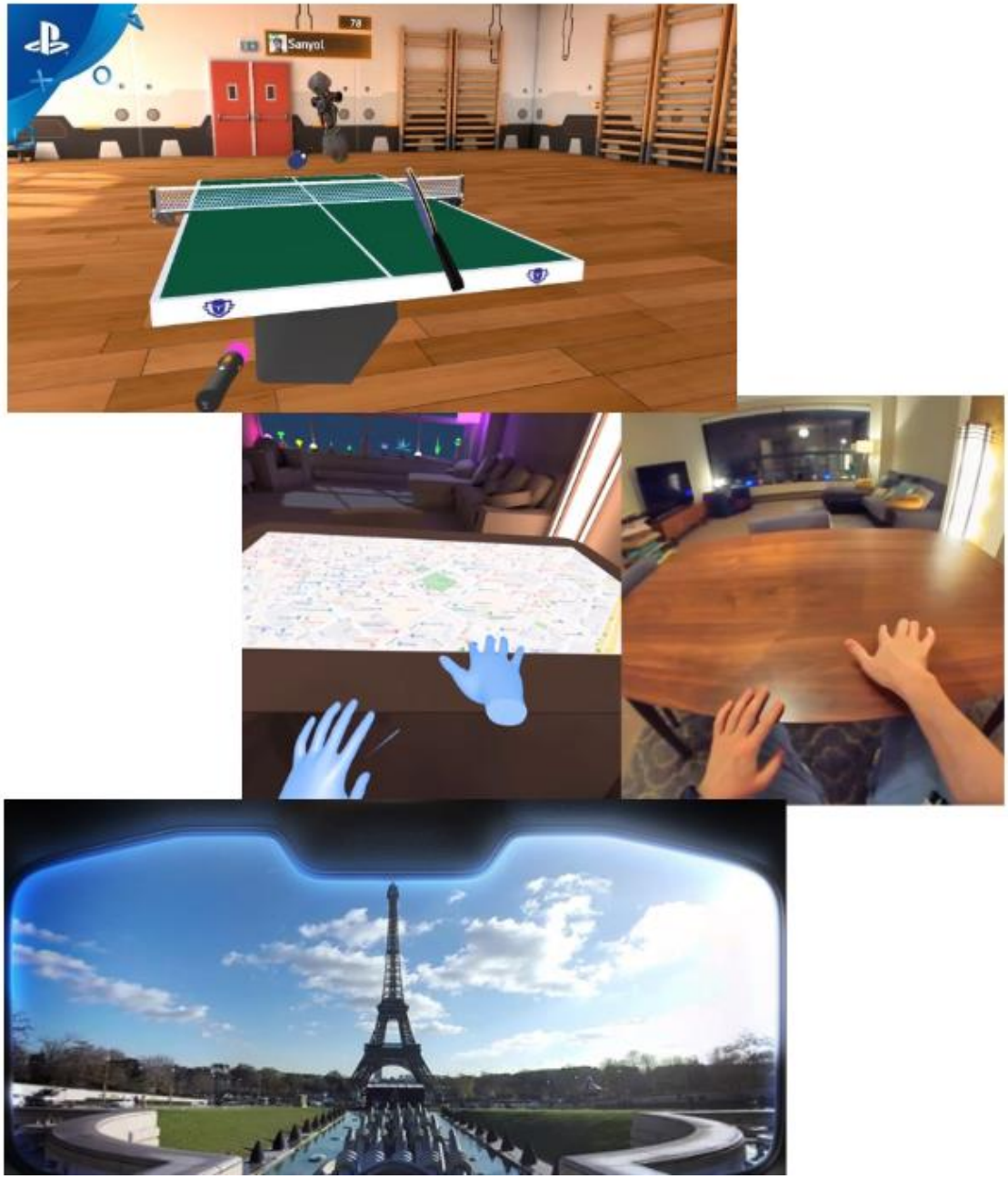
- Hoe kunnen gebruikers samen in de wereld zijn? (bijvoorbeeld samen ergens heen reizen, gewoon kletsen, spel spelen online)
- Hoe moeten mensen het product gebruiken? (denk hierbij dus aan knoppen en menu's, hoe zullen deze eruit komen te zien?)

U kunt zelf een stukje schrijven (of typen), schetsen maken of iets anders als u een idee heeft (of een opmerking). Bestanden en teksten kunt u sturen naar mijn e-mail: f.vandergeest@student.utwente.nl
Voor vragen mag u altijd mailen of bellen! (mijn telefoonnummer: 06-28021774)

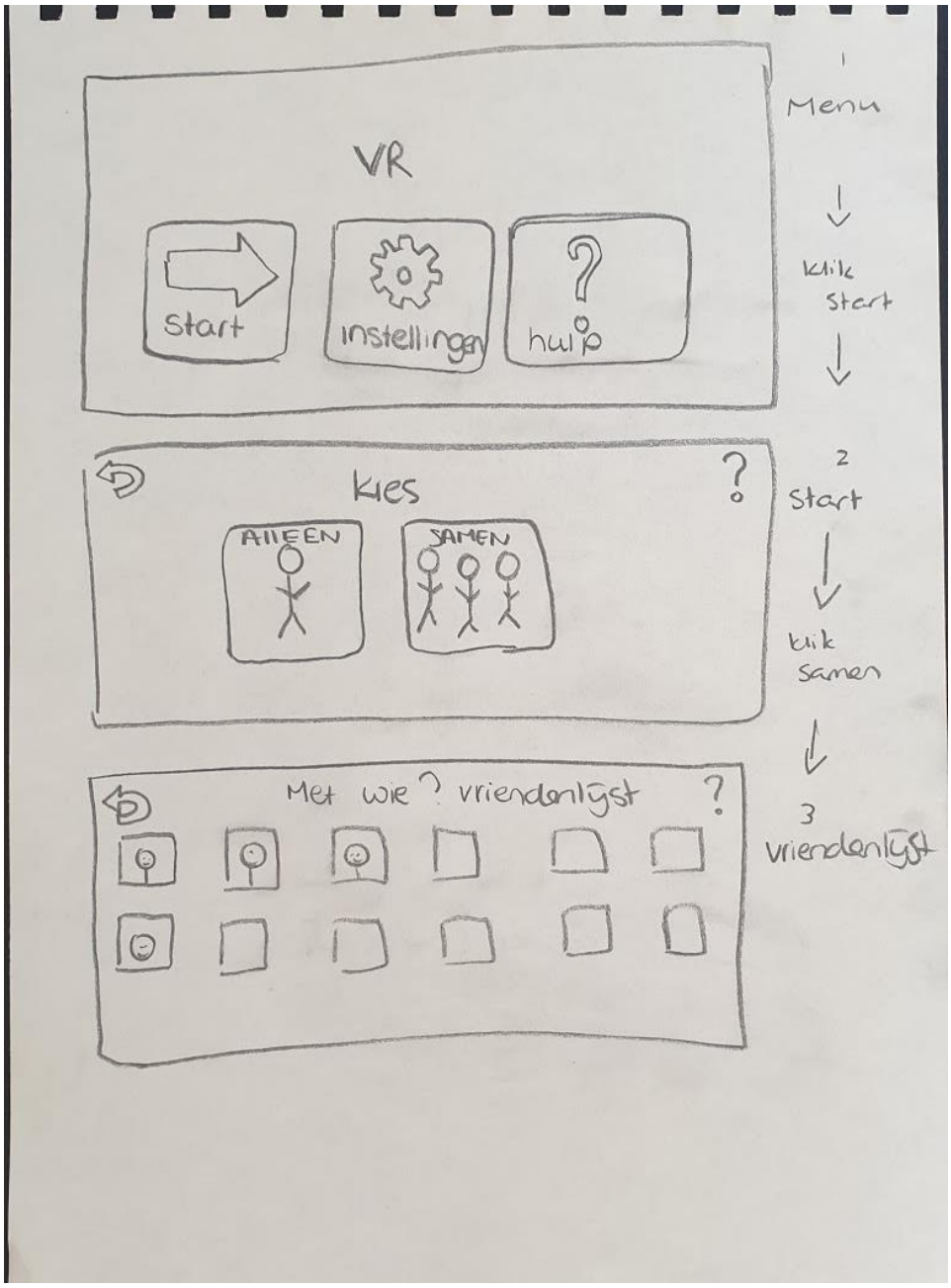


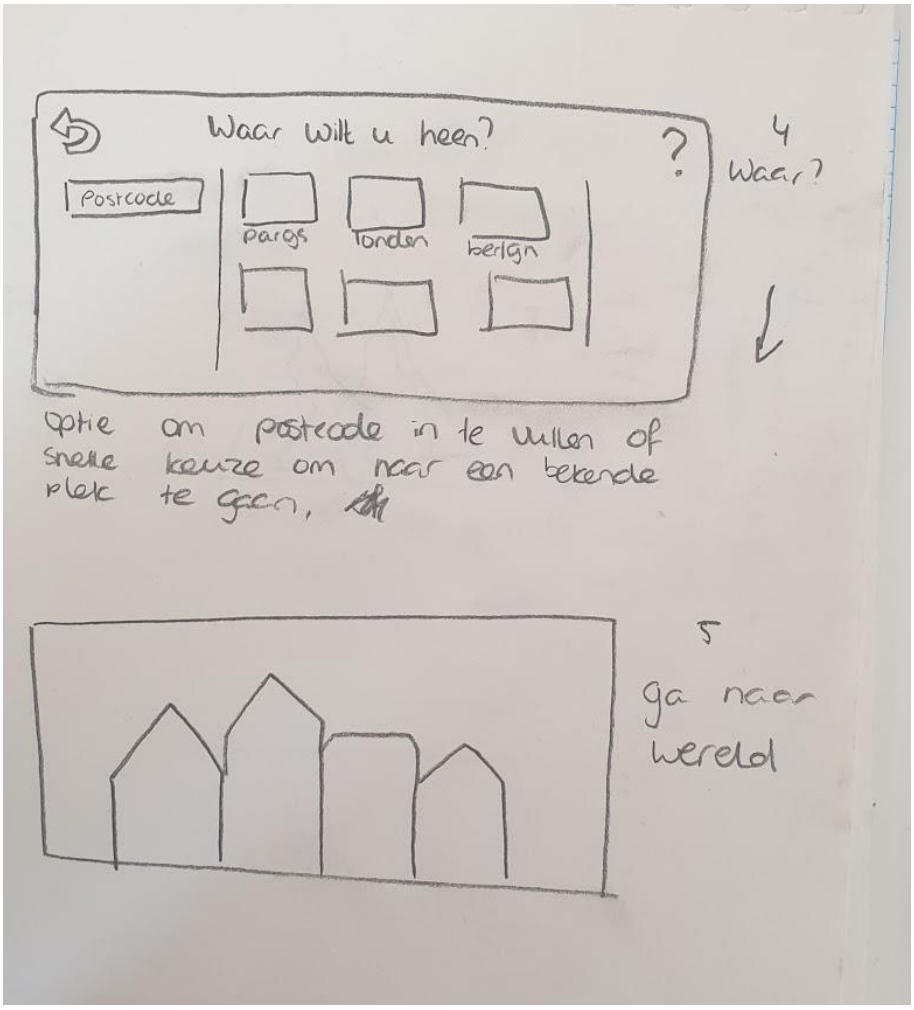
Hier wat afbeeldingen van game interfaces / menu's. Sommige zijn simpel, andere wat moeilijker. Deze kunnen als inspiratie gebruikt worden en om te zien wat u wel en niet fijn vindt.

VR voorbeelden, hoe ziet Virtuele Realiteit eruit en wat kunt u er allemaal mee doen. Bijvoorbeeld: Tafeltennis spelen of de eiffeltoren bezoeken.



Een van mijn schetsen voor een menu van een Virtuele Omgeving. Mensen kunnen kiezen met wie ze op stap willen, en waar naartoe:




Waar wilt u heen?
Postcode
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Tonden
berlgn
4
Waar?
Optie om postcode in te vullen of snelle keuze om naar een bekende plek te gaan,
5
ga naar wereld

Appendix E: Reactie Gerard Tubantia

Virtueel op stap.

Als middel tegen verveling, eentonigheid en eenzaamheid. Wat ik bij meerdere oudere mensen en mensen met een beperking merk, is dat ze graag een ritje in de auto of busje maken. Onze zoon vindt dat ook prettig. Nu kan ik me voorstellen dat er niet altijd mogelijkheden zijn om zomaar met een persoon of groepje op weg te gaan. Dus lijkt me het volgende wel interessant. Schaf een oud afgekeurd busje aan en richt dat zó in dat er binnenin genoeg ruimte is om lekker te kunnen zitten en er ook ruimte en inrijmogelijkheid voor rolstoelers is. Voorzie alle ramen van beeldschermen en laat hierop opnames zien van een tour door de omgeving. Produceer er ook autogeluiden bij, laat de bus licht bewegen en bij bochten ook iets hellen (alsof er echt gereden wordt), zodat er maximale beleving is. Eventueel een lekker muziekje op de autoradio of een eigen koptelefoon. De chauffeur kan onderweg ook iets uitleggen.

In feite kost dit qua onderhoud alleen maar een camera voor toezicht, geen benzinekosten, geen milieuvervuiling en toch is de trip compleet. Mensen zijn er even uit geweest, het alledaagse ritme is doorbroken, ze kunnen erover vertellen en er ook naar uitkijken. Omdat het een veilige rit is, zou het waarschijnlijk ook voor iemand die b.v. incontinent is tot de mogelijkheden behoren

Appendix F: Unity assets

- Gamer Squid - Indoor lamps
- Elcanetay - Toon Furniture
- 3DFRK - Picture frames with photos
- Mixaill - Window props for room
- Tridify - HDRP furniture pack
- Poneti - Clean Vector Icons
- Crosstales - 3D Skybox Pro Mediterrane
- Crosstales - 3D Skybox Pro Swiss
- Moodware - City street skyboxes vol. 1
- Unity Technologies - Standard Assets

Appendix G: Unity Code

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;
using UnityEngine.SceneManagement;

public class LoadLevel: MonoBehaviour
{
    public void LoadStart()
    {
        SceneManager.LoadScene(0);

    }

    public void LoadMenu()
    {
        SceneManager.LoadScene(1);

    }

    public void LoadLocation()
    {
        SceneManager.LoadScene(2);
    }

    public void LoadSwissCow()
    {

        SceneManager.LoadScene(3);

    }


    public void LoadSwissCity()
    {

        SceneManager.LoadScene(4);

    }

    public void LoadSwissMountain()
    {

        SceneManager.LoadScene(5);

    }

    public void LoadSpainNature()
    {

        SceneManager.LoadScene(6);
```

```
    }

    public void LoadSpainHarbour()
    {

        SceneManager.LoadScene(7);

    }

    public void LoadSpainCity()
    {

        SceneManager.LoadScene(8);

    }

    public void LoadKoffie()
    {

        SceneManager.LoadScene(9);

    }

    public void LoadSamenAlleen()
    {

        SceneManager.LoadScene(10);

    }


}
```

```
using System.Collections;
using System.Collections.Generic;
using UnityEngine;

public class CameraMove : MonoBehaviour
{
    public float speedH = 2.0f;
    public float speedV = 2.0f;

    private float yaw = 0.0f;
    private float pitch = 0.0f;

    // Start is called before the first frame update
    void Start()
    {

    }

    // Update is called once per frame
    void Update()
    {

        yaw += speedH * Input.GetAxis("Mouse X");
        pitch -= speedV * Input.GetAxis("Mouse Y");

        transform.eulerAngles = new Vector3(pitch, yaw, 0.0f);


    }


}
```