

Blink:

Enabling caregivers to apply
person-centred care

to increase the acceptance of the automatic
toothbrush developed by Dental Robotics among
people with dementia.

The graduation report of Lot van Touw
Design for Interaction
February 2019

Colophon

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Master thesis

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February 2019

*“When you can connect with
people with dementia, you can
connect with everyone”*

- Anneke van der Plaats
Social geriatrician

Preface

This thesis is the final result of 20 weeks of hard work, a roller coaster of idea directions and many user tests and interviews, but mostly, it is the result of 20 weeks of fun.

The hours in the nursing home were rewarding. It led to many moments that still make me laugh, and it led to a feeling of pride. People with dementia are often forgotten in society, and they deserve so much more. I feel proud to have contributed to an improved quality of life for these people, even if only a little bit.

And I could not have done it alone. First of all, I would like to thank my supervisory team for always pushing me to the next level and encourage me to keep thinking and improving.

My colleagues of Dental Robotics, for always motivating me and for being patient with me during the many table football games (I promise: some day I will learn!)

Nick, for being my always present critical brain, for keeping up with me, even during the more stressful times and for keeping life outside graduation fun.

My sweet Panda friends, for always being ready to advise me on all the difficult matters and for the perfect distraction during dinner or tea breaks.

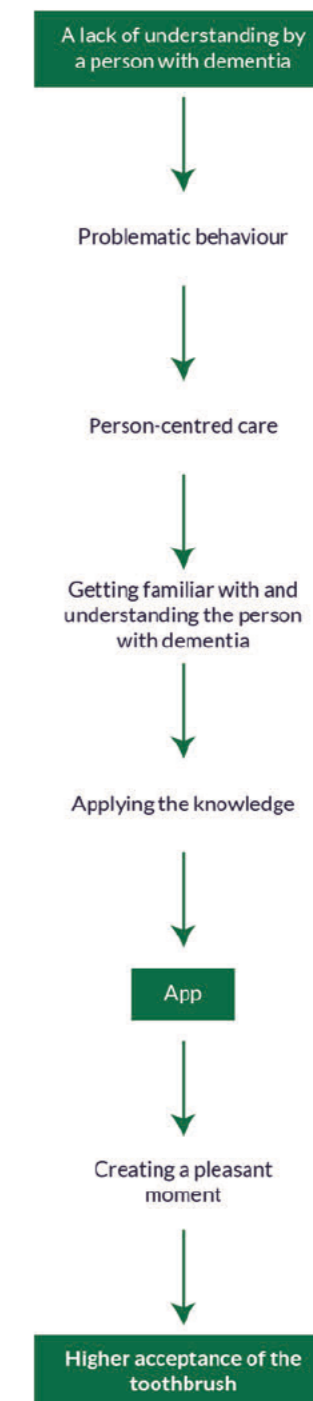
My old housemates of BFM, that showed me that out of sight does not always mean out of heart and my parents for always being ready to listen to my concerns and plans regarding graduation

And last but not least: I would like to thank everyone that participated in my user tests, interviews and questionnaires, with a special shout-out for everyone involved at Zorgboerderij Buitengewoon for the enthusiasm and hospitality, every time I came by for help.

Executive summary

The quality of oral care among frail elderly people in nursing homes is low. Due to reduced mobility or cognitive functioning, elderly people fail to complete the oral care ritual sufficiently. Once this happens, caregivers are obliged to take over this task. Unfortunately, in many cases this does not happen due to the difficulty of the task, the uncomfortable feeling of intimacy for both the elderly person and the caregiver, and the high time pressure caregivers experience during the morning care ritual.

Dental Robotics aims to improve the quality of care among frail elderly by developing an automatic toothbrush that takes away these pains. The Dental Robotics toothbrush simply requires the elderly person to bite in a mouthpiece. This enables the caregiver to brush all teeth at the same time while applying the right pressure and angle without skipping any teeth. The toothbrush completes this task in only 10 seconds, helping to reduce the total amount of time of the oral care ritual.



However, for people with dementia such a product, bringing along new and different interactions, is difficult to comprehend. This lack of understanding can lead to problematic behaviour. This can be apathic, anxious, aggressive or agitated behaviour, all of which is difficult to overcome by the caregiver. Currently, the most common solution that caregivers use to overcome problematic behaviour is skipping the oral care altogether. When this happens, the care ritual cannot be completed. This is a major challenge for Dental Robotics, leading to the following design goal:

Increase the acceptance of the Dental Robotics toothbrush among people with dementia and their caregivers, by creating a more pleasant experience for both.

Person-centred care is a way to avoid problematic behaviour in the long term. This is an approach that puts the client with dementia in the centre of their own care, and uses the preferences and habits of the client during the care ritual. Since everyone has a different history, the way in which care should be approached should be different for everyone as well. In addition, the symptoms and severity of all clients are different. In order to apply this person-centred care, it is important to have a good understanding of the person in question.

In theory, most nursing home organisations already apply the person-centred approach. However, due to time restraints and the growing number of temporary workers, it is often not executed sufficiently.

Blink is an app that aims to enable caregivers to apply the person-centred approach over the entire care ritual. This is supported by the theory that, when the entire care ritual is executed without any problematic behaviour, the client with dementia will be put at ease and be more prone to accept such a difficult product as the toothbrush.

Blink will be the new shape of the care plan. During the intake, it will guide the relatives of the client with dementia and the professional caregivers through the care plan. This way, caregivers can make sure that the care plan is complete and thorough as soon as a client moves into the nursing home. From that moment on, caregivers can use the app to have an overview of the main preferences of a client, and have access to their favourite music and pictures.

Every time Blink is used for a specific client, the content changes. It will adapt based on the connection between the client and the caregiver, the severity of the dementia and the specific tool preferences for both the caregiver and the client. This helps to keep the use of Blink engaging. Over time, the connection between the caregiver and the client will grow. At the same time, the dementia gets more severe, making it increasingly difficult to connect and have conversations. The focus of the app will be on establishing a connection in the beginning, and slowly shifting towards more active help, such as an easy way to turn on music or videos.

The biggest hurdle in the use of the app is the slow adaptation of such new technologies by caregivers. By connecting Blink to the care plan and vice versa, it is no longer needed to do double work. NFC chips are placed throughout the rooms in the care home to enable an easy navigation through the different screens of the app. Artificial Intelligence technologies in the back-end of the system complete, maintain and update the information. Furthermore, it will keep the app engaging, even when caregivers have known a specific client for years.

Together, this will help to create a more pleasant care moment for both the client and the caregiver, ensuring an increased acceptance of the automatic toothbrush developed by Dental Robotics.

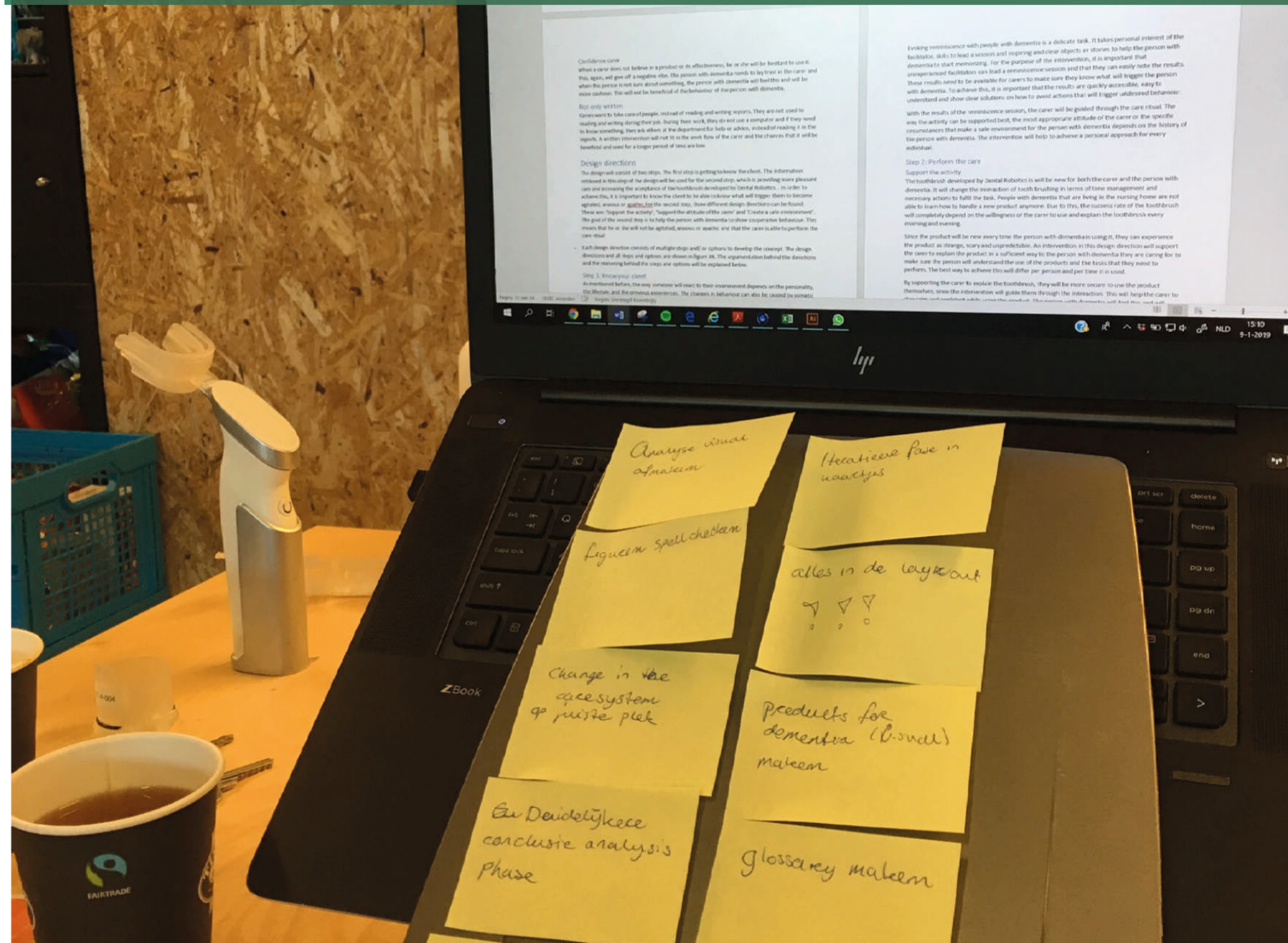
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DENTAL ROBOTICS

Chapter 1: Introduction



A project setup asks for post-its and tea!

Adriana is sitting straight up in bed. Something is off, but it is hard to pinpoint. Peter, her husband, is already awake and out of bed. He's packing a suitcase. "Are we going on holiday?", Adriana asks. Peter looks up, he seems sad. "Yes, something like that.", he replies. Adriana gets up and starts dressing. When she tries to put on her blouse, it goes wrong. She buttoned it up crooked. Peter looks at her, laughing uncomfortably. "Here, let me help you with that". Adriana begins to get a bit agitated. She almost screams: "Come on man, I don't need your help, why are you laughing? It's only buttoning a shirt. How hard can it be?". Peter accepts, he does not have the energy to start an argument. He would never win anyway. Besides, this is just the beginning, if she's already this agitated, he'll never get her to brush her teeth. Also this being the last morning they have together, he'd like to keep it friendly.

Peter walks to the bathroom and calls Adriana. She walks in surprised. "Let's brush our teeth, ok?", Peter asks. "Ah, yes, sure, we should." Peter prepares the toothbrush and hands it to Adriana. She looks at it, confused. Peter observes. Adriana looks at it for 5 seconds, then she brings the brush closer to her face. "Yes!", Peter thinks, "No argument today". But she quickly changes the course of her hand and starts brushing her hair. A beautiful straight stripe of toothpaste is spread down from the root of her hair. Peter can't handle it and he walks out. The van to pick up Adriana arrives in 10 minutes, so it is too late to wash her hair, especially when she's in this state of mind. Somewhat ashamed, Peter asks Adriana to follow him downstairs. He doesn't want the others in the bus seeing her in this state, but he has no energy to fix it. It is really necessary that she moves out, he cannot take care of her anymore. It is too difficult, too tiring and most of all, too emotional. He feels terrible for leaving her with dirty clothes, unwashed hair and bad breath. She stopped eating, she stopped entertaining herself and

it has become impossible for her to be alone anymore. Although Peter tried to keep her at home as long as possible, he is now burned out completely.

The van brings Peter and Adriana to 'De Wilgenhoek', a care farm 15 minutes away from their house. The moment they walk in, Peter feels relaxed. This is where Adriana will live now, and she will feel at home. The caregivers seem really nice, they are involved and interested. The moment Peter and Adriana walk in, they take her by the arm and bring her to the bathroom to wash the toothpaste out of her hair.

In the meantime, Peter gets a tour. The caregivers explain the daily rhythm and the different activities organised by the employees and volunteers in the nursing home. Adriana will help with feeding the animals and cleaning the cages. After the explanation, a nurse asks Peter some questions. The care plan needs to be filled out. "What is the biggest problem you faced during her care?", she asks. For Peter, this is an emotional question. He always had the feeling Adriana would get angry when he tried to help her during her personal care. Brushing her teeth was an especially big challenge. This would always turn into a huge ordeal, during which Adriana would gradually forget the nature of the argument. Peter always felt like he was falling short when he couldn't help her by providing the care she needed. Peter describes these feelings and the nurse listens carefully. "Well", she says, "I think we have the perfect solution for her". Peter looks at her, intrigued. "We have an automatic toothbrush, I will show you! It's a mouthpiece that Adriana can bite into, so we can position it on all her teeth. After that, we turn the brush on and in 30 seconds, the toothbrush does all the work. We don't have to do anything ourselves, and Adriana doesn't have to switch between having her mouth closed and open.

More importantly, it takes nowhere near as long, so the chances of success are way higher! What do you think?" Peter smiles, a bit hesitantly. "But if she doesn't even want to put a regular toothbrush in her mouth, how will this ever work?" "Let's just try it, okay?", the nurse says. "We have some methods that we also apply during normal care, we can just see if it works." "Sure", Peter agrees, "Let's see".

The weeks pass by and Peter visits Adriana every day. Adriana has gotten used to her new house, and she now knows the caregivers as well as the other residents. The caregivers know her, but there is still one problem. Brushing her teeth is still an issue because she simply refuses to open her mouth. The caregivers have tried many things. They explained it carefully, they tried simply forcing it, they asked her to do it herself, but nothing worked. Peter can clearly see that her mouth hurts as she eats less and less. The dentist visited, but he was also not able to clean Adriana's teeth properly. Peter feels disheartened, but he has no clue how to solve this problem.

1.1. Project goal

This story is fictional, but unfortunately it is a reality for many elderly people with dementia and their informal caregivers. During my internship, I have seen this struggle. While talking with professional caregivers, I noticed that everyone feels oral care needs to be improved, but they all do not have the means to do this. The quality of oral care was lacking in nursing homes, and these are caregivers that are educated to provide care. I can only imagine what a struggle it must be for informal caregivers without any experience in this sector.

In the six months before the graduation project I did an internship at Dental Robotics to gain knowledge in the field of User Research.

The company is developing an automatic toothbrush for the elderly market. While doing user tests with people with dementia and their caregivers during this internship I noticed how difficult it was to use the toothbrush for people with dementia. To somatic clients, it was possible to explain what the purpose of the product was and that it might be unpleasant, but that it will benefit them. For people with dementia this is not possible. Furthermore, the interaction is completely new and the product looks unfamiliar.

Most of the time, when someone with dementia does not understand something, they show problematic behaviour or refuse care. This led to the following design goal:

Increase the acceptance of the Dental Robotics toothbrush among people with dementia and their caregivers, by creating a more pleasant experience for both.

1.2. Project setup

The project will start off with the analysis phase. In this phase, the problems the elderly currently have with tooth brushing are explained. Next, the aims and ambitions of Dental Robotics to solve these problems are explained. This is followed by an explanation of the problems people with dementia and their caregivers have with the use of the automatic toothbrush developed by Dental Robotics and a theoretical explanation of the reason why these problems occur. This chapter describes the development of dementia and the symptoms that occur because of this. It describes the current way caregivers interact with people with dementia and the optimal way to interact. Finally, it describes the person-centred approach, a method that is based on the fact that everyone has their own wants and needs for care.

The insights from the analysis have been used to determine the design criteria and the design directions to achieve the design goal.

After the conclusions, the iterative phase is described. This resulted in a final design, which is validated and completed with recommendations.

Analysis phase

In order to find a solution to fit the design goal, a thorough analysis is needed. For the analysis, multiple interviews with care professionals, experts on problematic behaviour and oral hygiene for elderly and dentists are conducted and observations and user tests are done. The information from these sources is backed by literature. Figure 1 shows a chronological overview of the activities in the analysis phase, which is started with user tests during the internship prior of the graduation project.

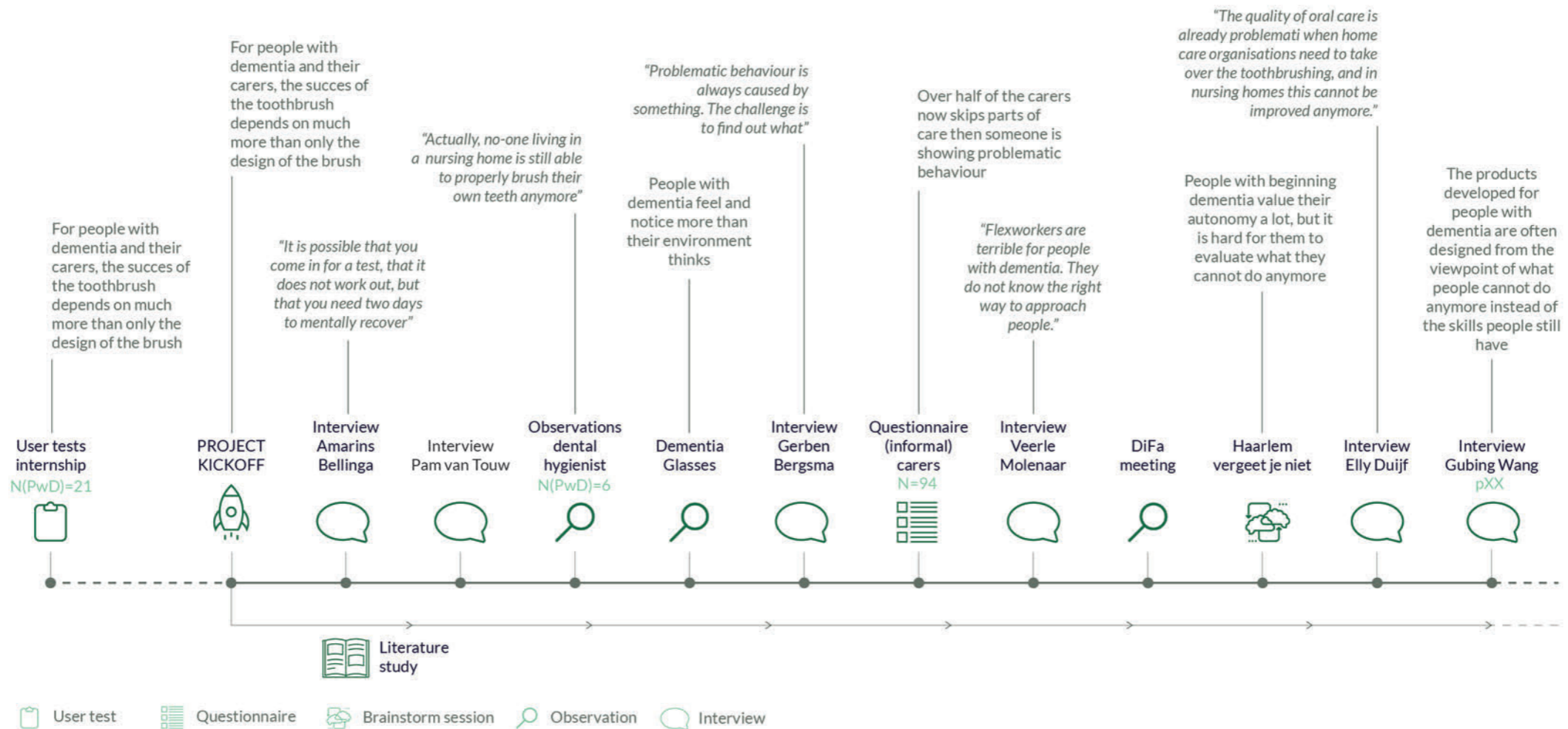


Figure 1: An overview of the analysis phase



Chapter 2: Tooth brushing by elderly people

Stockphotos might pretend that tooth brushing is the most fun you will ever have, but in reality, this is far from true for many people.

Source: <https://www.andersonsmile.com/blog/dentures-in-colorado-springs/>

The older people get, the higher the chance that they face problems with their health. These problems are often specific for the elderly generation. In order to prevent these problems, enable improvement and maintain self-reliance, frail elderly people can visit a geriatrician. These care professionals are educated to cure and prevent common problems elderly phase (Nederlandse Vereniging voor Klinische Geriatrie, n.d.). This can be: problems with mobility and falling, incontinence, general sadness or loneliness, problems with the cognitive system and memory or delirium (acute confusion).

When someone is suffering one or more of these problems, this has consequences on their quality of life and their ability to fulfil tasks.

One of the parts of care that is difficult for frail elderly the brushing of the teeth (De Visschere, Grooten, Theuniers & Vanobbergen, 2006). Institutionalized and homebound elderly have poorer oral health status than active elderly (Petersen & Yamamoto, 2005). This has two main reasons. Firstly, some elderly people do not have the strength or concentration to keep brushing for two minutes. Secondly, some elderly people forget to do it. The more severe the health problems are and the higher the level of dependency, the lower the quality of oral health (De Visschere et. al, 2006; Vanobbergen & De Visschere, 2005).

2.1. Taking over the tooth brushing

When someone is not able to brush their own teeth anymore, this should be taken over by a caregiver. During the analysis it became apparent that in reality this does not happen enough and that the quality of oral care is lacking. As soon as people cannot brush their own teeth anymore, the oral health quickly deteriorates. This is confirmed by research of Hoeksema et. al. (2014). They found that more than 80% of elderly people have poor oral health when they are moving into a nursing home. Klüter & de Baat (2015) found that the oral health even deteriorates further during the stay in a nursing or care home.

This is especially true for elderly people that still have their own teeth. People with natural teeth were perceived as the most complicated group to provide oral care for (Wårdh, Andersson & Sörensen, 1997). However, the percentage of dentate elderly people is rising fast, due to improvements in the standard of living, the increased use of fluoride toothpaste and dental services, and a raised attention for preventive oral health care and positive attitude towards oral health (De Visschere et. al, 2006; Österberg, Carlsson & Sundh, 2000). This means it becomes increasingly important to focus on the improvement of oral care for dentate elderly people.

The cause of lack in quality of oral care is complicated and multi-factorial. First of all, brushing the someone else's teeth is challenging. It is difficult to feel if the toothbrush is in the right position and has the right amount of pressure applied. In a study of Day, Martin & Chin (1998), caregivers were only able to remove 6% of the dental plaque with a manual toothbrush over the course of six weeks, even after a training on the best way to deliver dental care. De Visschere et. al (2006) found 15% of the elderly participants in their study did not have a access to a toothbrush at all.

This lack in quality is enhanced by the intimacy of the interaction (Wårdh et. al, 1997). Nursing personal named tooth brushing as the most undesirable action of the care and 30% of the participants mentioned a feeling of embarrassment during the action of providing oral care on a client. Clients also experience the intimacy of the interaction. Many people refuse to have their teeth brushed by someone else (Wårdh et. al, 1997).

At last, caregivers experience a high time pressure during the care (Mynors-Wallis & Davis, 2004). The tooth brushing should take two minutes, but, according to a questionnaire among caregivers and clients in care organisation Groenhuysen in Roosendaal, the overall oral care takes 10 minutes on average (Van Touw, 2018). The chances are high that a person with dementia shows problematic behaviour at some point during the oral care. The oral care takes up a significant part of the time, since caregivers generally take around 30 minutes per person to perform the full care ritual.

Klüter & de Baat (2015) mention that oral care is currently not part of the fixed curriculum in the education for professional caregivers. This is validated by a dental hygienist for elderly people. She mentioned that oral care is an elective during the education of caregivers. Only people that are interested in this topic will take the elective. These people are noticeably more skilled in performing oral care (Vanobbergen & De Visschere, 2005; Nicol, Petrina Sweeney, McHugh & Bagg, 2005). The importance of good oral health is not common knowledge and therefore caregivers in training are not likely to take the elective or educate themselves during their working life.

In order to improve the oral health of the elderly in nursing homes, Verenso (organisation for specialists in geriatrics) wrote a guideline for oral care in 2007. This includes information on the causes and consequences of poor oral health, advice on how to improve the oral health on a daily and systematic basis and on how to implement and evaluate the guidelines. In practice, official guidelines are generally not used (Vanobbergen & De Visschere, 2005).

The guidelines also include a section about the refusal of oral care by both competent and non-competent clients. When a client is still competent, it is important to find the cause of the refusal, even if this takes a lot of time. It can help if the connection between the caregiver and the client is trusting and the caregiver explains the treatment well, so that the client can make a deliberate decision. When someone is not able to consider the arguments, it is important to make contact first, for example by the presence of a trusted person. In the case of a client that is not competent and is refusing oral care, the representative of this person is responsible. In any case, whether the client is competent or not, the refusal needs to be respected.

2.1.1. Somatic clients

Somatic clients are people with physical problems living in the nursing home. For somatic clients, the biggest problem when the oral care is taken over is a feeling of shame. The interaction is very intimate and the interaction seems fairly simple. When someone needs to give away this part of care, they feel less autonomous. In an interview with healthy elderly women in Rotterdam, they all mentioned they would not use an automatic toothbrush, because they are still capable of doing it themselves. Besides, they feel more secure about the use of a manual toothbrush because they have more control over the quality of care.

2.1.2. Psychogeriatric clients

Psychogeriatric clients are people with dementia living in the nursing home. For people with dementia, the problems with the tooth brushing are bigger compared to somatic clients. They often suffer from agnosia, which is the inability to process sensory information to recognise objects, people and shapes and from apraxia, which harms the ability to perform complex movements or follow orders to perform movements. This makes it difficult for someone with dementia to recognise a toothbrush and its purpose and to explain this to them.

A questionnaire was conducted with 93 professional and informal caregivers. The main objective of the questionnaire was to find the problems caregivers experience during the care for people with dementia and in particular the oral care for people with dementia. The results of the questions about problems with oral care can be found in Figure 2. The more something is mentioned, the thicker the line.

The problems are mainly caused by the person with dementia having problems understanding something in the tooth brushing process. When the person with dementia is still living at home and the informal caregiver is still the main caregiver, the person with dementia is still brushing their own teeth. In this case, the biggest problem is the person with dementia forgetting to brush. For some

caregivers, it is difficult to appoint a reason why the brushing is not working out. They simply mentioned that the brushing often does not work out, without clarifying why. According to Hoeksema et. al. (2014) over half of the elderly in nursing homes do not want to cooperate with oral examination or treatment.

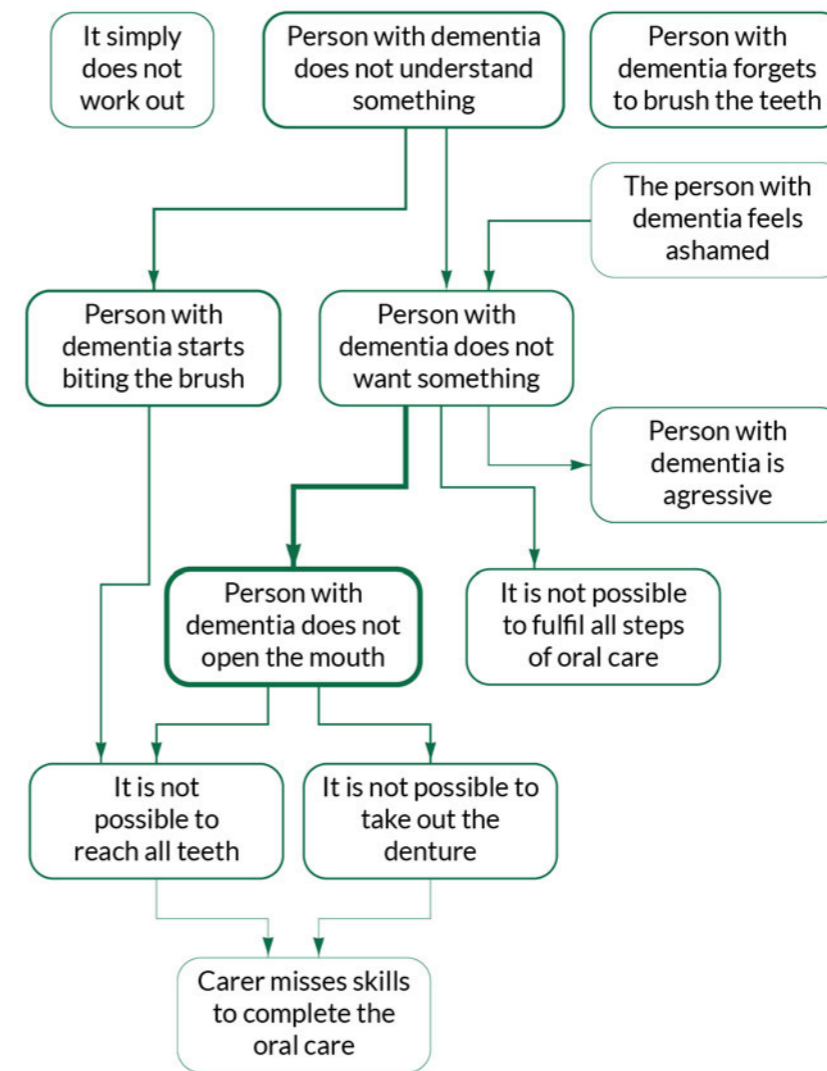


Figure 2: A scheme of the problems caregivers experience during the oral care for people with dementia, based on the results of a questionnaire with caregivers.

When the person with dementia does not understand something during the tooth brushing process, or feels ashamed of not being able to brush their own teeth anymore, it can lead to the person biting the brush while brushing the molars or to not wanting to cooperate at all. This can result in aggressive behaviour, in the person with dementia refusing to open the mouth and in the caregiver not being able to finish all steps of the dental care (e.g. mouthwash, flossing). When the person with dementia does not open the mouth, or starts biting the brush, the caregiver is not able to brush all teeth. When a person has dentures, this behaviour can prevent the caregiver from taking it out to clean it. One caregiver mentioned that she did not have the skills to complete the oral care when the person with dementia is not cooperating well. This feeling is substantiated by a dental hygienist for elderly with dementia who mentioned during an interview: "Oral care is an elective during the education of professional caregivers. You clearly notice who took that elective, because the quality of the oral care the others give is clearly lacking."

2.2. Importance of good oral health

When the elderly person is not able to brush their teeth properly anymore and the caregiver fails to take over, the oral health deteriorates quickly due to a build-up of plaque and the client might start suffering from dental pain, dental caries, periodontal disease, tooth loss, oral mucosal lesions and oropharyngeal cancers (Petersen, Bourgeois, Ogawa, Estupinan-Day & Ndiaye, 2005). When someone is using medication, which is the case for most elderly people in nursing homes, this can cause dry mouth (McNeill, 2000). This has a negative effect on the oral cavity, which makes the importance of good oral care even greater for this group.

Poor oral health can have a great impact on older adults' quality of life and wellbeing. People's eating ability, diet type, weight, speech, hydration, behavioural problems, appearance and social interactions are affected and these are concerns not only for the older person but also for their family and caregivers (Chalmers & Pearson, 2005; Kossioni et. al, 2018). Practical guidelines for physicians in promoting oral health in frail older adults. *Journal of the American Medical Directors Association*, 19(12), 1039-1046.). On top of that, a poor oral state can indirectly cause diabetes mellitus type 2, kidney deficits, cardiovascular incidents, infection of the lungs due to aspiration, rheumatism and brain malfunctioning (Hoeksema, Meijer, Vissink, Raghoobar & Visser, 2016). This brain malfunction is further examined by Takeuchi et.al (2017). They proved that tooth loss is a risk factor for development of all-cause dementia and Alzheimer's disease in an elderly Japanese population. Recently, researchers discovered that *P. gingivali* bacteria, that cause periodontitis, can be found in the brain of people with Alzheimer's disease. This led to the assumption that mouth bacteria and gum disease may have an influence on the development of dementia (Dominy et. al, 2019).



Chapter 3: Dental Robotics

During his graduation project of the Master Integrated Product Design, Joppe van Dijk noticed the problems with tooth brushing in health care organisations and decided to develop an automatic toothbrush for the market for elderly people that aims to solve these problems.

*The first design
of the toothbrush
developed by Dental
Robotics. Picture:
Joppe van Dijk*

3.1. The company

The graduation project of Joppe led to the foundation of the start-up Dental Robotics. It is located in Yes!Delft. This is a high tech incubator located in Delft. In 2018, it was announced the second best Incubator affiliated with a university in the world by UBI Global (2018).

A year ago, Daan Domhof joined the company as a co-owner.



Currently, the team consists of two owners, four full-time engineers, an office manager and around six interns.

The ultimate goal of the company is to change the way the world brushes teeth. The first step towards achieving this goal is to deliver a quality product for elderly people in nursing homes and their caregivers that can improve the quality of the oral care while also taking less time.

Figure 3: The current prototype of the Dental Robotics toothbrush

3.2. The toothbrush

In order to achieve the goal, the company is developing an automatic toothbrush that brushes all teeth at the same time (Figure 3). It consists of an handle with a button and LED indication and a mouthpiece. The mouthpiece has gutters for both the upper and lower teeth. The elderly person needs to bite into the mouthpiece. Once it is well positioned, the elderly person or the caregiver presses the button to turn on the toothbrush for ten seconds. Afterwards, the teeth are as clean as if they were brushed with a conventional toothbrush for two minutes.

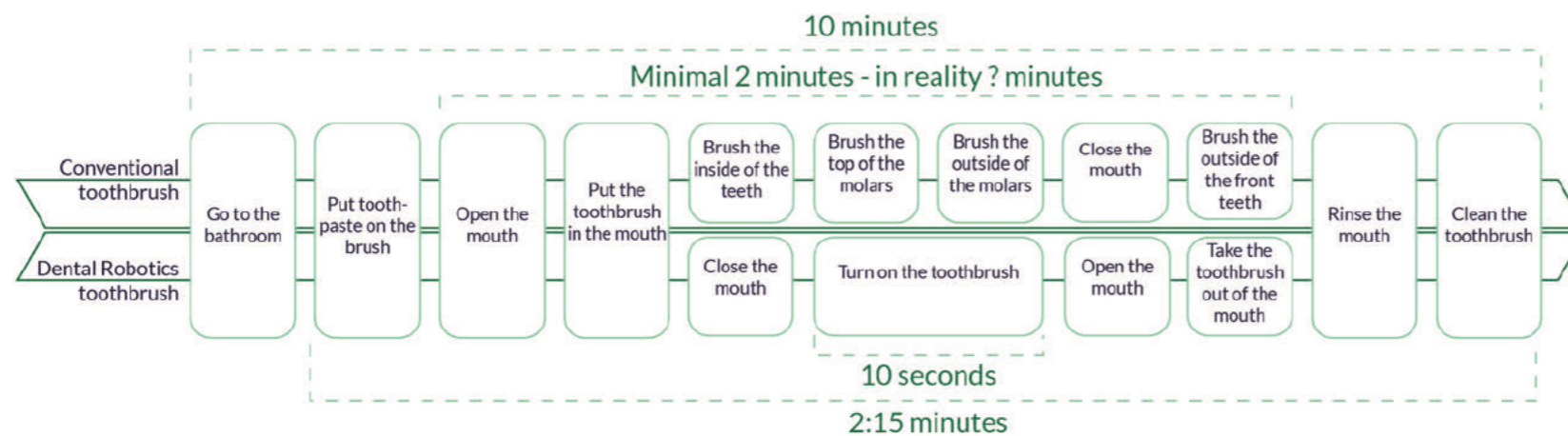
Besides the brushing itself and the appearance of the toothbrush, the tasks related to the brushing stays the same. The toothbrush uses a special foam toothpaste, because it is impossible to foam regular toothpaste in 10 seconds. Besides, when regular toothpaste is applied on the entire mouthpiece, half a tube is necessary, which leads to a too high fluoride concentration. The complete tooth brushing interaction is shown in Figure 4.

The interaction of the user with the toothbrush developed by Dental Robotics is completely different compared to the interaction with a manual toothbrush. It is not necessary to move the brush and it is important to have the mouth closed for the full 10 seconds. The product looks different and the mouthpiece can feel bulky, which makes having it in the mouth an unpleasant experience.

3.2.1. What's new?

The automatic toothbrush can be beneficial for the care, since it will be easier and quicker to complete the care. However, when someone does not understand the purpose of the product, he or she will not open the mouth. This is a huge challenge for Dental Robotics.

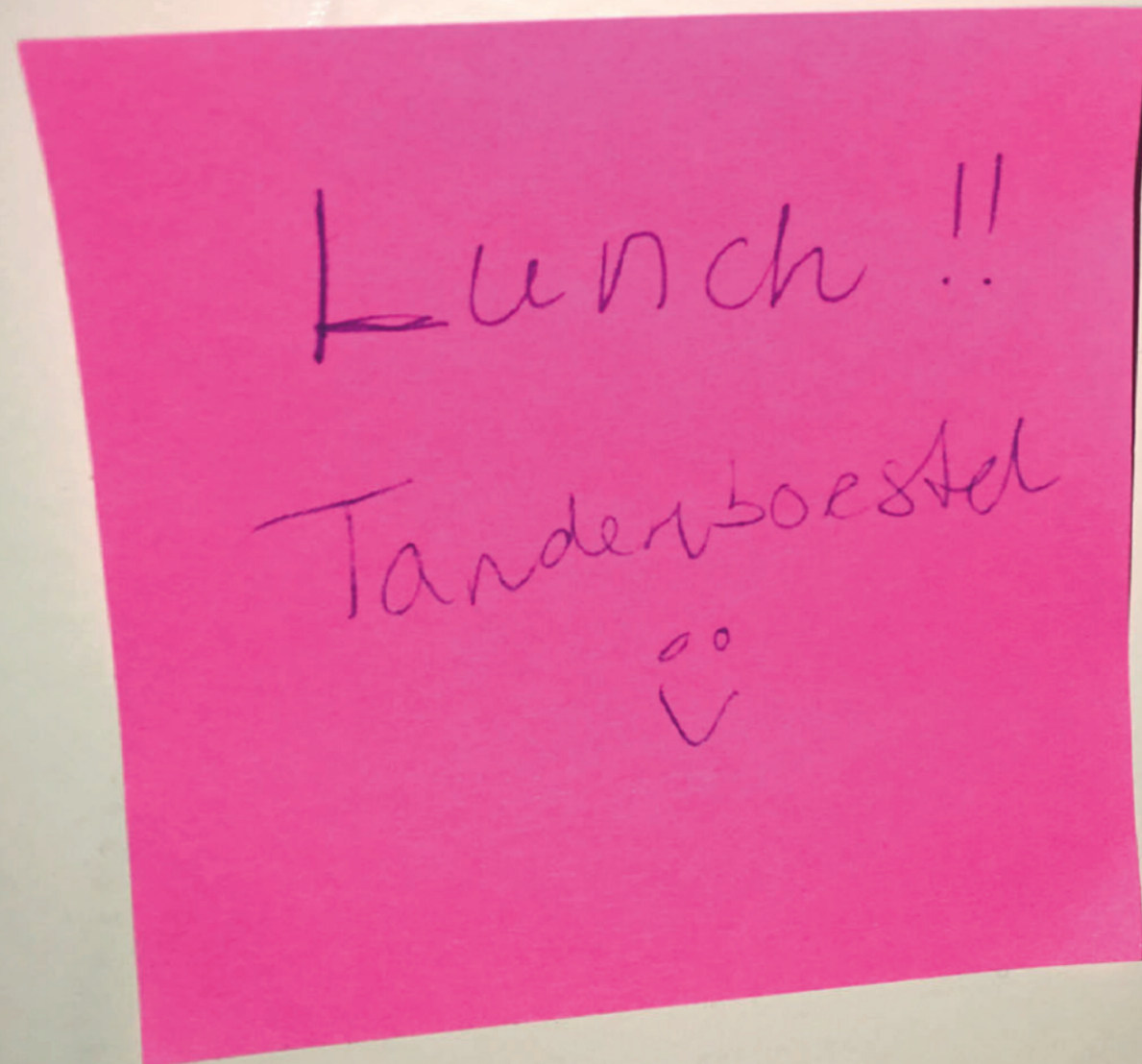
Figure 4: A comparison of the time needed with a conventional toothbrush and the automatic toothbrush



Chapter 4: Dementia

For people with dementia, it is nearly impossible to learn to handle new products. When something new is used, the caregiver needs to explain it every time. For people that have moved into the nursing home recently, it is still possible to explain what is asked from the client, but when the dementia gets more severe, it is more important that the client trusts the caregiver that no harm will be done than that he or she does fully understand what is asked from them.

In order to understand the development and the symptoms of dementia, the best way to work with dementia and the problems that occur during the care for people with dementia, a thorough research has been conducted. This was done by reading literature and doing interviews and observations.



Note at the front door of the graduation student to make sure everything is packed for work.

This strategy is often used by people with beginning dementia

4.1. Definition of dementia

The World Health Organisation defines dementia as follows: *“Dementia is a syndrome – of a chronic or progressive nature – in which there is deterioration in cognitive function (i.e. the ability to process thought) beyond what might be expected from normal ageing. It affects memory, thinking, orientation, comprehension, calculation, learning capacity, language, and judgement. Consciousness is not affected. The impairment in cognitive function is commonly accompanied, and occasionally preceded, by deterioration in emotional control, social behaviour, or motivation.”*

In this definition, a syndrome is a combination of medical problems that shows the existence of a particular disease or mental condition (Cambridge Dictionary, n.d.). Since a syndrome is a combination of medical problems the cause and symptoms differ per case.

In 2015 47,47 million people worldwide were suffering from dementia. This number is expected to increase to 75,63 million in 2030 and to 135,46 million in 2050 (Prince, 2013). Approximately 60 to 70% of these people are suffering from Alzheimer’s disease (World Health Organisation, 2017). The second most common kind of dementia, with 16% of all cases, is Vascular dementia (Alzheimer Nederland, 2017).

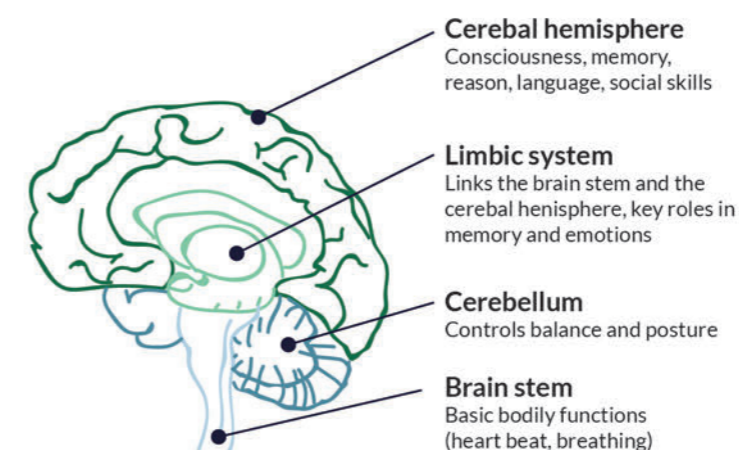
In the Netherlands the number of people diagnosed with Alzheimer’s dementia is estimated at over 270.000 people, of which 12.000 are younger than 65 years old. However, on average it takes 14 months to diagnose. This means the actual number of people with Alzheimer’s is bigger. (Alzheimer Nederland 2017).

The Zorgzwaartepakket (ZZP) determines whether someone moves to a nursing home. People with dementia in nursing homes have the ZZP level 5 or 7 (Ministry of Health, Welfare and Sport, 2018). In 2014, 58% of all nursing home clients had this indication (Statistics Netherlands, 2017).

4.2. Brain areas affected by dementia

It can help to understand the effects of dementia in the brain to be able to provide better care. Even though researchers and neuroscientists are still not sure what exactly causes dementia, much is already known. The Alzheimer’s Society has written a factsheet (2014) that explains which areas of the brain are responsible for which kind of processing and how these are affected by dementia. An interview with Pam van Touw, Nanobiologist, helped to understand the way the brain works on a micro level. The results of this interview can be found in Appendix 1.

Basically, the brain can be divided into four different parts, that each have a different function. These parts can be found in Figure 5. The biggest part of the brain is the cerebrum. This part is divided into four lobes (Figure 6). For most complicated tasks, the different parts of the brain need to work together. The signals move along pathways of nerves that connect the different parts and lobes.



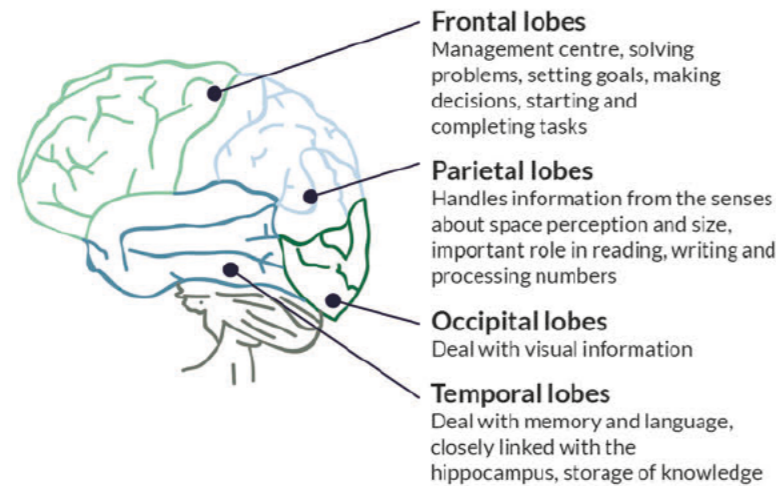
4.2.1. Parts of the brain

Figure 5: The four different parts of the brain

4.3. The symptoms of dementia

Alzheimer Nederland mentions that dementia is a collective name for over 50 diseases (Alzheimer Nederland, n.d.a.). In reality, the only difference between most kinds of dementia is the location in the brain of the start of the dementia. In those types of dementia, the brain starts shrinking in a specific part of the brain, caused by the accumulation of proteins. The symptoms depend on the function of the part of the brain that starts shrinking. Later on, the damage spreads to other areas in the brain. When the dementia progresses further, the symptoms per kind of dementia become more similar.

Figure 6: The four different lobes of the cerebellum



4.3.1. Alzheimer's disease

Alzheimer's disease is the most common kind of dementia. 70% of the people that are suffering from dementia, have Alzheimer's disease (Alzheimer Nederland, n.d.d). In Alzheimer's disease, the hippocampus and its connected areas are damaged first. The hippocampus is needed for retrieval of short term memories. This makes it more difficult to form new memories or learn new information. Due to this, someone in the early stages of dementia has problems with remembering what they did earlier in the day, while they are still able to remember their wedding day. As the dementia progresses, the cerebral hemisphere becomes thinner.

Damage in the temporal lobes makes recognizing people harder and damage to the frontal lobes causes people with Alzheimer's disease to struggle with decision making and completing difficult tasks. The development of dementia is visualised in Figure 7.

Important to note is that abilities that are learned long ago (during childhood) are retained for a longer time. Playing music or dancing is stored in the deep brain, which is not harmed in the first phases of Alzheimer's.

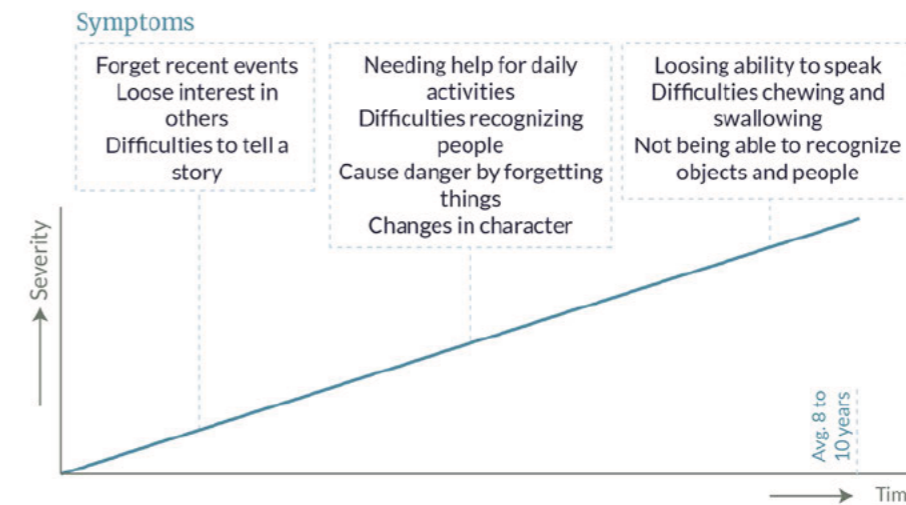


Figure 7: The development and symptoms of Alzheimer's disease

4.3.2. Vascular dementia

Vascular dementia is not caused by the accumulation of proteins in a specific part of the brain, but by different kinds of diseases of the blood supply to the brain. This can be a major stroke. In this case, a part of the brain dies because the blood supply to this part of the brain is suddenly cut off. It can also be caused by several mini-strokes over time. With every mini-stroke a small part of the brain tissue is affected. The symptoms of vascular dementia depend on the location of the (mini-)stroke.

The development of vascular dementia is shown in Figure 8. Since this type of dementia is not caused by the accumulation of protein in the brain, the development is different compared to Alzheimer's disease. With vascular dementia, improvements over time are possible, but the person that is suffering from vascular dementia will never become fully healthy again.

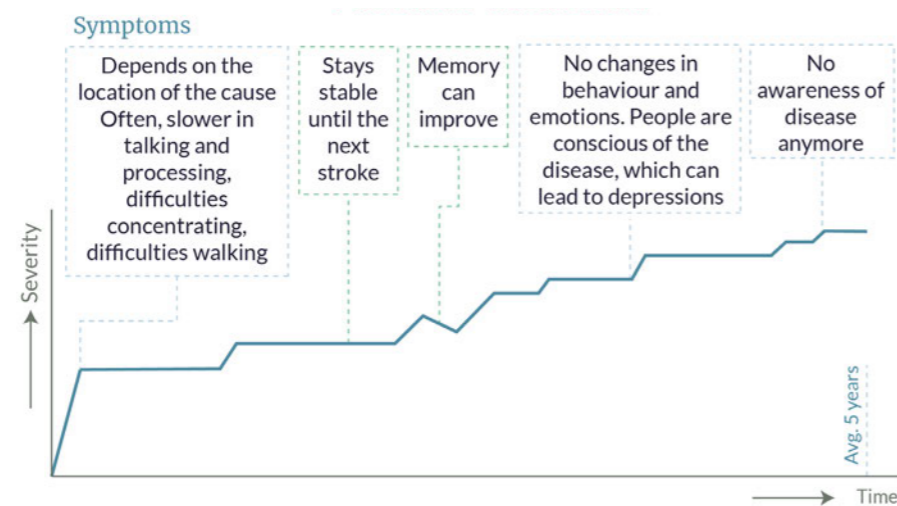


Figure 8: The development and symptoms of vascular dementia

4.3.3. Frontotemporal dementia

Frontotemporal dementia (FTD) is caused by shrinkage of the frontal or temporal lobes (Figure 9). The exact effect of this kind of dementia depends on the exact location of the brain that is harmed. Frontotemporal dementia can be divided into 3 sub-types: the behavioural variant, the language variant and the movement variant.

When someone has dementia from a young age, it is most likely that this person is suffering from frontotemporal dementia. In these cases, the dementia is often genetic (Alzheimer Nederland, n.d.e).

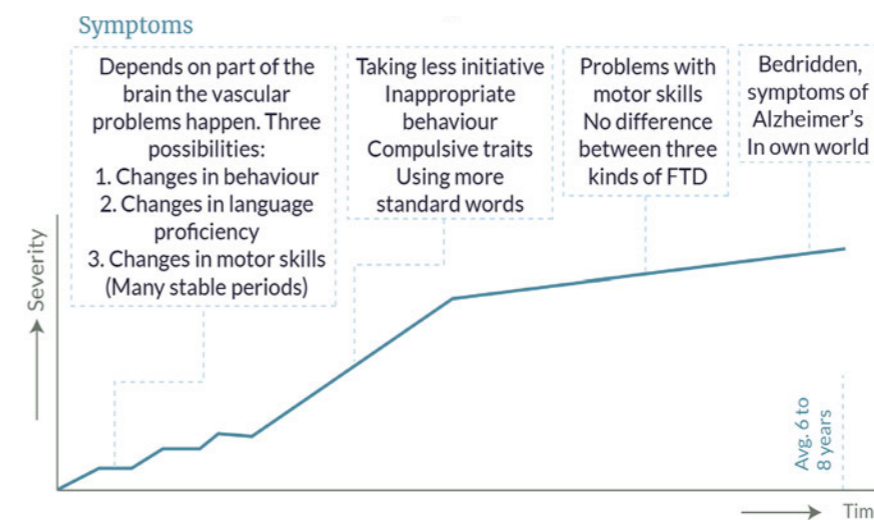


Figure 9: The development and symptoms of frontotemporal dementia

4.4. Behavioural development of dementia

The development of dementia has an effect on the behaviour and skills of someone with dementia. As the disease progresses, more and more severe symptoms will present themselves. Dementia is already visible in the brain long before the person that is suffering from the disease shows symptoms (Alzheimer's Association, n.d.).

After the diagnosis, the development of dementia is most commonly divided into 3 stages. These three stages are explained by, for example, the Alzheimer's Society (n.d.), Alzheimer Nederland (n.d.c) and the Alzheimer's Association (n.d.). The development is visualised in Figure 10. In the figure, the symptoms per phase are categorised into 4 groups. These are the main areas of the functionality of the brain that are harmed by the dementia. These groups are: 'Needed help', which explains the problems with normal functioning; 'Memory related problems'; 'Behavioural changes' and 'Uncertainty about place and time', which explains problems related to the perception of the world. Important is that the symptoms of dementia and the way the disease progresses is different for everybody. This is also apparent from the different symptoms per stage that each of the three foundations listed.

Early stage: Mild dementia	Middle stage: Moderate dementia	Late stage: Severe dementia
<p>Needed help</p> <ul style="list-style-type: none"> • No help needed yet 	<p>Needed help</p> <ul style="list-style-type: none"> • Changes become more marked • Need more support, for example with dressing • Sometimes problems with bladder control 	<p>Needed help</p> <ul style="list-style-type: none"> • Completely dependent on help of others • Become increasingly weak, problems walking, sitting, swallowing and chewing • Incontinence of urine (and later for bowels) • Vulnerable to infections • Losing weight, even though they eat a lot
<p>Memory related problems</p> <ul style="list-style-type: none"> • Forget conversations, events or read information • Loose objects • Problems with speaking fluently and finding the right words 	<p>Memory related problems</p> <ul style="list-style-type: none"> • Unable to recall own address or phone number • Forgetfulness about one's own personal history • Putting people at risk with forgetfulness 	<p>Memory related problems</p> <ul style="list-style-type: none"> • Gradual loss of speech, sometimes keep repeating specific words or shout out from time to time
<p>Behavioural changes</p> <ul style="list-style-type: none"> • Lose interest in other people or activities, change in abilities • Problems grasping and trying out new ideas 	<p>Behavioural changes</p> <ul style="list-style-type: none"> • Unusual, inappropriate behaviour • Having delusions or hallucinations • Being upset, moody, withdrawn or suspicious 	<p>Behavioural changes</p> <ul style="list-style-type: none"> • Becoming restless looking for something or someone • Being sad or aggressive, especially when they feel threatened, or when they do not understand what is asked from them (for example during care)
<p>Uncertainty about place and time</p> <ul style="list-style-type: none"> • Problems planning and organising, problems performing tasks • Problems judging distance 	<p>Uncertainty about place and time</p> <ul style="list-style-type: none"> • Changes in sleeping pattern • Confusion about whereabouts: wandering and becoming lost 	<p>Uncertainty about place and time</p> <ul style="list-style-type: none"> • Lose of awareness of recent experiences and their surroundings

Figure 10: The three stage development of Alzheimer's disease














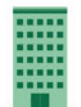
Phase	Name		Symptoms	Most common living situation
1	No cognitive decline		No memory deficit	
2	Age Associated Memory Impairment		Not clear in social situations yet Loosing objects Forget names of people	
3	Mild Cognitive Impairment		More clear deficits Lost when traveling to familiar situations Concentration deficit	
4	Mild Dementia		Decreased knowledge of recent events Inability to perform complex tasks	
5	Moderate Dementia		Need some assistance to survive (not with toileting and eating) Frequent disorientation	
6	Moderately Severe Dementia		Can forget the name of their spouse Unaware of surroundings Need help with activities of daily living	
7	Severe Dementia		Verbal abilities are lost Requires assistance toileting and feeding Brain cannot control the body anymore	

Figure 11: 'The Global Deterioration Scale for Assessment of Primary Degenerative Dementia (GDS)

Next to the frequently used three stage model to show the progression of dementia, a seven stage model is used by professionals to give a more specific indication of the development of dementia in a patient (Reisberg, Ferris, de Leon & Crook, 1982). The official name of the seven stage model is 'The Global Deterioration Scale for Assessment of Primary Degenerative Dementia (GDS)'. This model is explained further in Figure 11. The first two stages show the normal cognitive functioning of a person. In the third stage the first signs of dementia are showing. From the fourth stage onwards the professionals speak about dementia. From the fifth stage on the person with dementia cannot survive anymore without assistance.

70% of the people with dementia still lives at home and is cared for by close family (informal caregivers). As long as the informal caregivers can still handle the burden of taking care of the person with dementia, they stay at home. Yet, 54% of all informal caregivers for people with dementia is heavily burdened or overburdened by the care of their relative with dementia (Alzheimer Nederland, 2017).

For most informal caregivers, it is not possible to take care of the person with dementia anymore if they are in stage 6 on the GDS (Reisberg et.al, 1982). For example, people with moderately severe dementia will forget the name of their spouse, while they are completely dependent on them. This is also the stage where people with dementia often become incontinent, and start losing the sense of day and night. This means people with dementia in stage 6 and 7 on the GDS live in nursing homes. Since these people are the target group of Dental Robotics. The focus of the intervention should be on people with moderately severe and severe dementia.

4.4.1. Moving to the nursing home

4.5. Problematic behaviour

The way someone reacts to the world around him or her depends on the signals passed between the limbic system and the frontal lobes. The amygdala is located in the limbic system and reacts to danger (Figure 5). The created emotions are analysed in the frontal lobes. It is determined whether the threat is severe or that the mind misread the situation. In the latter case the frontal lobes then stop the body from reacting aggressively. When someone has dementia, the emotional centres in the brain can cause someone to become either over-emotional or lacking in feelings (Alzheimer's Society, 2014).

This can lead to problematic behaviour, which is defined as: all behaviour that is accompanied by distress or danger for the person with dementia or the people in their environment (Verenso, 2018). This problematic behaviour may include: 'psychotic behaviour', 'depressed behaviour', 'anxious behaviour', 'agitated behaviour (including restlessness)', 'sexually inappropriate behaviour', 'attention seeking and non-cooperative behaviour' and 'apathic behaviour'.

The way someone with dementia will react depends on the personality, the lifestyle, and the previous experiences. The changes in behaviour can also be caused by somatic factors, like pain or use of medication. The environment of the person with

dementia can have a huge influence on the behaviour. Examples are the bond and interaction someone with dementia experiences with their caregivers, the amount of stimuli in the environment (too many or too little stimuli) or the familiarity someone experiences with the environment. Since there are many factors that can cause the problematic behaviour, the origin of specific behaviour is different with every case. This makes it difficult to find a solution to the problem.

The effect this problematic behaviour has depends on the (expectations of the) caregiver and the situation. In general, caregivers mention that they experience time pressure during the care. This is often enhanced by the person with dementia not understanding what is asked from them, often caused by the caregiver not knowing how to take care of a person with dementia (e.g. because they are not aware of specific personal needs) and by the person with dementia not understanding the products that are used during the care. When a person with dementia does not understand what is asked from them, they can be impatient and not keep up with the full care ritual or they can refuse something or stop collaborating. This, combined with being more sensitive to pain, can lead to problematic behaviour of the person with dementia. In that case, the care needs to be postponed to another moment where the person with dementia is calmer.

4.5.1. Dealing with problematic behaviour

Everyone who takes care of someone with dementia finds ways to work around this problematic behaviour. In a questionnaire with 93 participants, solutions (informal) caregivers find to deal with problematic behaviour were investigated.

In the questionnaire, the participants were asked to explain the way they try to overcome problematic behaviour during the daily care and during tooth brushing in particular. This led to the model as shown in Figure 12. In the figure a step by step approach during the care is explained. The full questionnaire can be found in Appendix 2.

The model presumes that problematic behaviour of someone with dementia is caused by environmental factors and the behaviour and state of mind of the caregiver. This is based on insights from previous experience with the interaction with people with dementia during care, from experiencing the Dementia Glasses (see Appendix 3) and from an interview with Gerben Bergsma, an expert on solving problematic behaviour from people with dementia.

Currently, the most used solution to overcome problematic behaviour is skipping the care for the time being and trying it again later. In the model, step 0 is creating the right setting. In this setting, the caregiver is calm and takes the necessary time, the caregiver knows their weaknesses and the way their mood/ atmosphere is picked up by the person with dementia. When this step is executed well, the care will already be more successful. The next step is communicating with the person with dementia. In this step, it is important to explain every step of care, to show what is expected, and to persuade or comfort the person with dementia. If this does not work out, it is possible to distract the person with dementia to get them into a more positive mood. Caregivers currently use many different methods to distract their client. They can use music, pictures, humour or a game to make sure the care

is successful. If the care is still unsuccessful after trying to distract the person with dementia, the caregiver can always then decide to skip the care for the moment and wait until the client has calmed down.

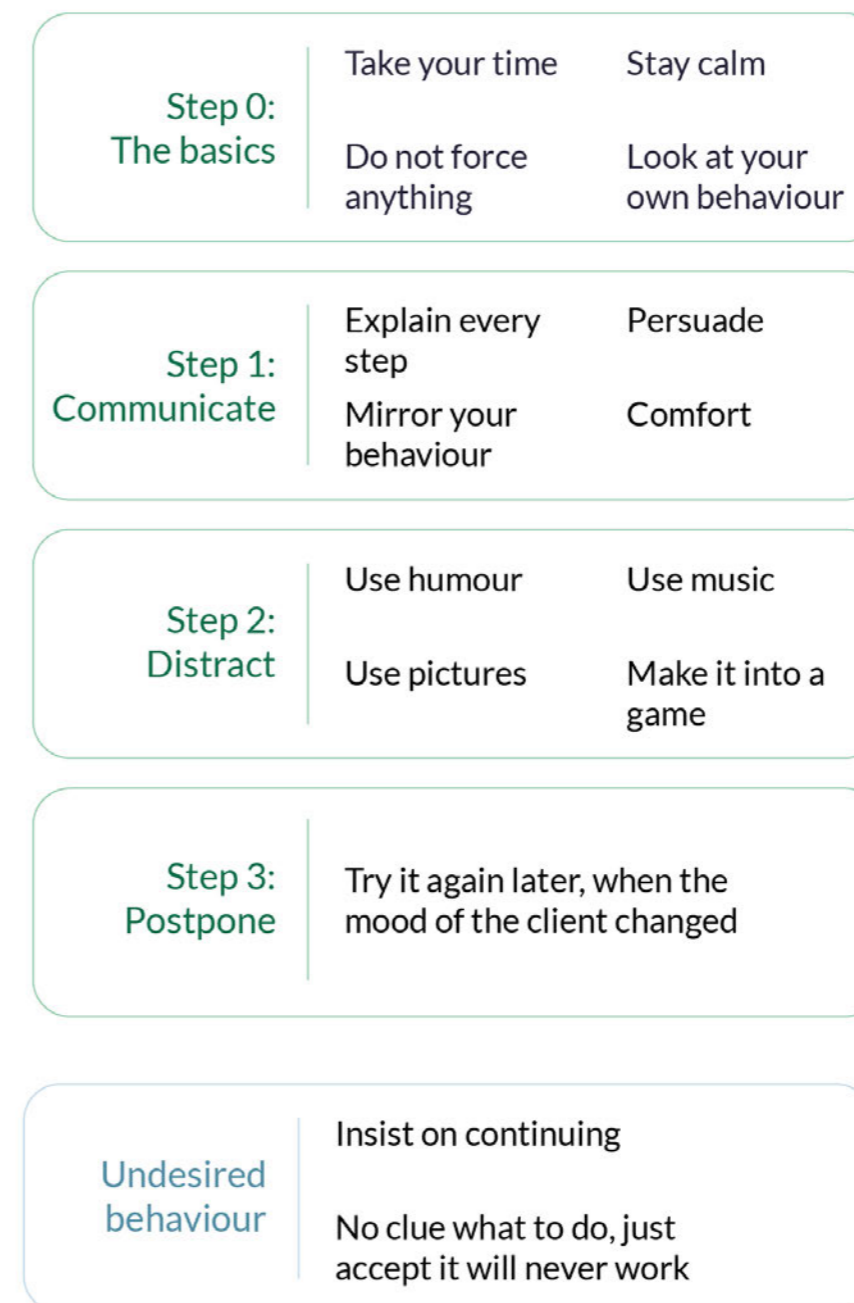


Figure 12: Current model of caregivers in the approach to avoid problematic behaviour

4.5.2. Person- centred care

The behaviour of people with dementia drastically changes over time. When the disease progresses, people suffering from dementia are not able to fulfil tasks that are expected of an adult. For the environment, it is difficult to keep fully viewing someone as an adult. For example, people will start talking about someone, instead of to someone. People with dementia will notice this, since their emotional development is not impaired (learned in observation Dementia Glasses). Even more so, people with (beginning) dementia are seldom acknowledged in society, which undermines the personhood of these individual (Kitwood, 1997).

When someone is not able to explain what they want and need anymore, it does not mean that he or she does not know what they need and want. This is often not understood by caregivers. They start caring in their way, which might be uncomfortable for the person with dementia they are caring for. In 1997 Kitwood published the paper 'Dementia reconsidered: the person comes first.'. This turned out to be very influential on the perspective on care for people with dementia. In his approach, Kitwood places the person in the centre of their own care. When someone is suffering from severe dementia, care professionals are responsible for meeting the psychological needs of the people with dementia they are caring for. Kitwood developed a framework of psychological needs that are often not met and the way caregivers can improve the fulfilment of the psychological needs of their clients (Kitwood, 1997). The most important ones for this project are shown in Figure 13.

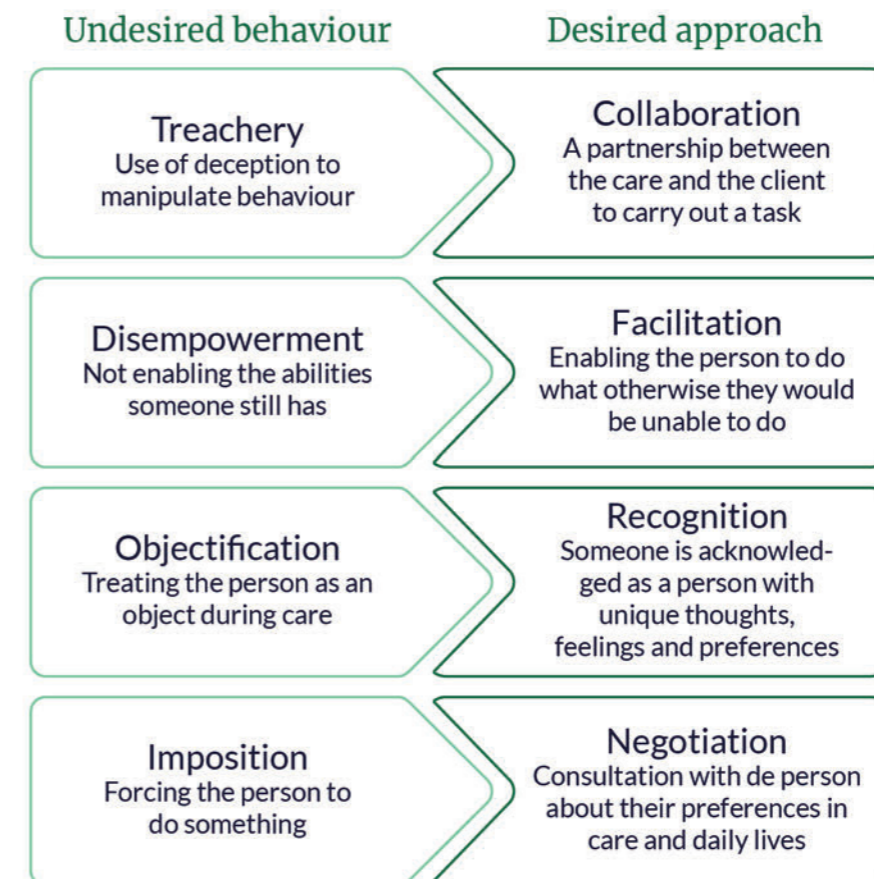
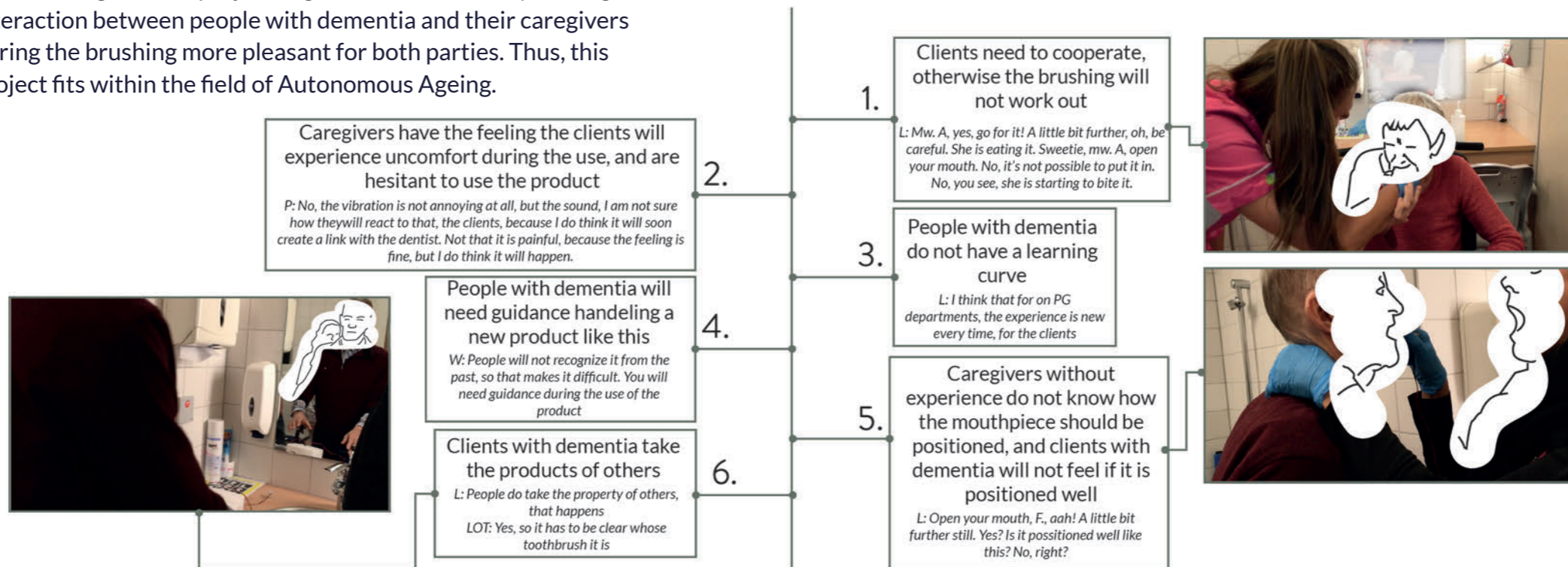


Figure 13: Relevant aspects of Tom Kitwood's approach towards person-centred care

4.6. Autonomous aging

One of the objectives of Kidwood's framework is enabling people to do what they would otherwise be unable to do. This can be simple things, like taking someone for a walk in the park, but it can also be more complicated things. Enabling people with dementia to fulfil complex tasks again can be done by designing products or innovative approaches. This will help promote independence and maximise quality of life, compensating for functional deficits associated with ageing (Cahill, Macijauskiene, Nygård, Faulkner, & Hagen, 2007; Van Der Cammen, Albayrak, Voûte, & Molenbroek, 2017). This independent living can also be described as Autonomous Ageing, which can be defined as 'The freedom to determine one's own actions' while ageing. The aim of design for autonomous ageing is to support the older person in maintaining autonomy, in comfort and safety and with quality of life.

The vision of Dental Robotics is to enable the elderly to brush their own teeth again. This project aligns with this vision by making the interaction between people with dementia and their caregivers during the brushing more pleasant for both parties. Thus, this project fits within the field of Autonomous Ageing.



4.7. Tooth brushing with the Dental Robotics toothbrush

The automatic toothbrush developed by Dental Robotics is completely new. The interaction with the toothbrush developed is different compared to the interaction with a conventional toothbrush. It brushes all teeth at the same time, moving is not necessary. People with dementia might not be used to the vibrations, to the shape and weight of the brush and to the way the product is handled.

For people with dementia it is more difficult to learn how to handle and understand new products. From user tests during the internship of the graduation student prior to the graduation project, multiple challenges concerning the brushing with the automatic toothbrush of Dental Robotics are found. At one point, a top-10 of the most common problems concerning the tooth brushing among people with dementia and their caregivers is made. This overview can be found in Figure 14.

Figure 14: Main insights from the internship prior to the graduation project



Chapter 5: Products for dementia

The cure for dementia is still far from completed (Burnett, 2018). Until that time, many organisations have the goal to improve the quality of life by developing products that, for example, improve the quality of care or enable people with dementia to have a moment of distraction. Some of the products are researched. The benefits and negative points are described. The most inspirational products are displayed on the next page, the others are shown in Appendix 4.

The graduation student during the shoot for a promo video of Pieter van Foreest. Picture: Bryan Yip

The products that are developed almost all have the goal to improve the quality of life of people with dementia. However, this can be achieved in different ways.

First of all, it is possible to take over tasks of the people with dementia or their carers. An example of a product that fits this category is the DAZA Chair alarm (Figure 15). This takes over a part of the controlling tasks of the caregiver. However, this takes away a big part of the autonomy of the person with dementia.

Currently, the toothbrush developed by Dental Robotics fits most within this category, since it has a functional goal. This approach however can cause the person with dementia to not understand the purpose and added value. The intervention should not fit in this category to ensure the person with dementia will truly use the toothbrush.

DAZA Chair alarm

What is it?

The chair alarm is a chair pillow that notifies the caregiver when someone with dementia gets up from the chair

Benefits?

The pillow allows caregivers to shift the attention from the movement of clients towards more meaningful contact with a client.

Negatives?

The chair alarm completely takes autonomy of the person with dementia away.



Source: <https://www.daza.nl/stoel-ver-laten/>

Figure 15: The DAZA Chair alarm, that notifies the caregiver when a person with dementia gets up from a chair for too long

In the second category, products for activities that are adapted the abilities of the person with dementia fits. An example is the puzzle by creative scenes, which enables a person with dementia to make a puzzle and evoke memories without making mistakes (Figure 16).

The intervention will be used during the care for people with dementia. Due to this, it is not likely that the product will fit in this category.

Creative Scenes- Puzzles

What is it?

Creative Scenes enables people to create their own scene using a set of magnetic pieces that can be placed on the background board.

Benefits?

While making this puzzle, everything is possible, and no mistake can be made. It leaves a lot up to imagination

Negatives?

The puzzle is never finished. This does not provide a feeling of accomplishment



Source: <https://www.active-minds.org/uk/reminiscence/creative-scenes/>

Figure 16: Creative Scenes puzzle, that evokes reminiscence during puzzling, without having the option to make mistakes

Figure 17: The QwiekUp, that is designed to provide the right amount of stimuli during care or when someone needs to go to sleep

Qwiek Up

What is it?

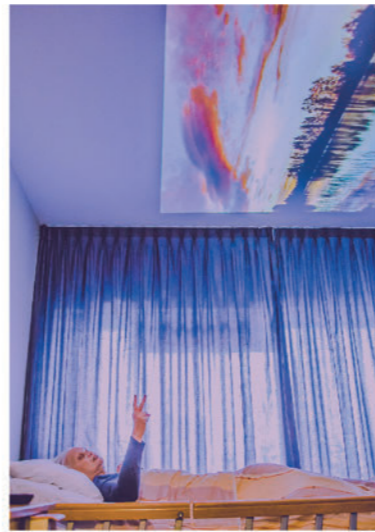
Qwiek Up creates an audiovisual experience for clients that help to regulate the incentives during the care.

Benefits?

The device is adaptable for multiple situations and takes the needs of the person with dementia into account.

Negatives?

The device and the visuals are expensive and the device is big, on wheels it needs to be transported from room to room.



Source: <https://qwiek.eu/up/>

The last category are products that improve the experience of people with dementia. These products are generally the most advanced and aim to deliver the right amount of stimuli. An example is the QwiekUp, as shown in Figure 17.

Products from the last category are the most complicated to design for and require a deep understanding of the target group. Nevertheless, it should be best when the product fits in this category, since this is the category that leaves the most options to apply person-centred care to avoid problematic behaviour.

The step towards the design

In order to create guidance during the design process, the insights of the analysis phase are summarized. This helped to define the design requirements. Next to this, the main design possible design directions are described.

Both the requirements and directions will be leading during the iterative process that follows.

Design requirements



Figure 18: The design requirements

Design directions

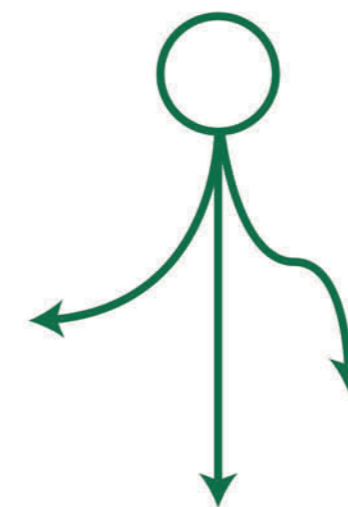


Figure 19: The design directions

A photograph showing a caregiver in a dark shirt leaning over a bed to assist an elderly person. The caregiver is holding the person's hand. The elderly person is lying in bed, partially covered by a patterned blanket. The background is a simple room with a wooden headboard and a wall-mounted object.

Chapter 6: Design criteria

In order to find out what makes the interaction pleasant for both the carer and the client with dementia, the main insights from all interviews, observations and previous experiences are bundled in an overview in Figure 20 on the next page. The complete overview of the interview questions and background information about the people involved in the interviews can be found in Appendix 5.

Caregiver Esmee in
HUMAN show 'De
Leeuwenhoek'. Source:
[https://www.human.nl/
in-de-leeuwenhoek/kijk/
afleveringen/aflevering-3.html](https://www.human.nl/in-de-leeuwenhoek/kijk/afleveringen/aflevering-3.html)

Toen ik begon was het wel anders. Toen had je
tijd voor de mensen, en nu heb je eigenlijk
helemaal geen tijd meer voor de mensen.

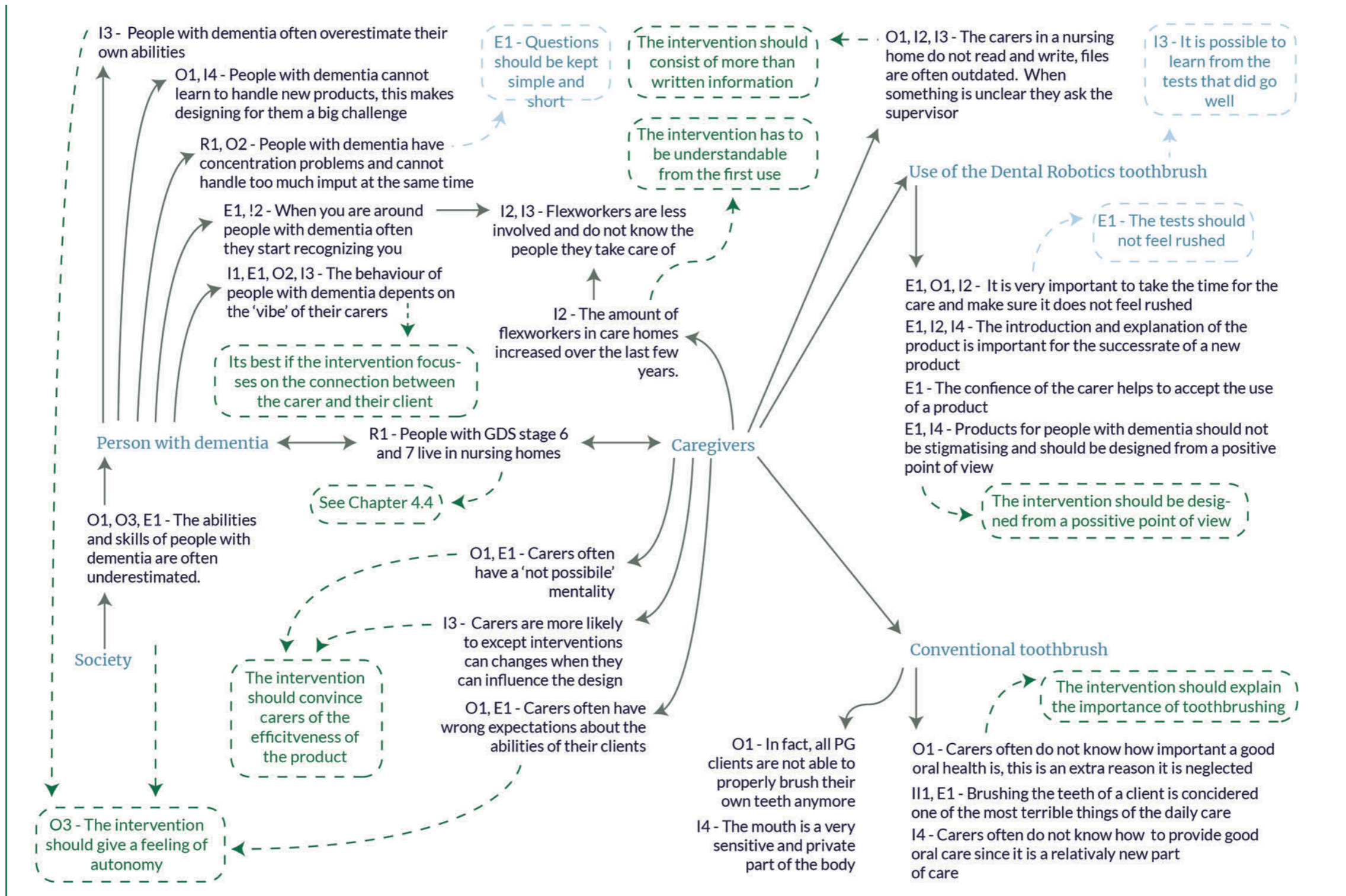


Figure 20: Overview of the insights of the analysis phase

The design criteria will help to design a solution that will truly benefit the acceptance of the Dental Robotics toothbrush and fulfil the design goal.

The design goal is as follows:

Increase the acceptance of the Dental Robotics toothbrush among people with dementia and their caregivers, by creating a more pleasant experience for both.

The combined insights of all interviews and the insights from the literature research lead to the following design criteria:

Time saving

For nursing home organisations, the most important factor when buying a new product is saving money. One of the ways to achieve this is by saving time (and thereby man hours). This is the main incentive for nursing homes to purchase the Dental Robotics toothbrush. Since Dental Robotics will supply the intervention, it is important that the use of the intervention will not take time from the caregivers during the care ritual.

Designing for the entire care ritual

Even though the intervention will be carried out by Dental Robotics, it is possible to design for the entire care ritual, because the cooperation of a person with dementia is important during the entire care ritual, not necessarily only during the tooth brushing.

Since the designed solution will focus on improving the mood of the environment by improving the emotional state of the caregiver and the interaction between the caregiver and the client, the intervention can also be used care wide.

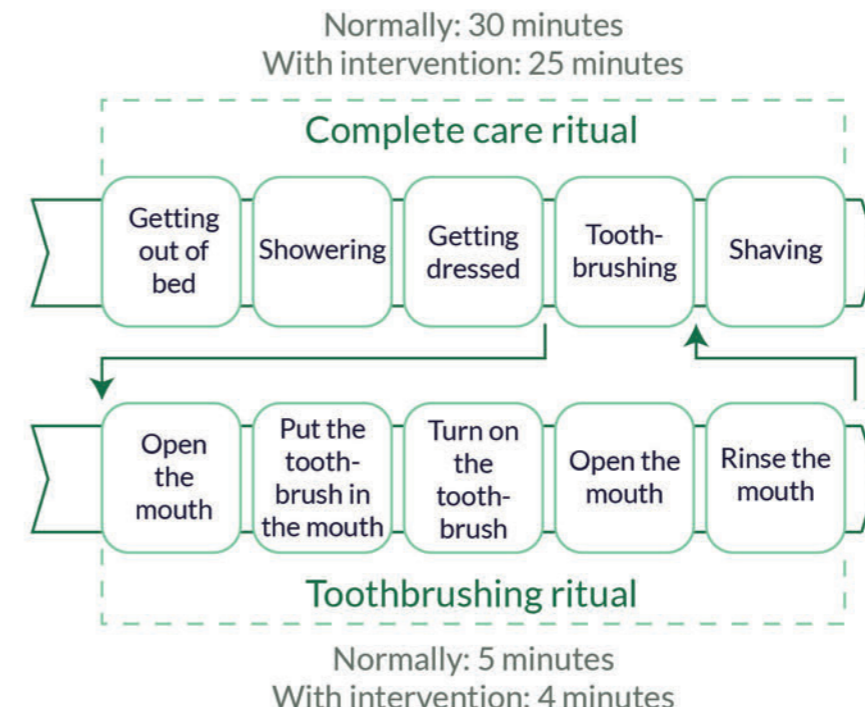


Figure 21: A fictional example of the possibility to save time during the care ritual

When the effectiveness of the entire care ritual can be improved by applying an intervention that is generally applicable, the total time that can be saved may be bigger compared to an intervention designed only for during the tooth brushing. An example is visualised in Figure 21.

When this approach is taken, the acceptance of the Dental Robotics toothbrush should always stay on top of mind. When the design benefits the entire care ritual, but the acceptance of the toothbrush is not increased, the design goal is not met.

Flexibility

The behaviour of people with dementia is often unpredictable, especially for a caregiver who is not familiar to that person. It is not clear what will trigger the person with dementia to show problematic behaviour and stop cooperating. Additionally, everyone will show different problematic behaviour. Some people might walk out, start doing something else or become agitated towards the caregiver.

A flexible process

The intervention should be flexible enough to take this unexpected behaviour into account. At the least, the intervention should empower the caregiver to pick up the care ritual again after the person with dementia was distracted or agitated. In the best case, the intervention helps the caregiver to prevent or deal with the problematic behaviour to make sure the caregiver has full understanding of the problematic behaviour or to make sure it does not happen at all. In this case, there should still be a backup option to get back into the routine after problematic behaviour occurred.

Flexible for the caregiver's needs

Next to the flexibility of the intervention during the use, it should also be flexible in terms of the usefulness for different kinds of users. The intervention should be beneficial for both flex workers, that do not know the person they are caring for and for fixed caregivers, that might have known the person with dementia for years. The flex workers will need guidance understanding the basic reasons for a person with dementia to show problematic behaviour, while the caregivers will only need assistance when the person with dementia will show problematic behaviour they do not normally show. Next to that, it is possible the flex worker has never seen the toothbrush developed by Dental Robotics before, while the fixed caregiver knows what it is and how it works.

Flexible for the client's needs

Not only do all caregivers have different wants and needs during the care for people with dementia, the clients also all have different needs. Everyone has their own history and has developed their own preferences and rituals. As the dementia progresses, the person suffering from dementia loses their inhibition. This makes it more important to adapt to their preferences. Besides, not only is the history of every client different, the progression and symptoms of the dementia differ per person. The intervention should be flexible enough to take this into account.

Positive design

Many designs for people with dementia are focussed on the actions people with dementia cannot do anymore. This is stigmatizing and not preferred. By looking instead at the things that people with dementia can still do, the intervention will have a more positive atmosphere and will hopefully be more fun to use.

Connection caregiver – client

People with moderately severe to severe dementia cannot use their thinking brain anymore. They fully depend on their emotional brain. This causes them to be highly sensitive to the mood or atmosphere of the environment and the people in their environment. When the environment is not pleasant, the person with dementia can get into an agitated mood and the care might be less successful. When the caregiver is calm and has a good connection with the person with dementia, the care will work out better.

Autonomy

For people with dementia, it is very important to feel autonomous. It is difficult to give up more and more of the personal care. Every time something does not work out as it normally does, it feels like failing. By designing an intervention that enables a feeling of autonomy, the chances are higher the person with dementia will cooperate during care. At the same time, the caregiver should have the feeling they have control over the situation and that they can decide what will happen and at what pace.

Confidence of caregiver

When a caregiver does not believe in a product or its effectiveness, he or she will be hesitant to use it. This, again, will give off a negative atmosphere. The person with dementia needs to put trust in the caregiver and when this caregiver is not sure about something, the person with dementia will feel this and will be more cautious. This will not be beneficial to the behaviour of the person with dementia.

Not only written

Caregivers want to take care of people, not read and write reports. They are not used to reading and writing in the course of their job. During their work, they do not use a computer and if they need to know something, they ask others in the department for help or advice, instead of reading it in the reports. A written intervention will not fit in the work flow of the caregiver and the chances that it will be beneficial and used for a longer period of time are low.



Chapter 7: Design directions

The design will consist of two steps. The first step is getting to know the client. The information retrieved in this step of the design will be used for the second step, which is providing more pleasant care and increasing the acceptance of the toothbrush developed by Dental Robotics. In order to achieve this, it is important to know the client to be able to know what will trigger them to become agitated, anxious or apathetic. For the second step, three different design directions can be found. These are: 'Support the activity', 'Support the attitude of the caregiver' and 'Create a safe environment'. The goal of the second step is to help the person with dementia to show cooperative behaviour. This means that he or she will not be agitated, anxious or apathetic and that the caregiver is able to perform the care ritual.

Each design direction consists of multiple steps and/ or options to develop the concept. The design directions and all steps and options are shown in Figure 22. The argumentation behind the directions and the reasoning behind the steps and options will be explained below.

*Jullian Moore as
Alice in 'Still Alice'*
Source: Glatzer, R. &
Westmoreland, W. (2014)
Still Alice. USA: Sony
Pictures Classics

I am not suffering, I am struggling,
struggling to be a part of things.
To stay connected to who I once was

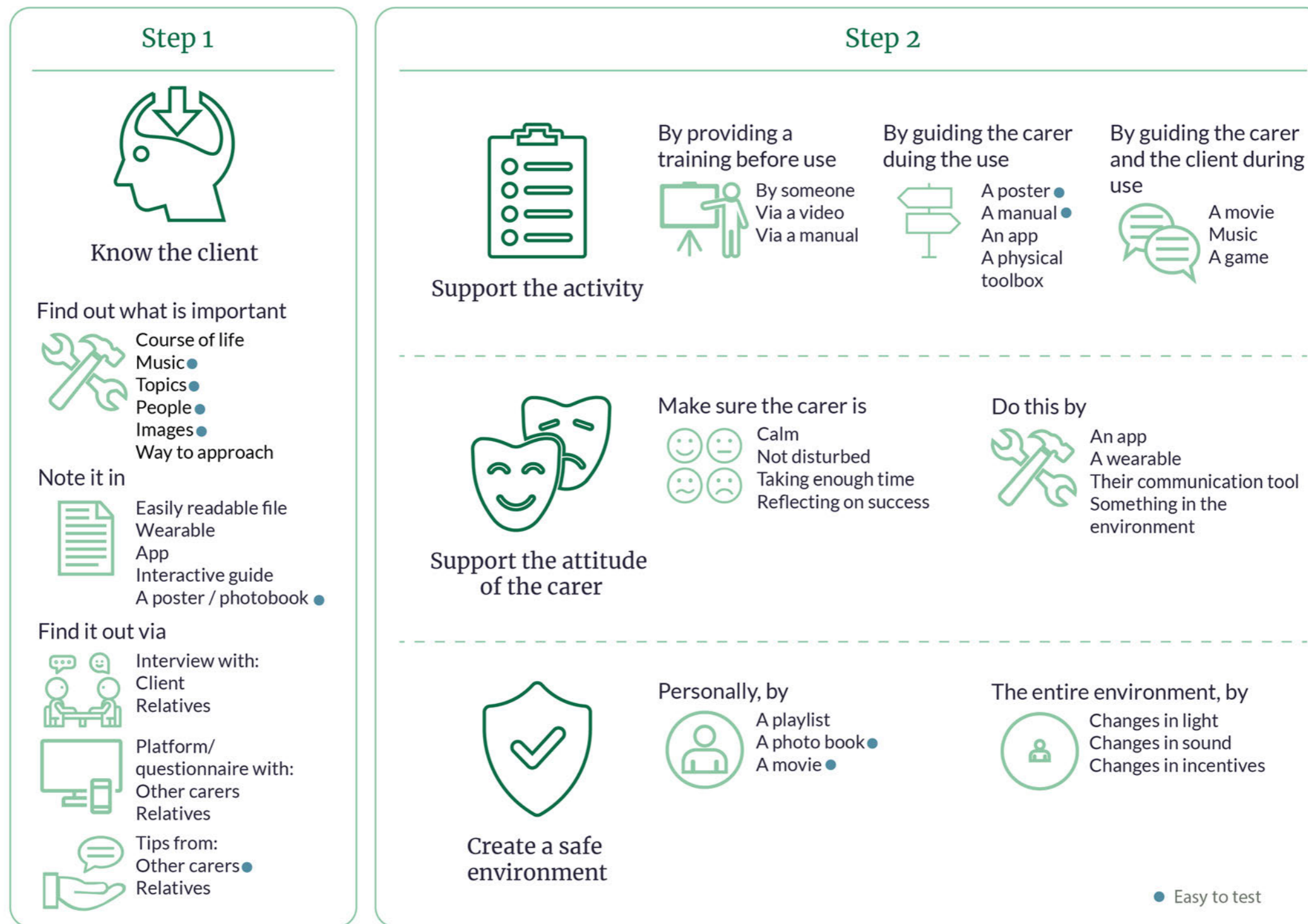


Figure 22: The overview of the design directions. These are explained further in the coming chapters

Step 1: Know your client

As mentioned before, the way someone will react to their environment depends on the personality, the lifestyle, and the previous experiences. The changes in behaviour can also be caused by somatic factors, like pain or use of medication. In order to understand this behaviour, it is of great value to know the most important people and life events of the person with dementia, and to know what their favourite music, movies and games are. If a caregiver understands this, they are able to show more appropriate behaviour and react better to the behaviour of the person with dementia. When the caregiver is familiar with the life history of the person with dementia, this information can be used to support the activity, create a safe environment and support the attitude of the caregiver.

The basis of the intervention will be a tool to empower a caregiver to easily find out what is important to the client and what will trigger undesired behaviour. Next to that, the tool needs to help the caregivers quickly retrieve this information to be able to use it during the care.

Reminiscence

Actively retrieving memories is called reminiscence (Moderne dementiezorg, n.d.). This activity can be very valuable for people with dementia, since they are slowly losing the ability to memorise. Reminiscence in dementia care is a way to enrich the daily life by remembering the past. For people with dementia reminiscence is not self-evident. For them, it is easier to recognise than to recall. People or objects can trigger memories and encourage people with dementia to talk about the past (Schweitzer & Bruce, 2008).

Evoking reminiscence in people with dementia is a delicate task. It takes personal interest of the facilitator, skill in leading a session and inspiring and clear objects or stories to help the person with dementia to start remembering. For the purpose of the intervention, it is important that inexperienced facilitators can

lead a reminiscence session and that they can easily note down the results. These results need to be available for caregivers to make sure they know what will trigger the person with dementia. To achieve this, it is important that the results are quickly accessible, easy to understand and show clear solutions on how to avoid actions that will trigger undesired behaviour.

With the results of the reminiscence session, the caregiver will be guided through the care ritual. The way the activity can best be supported, the most appropriate attitude of the caregiver or the specific circumstances that make a safe environment for the person with dementia, depends on the history of the person with dementia. The intervention will help to achieve a personal approach for every individual.

Support the activity

The toothbrush developed by Dental Robotics will be new for both the caregiver and the person with dementia. It will change the interaction of tooth brushing in terms of time management and necessary actions to fulfil the task. People with dementia that are living in the nursing home are not able to learn how to handle a new product anymore. Due to this, the success rate of the toothbrush will completely depend on the willingness of the caregiver to use and explain the toothbrush every morning and evening.

Since the product will be new every time the person with dementia is using it, they can experience the product as strange, scary and unpredictable. An intervention in this design direction will support the caregiver in explaining the product in a sufficient way to the person they are caring for, to make sure the person will understand the use of the product and the tasks that they need to perform. The best way to achieve this will differ per person and per time it is used.

Step 2: Perform the care

By supporting the caregiver in explaining the toothbrush, they will be more secure in using the product, since the intervention will guide them through the interaction. This will help the caregiver stay calm and confident while using the product. The person with dementia will feel this and it will be more likely that they will cooperate more.

Support the attitude of the caregiver

As mentioned before, people with dementia are very sensitive towards the mood of the people in the environment. It is important for the caregiver to be positive, calm and honest. When they are rushed or pretend to be happy, the person with dementia will notice and feel patronised. This can cause problematic behaviour. By knowing what triggers the person with dementia to become agitated, anxious or apathetic, these actions can be avoided. This will lead to a more pleasant care ritual for both the caregiver and the person with dementia, which will result in more successful care.

The current care ritual

The intervention can only save time during the actual care or tooth brushing. In order to achieve this, the intervention should benefit this. This is only possible when there are more advantages than disadvantages to the use of the intervention. This can be achieved most easily by making the disadvantages as low as possible.

One of the biggest possible disadvantages is the change in the rhythm of the caregiver. When the intervention does not fit the current way of working, it is difficult to make it beneficial. This is enhanced by the caregivers feeling that they are the experts on their own clients. A design will be more successful when caregivers have had influence on the design or have influence on the way they can use the product (Interview Gerben Bergsma, Appendix 5).

The results of the questionnaire with 93 caregivers (Chapter 4.5) showed an approach to the interaction during the care of people with dementia. This approach is currently used by caregivers. When the intervention facilitates an effective use of this approach, the intervention will fit within the usual rhythm of caregivers during the care ritual.

Figure 23 on the next page shows the results of the questionnaire. The intervention can assist in the first three steps of the approach (the basics, communication and distraction). If the intervention successfully facilitates these steps, the fourth step of the current approach (postponing) becomes obsolete.

Create a safe environment

People with dementia are not able to concentrate for longer periods of time anymore. They are quickly distracted. An environment can trigger this. Sounds, fast changes in light and people they are not familiar with can cause people with dementia to start showing problematic behaviour. By creating a safe environment for the person with dementia, this can be avoided.

This can be done by creating something that can distract the person with dementia and help them to feel safe despite what is going on around them, for example by making them a personal photobook or playlist. Next to this, the entire environment can be adjusted to create an environment that makes the person with dementia feel safe, for example by changes in the lighting or sounds in the environment. For both options, the solution needs to fit the individual.

Iterative process

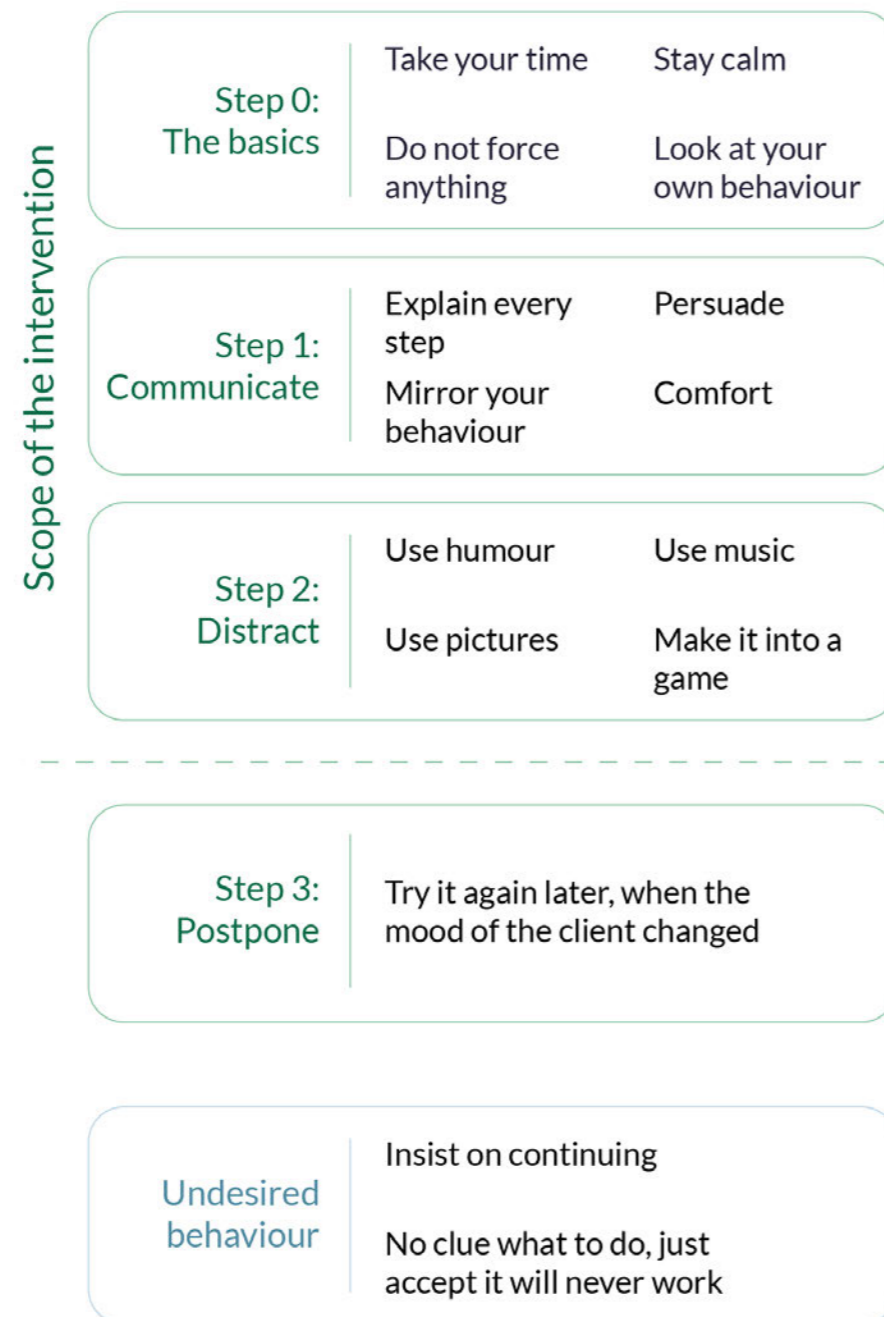


Figure 23: Scope of the intervention to support the attitude of the caregiver

The iterative process consists of roughly 5 phases of one to two weeks. In general, a phase starts with a new insight, followed by a brainstorm session, a design and a test. The results and conclusions from each test are the starting point of a new phase.

A complete overview of the iterative phase can be found in Figure 24. In this phase, three brainstorm sessions were organised, three prototypes were made, eight user tests were done, four interviews were conducted and six key insights led to an app as a final iteration. Each phase is strongly connected to the previous phase.

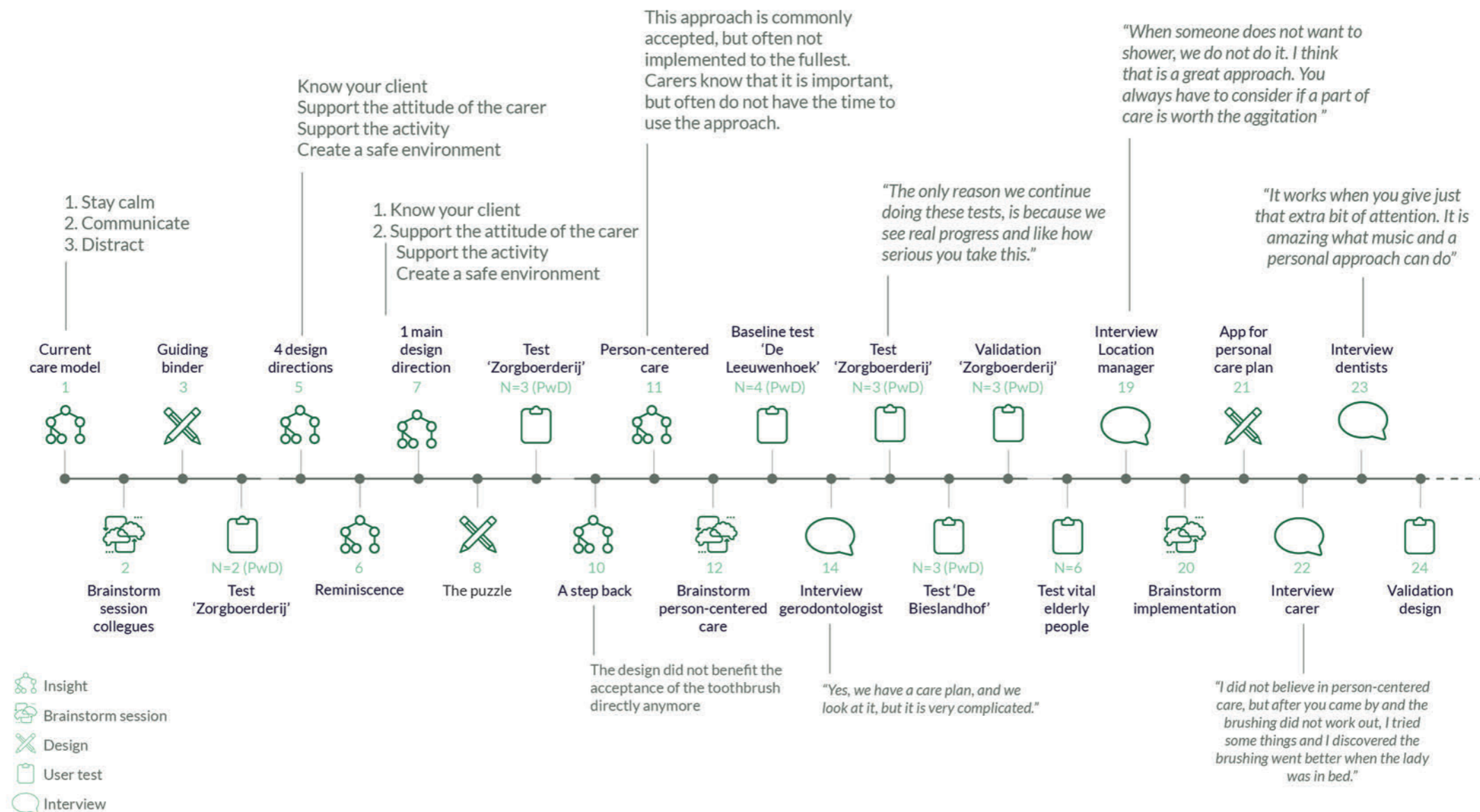


Figure 24: An overview of the iterative process

The long story

There are multiple ways to describe the iterative process. Since this is possible, the iterative phases is documented in a game of quartets. The different steps can be sorted chronologically, by iteration or by category. The game consists of 24 cards, that are divided into five categories, namely: Insights (6 cards), Brainstorms (3 cards), Designs (3 cards), User tests (8 cards) and Interviews (4 cards) (Figure 25). The cards can be found in Supplement 2.

Insights	Brainstorm sessions	Designs	User tests	Interview
				
card 1 Current care model	card 2 Brainstorm session colleagues	card 3 Guiding binder	card 4 Test 'Guiding binder'	card 14 Interview gerodontologist
card 5 4 design directions	card 12 Brainstorm person-centered care	card 8 The puzzle	card 9 Test "The Puzzle"	card 19 Interview Location manager
card 6 Reminiscence	card 20 Brainstorm implementation	card 21 App for personal care plan	card 13 Baseline test 'De Leeuwenhoek'	card 22 Interview carer
card 7 1 main design direction			card 15 Test 'Person-centred care'	card 23 Interview dentists
card 10 A step back			card 16 Test 'Sounds and mirroring'	
card 11 Person-centered care			card 17 Validation 'Person-centred care'	
			card 18 Test vital elderly people	
			card 24 Validation design	

Figure 25: An overview of the iterative phase

The short story

To summarise: at the beginning of the iterative phase, the focus was on the caregiver instead of on the client with dementia (card 1). The intervention was very descriptive: it literary told the caregiver what to do. It did not leave anything open for the caregiver to improvise or apply knowledge from before (card 3).

This did not work (card 4). This opened up the idea generation and the focused changed from the caregiver to the client (card 5).

The first step in this process was the focus on design direction: 'Know the client'. After the first research in this field, reminiscence seemed the way to go (card 6). The focus shifted from increasing the acceptance of the toothbrush developed by Dental Robotics towards collecting client information and documenting it in a way that would benefit the acceptance of the toothbrush afterwards.

This led to a puzzle that encouraged people with dementia to talk about their past with their caregivers (card 8). The caregivers could write down important information and hang it in the room.

This method did work with people with moderately severe dementia, for people with severe dementia, the questions were too complicated. However, this was not the biggest problem. The puzzle did not directly benefit the care. The results of the test with this prototype helped to realise that knowing the client is just the first step to be able to provide good care. The way the care is experienced (and is perceived as good or bad) and the definition of a good attitude of the caregiver, a safe environment and a well-supported activity differs per person. The focus of this project should be on the latter three, even though the information of the first step is vital to achieve this (card 10).

The method of applying personalised care is an approach developed by Tom Kitwood in 1997 and is called person-centred care. In this approach the caregiver adapts the care to the needs and wants of the client, even (of especially) when they are not able to explain this themselves. This method is also mentioned by Verenso (2018) in their guidelines to avoid problematic behaviour

as the best way to deal with this (card 11).

As a first test to see if this also worked during the use of the Dental Robotics toothbrush, the caregiver of Zorgboerderij Buitengewoon is asked to share some of the favourite movies and hobbies of the clients (card 15). This is played during the use of the toothbrush. The acceptance rate was a 100%, which means the use of personalised music was a great success. A second test was conducted to validate the results, to avoid a coincidence. Again, the success rate was a 100%. This was enough evidence to continue in this direction (card 17).

The next step was to find a way for a caregiver to apply the personalised music and the person-centred care. The design direction gained extra .. during interviews with caregivers, gerodontologists, a location manager and team manager. They all confirmed the effectivity of person-centred care, but they all had arguments on why they did not use this in the daily care. This ranged from: "It's the lack of time." to "The caregivers do not apply this, because they did not have a training yet." (card 14, 19, 22 and 23).

For the last 'test' an overview of an app that contains important information about the clients on a department (things not to talk about and to take into consideration), a list of interests of the client, the favourite music and videos and the option to show pictures is developed. The app is shown on three devices: an interactive mirror, a phone app, connected to a sensor in every room and on a tablet (card 21).

Sheets with the overview of the options and the different screens of the app is distributed in a Pieter van Foreest house. The caregivers have hung it in the team room to allow everyone on a break to look at it and give their opinion. The results are still pending at the time of writing (card 24).

The final phase

In the final phase, the end result of the iterative phase is developed further (Figure 26). The different aspects of the design are detailed and the way it should work is thought out. This result is validated with different caregivers and the manager for innovation of Pieter van Foreest. After the validation, the final design is developed. In an evaluation, the design is tested to the design goal and design requirements. At last, recommendations for Dental Robotics for further implementation is written. The project is closed with a personal reflection of the graduation student.

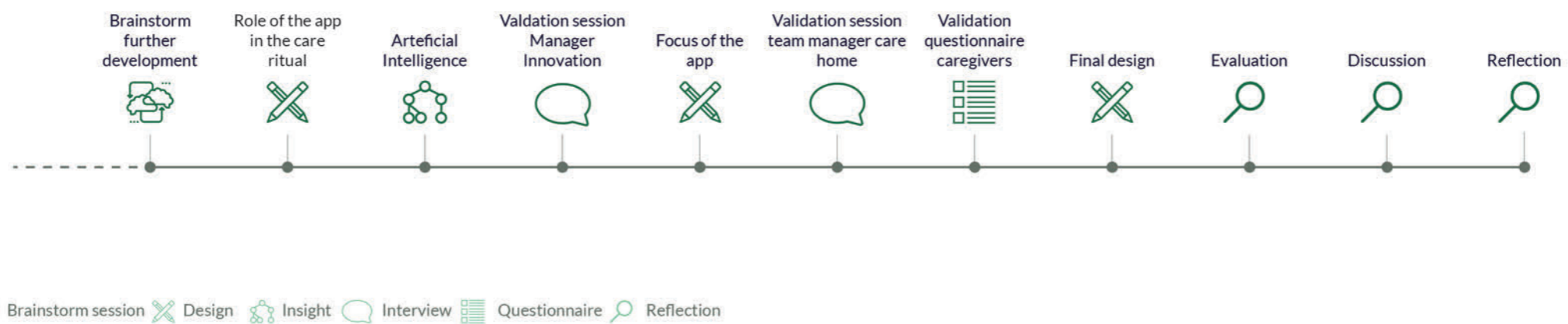


Figure 26: Overview of the activities in the final phase



Chapter 8: Blink

The iterative phase ended with an idea for an application that was validated on two PG departments and the oral care department of De Bieslandhof, by hanging a feedback form in the team rooms. Unfortunately, this did not provide enough feedback to draw founded conclusions. Nevertheless, it did became clear that the basic tablet app has the preference due to its easy implementation and high flexibility. Besides, the caregivers did indicate that they saw the added value of the app.



I am sorry sir, you cannot do this!
- Can I have a steak medium please?

*When your dad with
Alzheimer's takes his
pants off in public,
you do not get mad
at him, you join him.*

*This is exactly what
Blink should support.*

Source: Gluck, W. (2011)

Friends with benefits. USA:

Sony Pictures Classics

The goal of the app is still to increase the acceptance of automatic toothbrush developed by Dental Robotics. The app aims to achieve this by enabling the caregiver to apply person-centred care. Person-centred care can help to provide and understand what a client with dementia needs during the daily care ritual. When this is understood and the care is applied sufficiently, the client with dementia will be more at ease, which will help to prevent problematic behaviour.

Within the definition of person-centred care that is used, the caregiver is encouraged to apply care that follows the habits and rituals of the client, to comfort someone by talking about the history and interests or by playing music, videos or slideshows of recognizable pictures. It is best to apply these methods in consultation with the client, to help achieve a feeling of autonomy. During interviews with caregivers and gerodontologists, it became apparent that they know that they should apply person-centred care, but that they feel limited in applying this because they experience time pressure. They did mention that they do apply the use of music during the care at some moments, for example when someone is not at ease. Currently, they use their own phone to play the music.

They also mentioned that, with their experience, they are able to see what a client needs. Experience with a specific client helps to recognize in what state someone is in and to see what the best approach is to keep them in this stage or change their attitude. When a client is unfamiliar to them, they can use their experience with others to decide how to approach the client. In this case, it would help to have a quick overview on the wants, needs and interests of a client, to be able to pinpoint quicker what the necessary actions are.

8.1. Design for happiness

One of the main requirements of the app is that it is easy to use and to implement in the habits of the caregiver. All caregivers have their own way of working, and they are attached to this way of working. When someone from the outside comes in and tell them what to do, it is most likely that they will not accept this and refuse to implement it in their care ritual.

One approach to overcome this behaviour can be to design for happiness. This is part of the approach of the Delft Institute of positive design. This initiative is established in 2011 to develop methods that enables designers to formulate effective strategies in contributing to the happiness of people (Delft Institute of Positive Design, 2012). This can benefit to the aspiration of designers to make a positive contribution to the individual user and society in general by design. According to Desmet and Pohlmeier (2013) positive design has three main pillars. Namely 'design for pleasure', 'design for personal significance' and 'design for virtue'. A successful positive design, that truly helps the user to flourish, should contain all pillars.

8.1.1. Design for pleasure

The app fits within the field of positive design, since the goal of the app is to enable the caregiver to provide the client with a more personal care ritual that is adjusted to the needs of the client. However, it does not necessarily contain all pillars of positive design to the same extent. The positive design framework is used to create a more holistic design for happiness.

The function of the different pillars in the design are shown in Figure 27. For all pillars, the main goal is explained for both the caregiver and the client.

Design for pleasure is about addressing happiness by enjoying the moment. This can be achieved by evoking positive feelings or by reducing negative feelings. The design can be a direct source of pleasure, for example by being very intuitive, or facilitate pleasurable activities. The app is used by the caregiver, but should also evoke positive feelings among the client. In this case, the app should facilitate pleasure for both the caregiver as the client and by a direct source of pleasure for the caregiver. This is specifically important since the use of the app should not take too much time and should not take the attention away from the client. When the design does not evoke direct pleasure, the caregiver will not use the app on a regular basis.

8.1.2. Design for personal significance

Happiness is also achieved by sparking a sense of personal meaning. In this case, the focus is not on momentary effect, but on personal goals and aspirations on a longer term. This feeling can also be achieved by reminding the user of past achievement or a progress towards a future goal. For people with dementia, long term goals are more difficult to identify and hold on to. Nevertheless, in the core, the app does help people with dementia to feel significant. By applying knowledge from their past, they are reminded of their lives. Reminiscence sessions help to get the full image of the client and to see the person with dementia of a full person, instead of seeing the dementia alone. For caregivers, the

app helps to provide better care for their clients. Most caregivers are motivated to help the people they are caring for to the highest extend. Currently, they often feel limited due to shortage in time. By providing an intuitive app that helps to apply knowledge about the client, caregivers can be enabled to provide better care, which subsequently improves the feeling of job performance. Eventually, this will help the caregiver to have an increased feeling of personal significance.

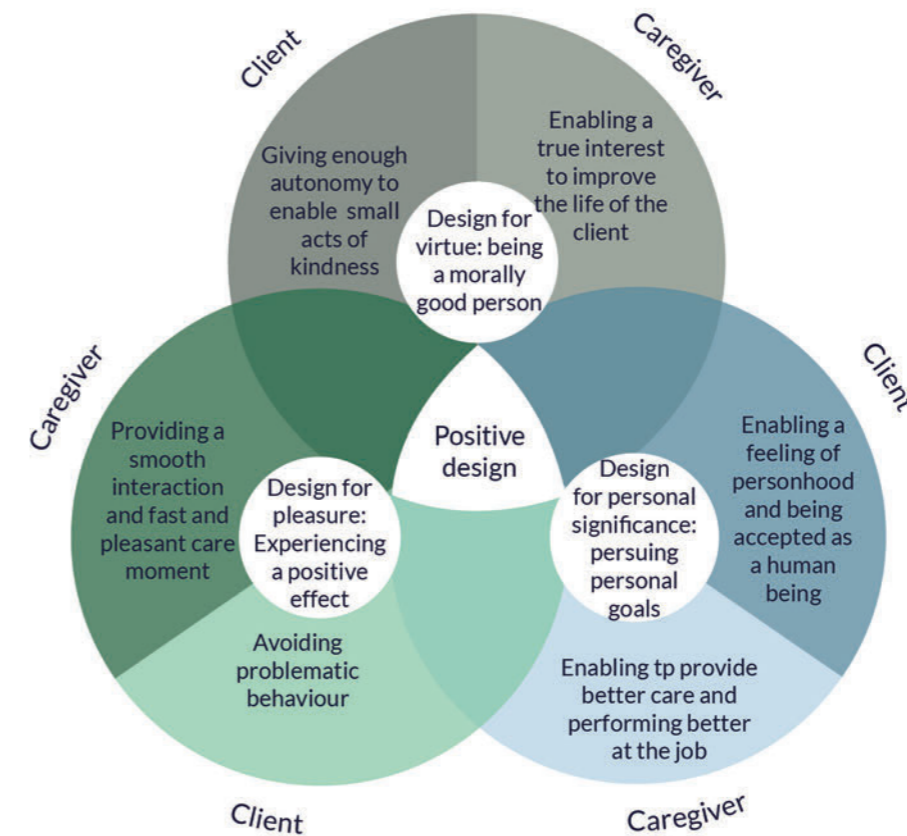


Figure 27: The use of positive design in the app

8.1.3. Design for virtue

The last pillar of design for happiness is the goal of showing virtuous or morally good behaviour. This is independent of what we personally might enjoy or strive for. This is the most complicated pillar in design for happiness to achieve for the app. It may seem that people with dementia do not have the abilities anymore to show virtuous behaviour, because they lose their feeling of inhibition and the skills to think about long term consequences of an action. On the contrary however, people with dementia rely more on their emotions. This helps to intuitively show morally right behaviour (McFadden, Ingram & Baldauf, 2001). For people with dementia, this will not be big gestures with a long-term impact, but small offerings of kindness or help. The app needs to give the autonomy to both the caregiver and the client to show these gestures of virtue. It needs to leave room for curiosity and creativity to enable the client and caregiver to team up and learn how to behave around each other.

8.1.4. Design for happiness card-deck

The design for happiness card deck (Figure 28) is derived from the positive design framework (Delft Institute of Positive Design, 2017). For each of the three pillars, 24 cards are designed that guide to apply positive design. For pleasure, an overview of 24 positive emotions is made. Personal significance is represented by 24 human goals. And for virtue, 24 positive character strengths are collected. An overview of the relevant cards is made and sorted on the moment in the interaction that can be felt and whether it is felt by the caregiver, the client or both. Furthermore, it is sorted on the way it may influence the interaction and whether it is implied that the app is evoking certain emotions or implies certain human goals or character strengths: core value of the user interface (UI), core value of the result of the interaction or added value for the UI or result of the interaction. The overview can be found in Figure 29 on the next page.

The emotions, human goals and character strengths in the core value of the UI or the result of the interaction derive, mostly, from

the core values and legacy of person-centred care. An example is Equity, that represents our desire for equality among people, or physical well-being, which represents our desire to view ourselves as worthy. The emotions and human goals that are listed for the client depend on the state of mind before the use of the app. When someone is feeling agitated before the use of the app, the most preferable emotional state during the use is, for example, relaxation. But, when someone is feeling anxious, the most preferable state will be relaxation.

The manifestations in the added value for the UI or the result of the interaction helped to gain new insights in the User Interface, User Experience and the functions in the app. Most manifestations are new for the caregiver, except for Self-determination and Exploration, which are added for both the caregiver and the client.

The main insights from the use of the design happiness card-deck are explained on page 100. A complete explanation can be found in Appendix 7.



Figure 28: Design for happiness deck. Source: Delft Institute of Positive Design from <http://studiolab.ide.tudelft.nl/diopd/library/tools-methods/design-for-happiness-deck/>

	Before use		During use		After use	
	Caregiver	Client	Caregiver	Client	Caregiver	Client
Core value UI	<small>Emotion</small> Inspiration <small>Human goal</small> Management		<small>Human goal</small> Task creativity		<small>Human goal</small> Management	
Core value Result	<small>Emotion</small> Hope Confidence <small>Character strength</small> Social intelligence	<small>Character strength</small> Honesty	<small>Emotion</small> Sympathy Inspiration Kindness <small>Human goal</small> Equity Resource provision <small>Character strength</small> Social intelligence Teamwork Curiosity Creativity Love of learning Unity	<small>Emotion</small> Surprise Relaxation Joy Enchantment Energetic Fascination <small>Human goal</small> Equity Safety Tranquility Individuality Entertainment <small>Character strength</small> Teamwork Curiosity Honesty Unity	<small>Emotion</small> Admiration Satisfaction Relief Euphoria Pride Surprise <small>Human goal</small> Mastery <small>Character strength</small> Gratitude	<small>Emotion</small> Surprise Pride <small>Human goal</small> Positive self-evaluation Physical wellbeing Individuality <small>Character strength</small> Honesty Gratitude
Added Value UI / Result	<small>Human goal</small> Exploration <small>Character strength</small> Curiosity Love of learning		<small>Emotion</small> Joy <small>Human goal</small> Self-determination Exploration Individuality Resource acquisition Transcendence	<small>Human goal</small> Self-determination Exploration	<small>Emotion</small> Inspiration <small>Human goal</small> Positive self-evaluation Individuality <small>Character strength</small> Honesty	

Figure 29: Overview of the relevant emotions, human goals and character strengths for the application of the app

Before the use

The emotions, human goals and character strengths are mainly about triggering the caregiver to use the app to begin with. This can be achieved by providing the caregiver with new information with every use, even if they already have a good connection with the client. This principle makes use of the character strength of caregivers to have a love of learning and improving the quality of care.

During the use

Once the caregiver opened the app, they should be motivated to apply the information in the app during the care. The different manifestations of pleasure, virtue and personal significance are mostly about the individuality and freedom of choice of the caregiver. The app should provide original tips and tricks, that match the connection between the client and the caregiver. Besides, the app should leave enough freedom for the caregiver to decide to use a specific tool and to be creative to use the method in the way they see fit.

After the use

After the use, the app should motivate enough to use it again. It should help to inspire the caregiver. When a tool or trick is offered for a specific client, but it is not for another, the caregiver could still choose to apply this method of the next client. Furthermore, the use of the app can evoke a positive self-evaluation. When the care works out better, the caregiver can be more satisfied with the performance. At last, the true value of the app is sharing the new insights with other caregivers. The bigger the user group, the more insights will be gathered every day. Caregivers should provide the system with information on the succesrate of certain tools. This requires honesty and a time investment of the caregiver. If this is not possible, facial or voice recognition can be used.

8.2. The initial design

The app will be used by the caregiver to provide better care for the client with dementia. The design should fit both users. The requirements of the client with dementia are specific and based on the type and severity of the dementia and of the past of the person. The needs of the caregiver are less specific, but depend mostly on their familiarity with the specific client and their overall experience as a caregiver for people with dementia.

In the interaction with the application, the main goal should be to provide guidance for the caregiver to apply the knowledge they already have. When they know the client already, this should mainly be shaped by providing tools like music and videos. This can be supplemented by tips and tricks that encourage the caregiver to keep trying new things. This can make the connection between the caregiver and the client stronger and can help to stay passionate about the caregiving job.

For both the client and the caregiver it is important that the output of the app is different every time. This sparks an element of surprise can motivate to keep using the app.

When someone with dementia moves into the nursing home, it is, most commonly, still possible to have a conversation with that person without too much effort. The client still understands almost everything and is in most cases able to answer to the question. When the dementia progresses, this ability will slowly disappear. When this happens, the client will also lose the ability to express what they do not like. By that time, it is important that the caregiver knows the client and knows what to do and what to avoid. This information will be gained and stored beforehand. The role of the app in the care ritual over time is visualised for the main caregiver, for flex workers and for the family in Figure 30.

In the current way of using the app, the biggest effort to implement information in the app is the intake session of the client in the nursing home. Together with the family, the main aspects of the personal history and the current care ritual and habits are discussed and documented. In a special version for the family, the meeting can be prepared by already thinking about all topics that will be discussed. When the client just moved in, the details collected during the intake will be used. This helps to get to know the client and develop a bond between the caregiver and the client. After a while, tricks and tools that were successful with other, similar, clients can be used. After the use, the app will ask for validation whether the trick or tool was successful. This information will be stored and can be used later.

And the name of this app: Blink.

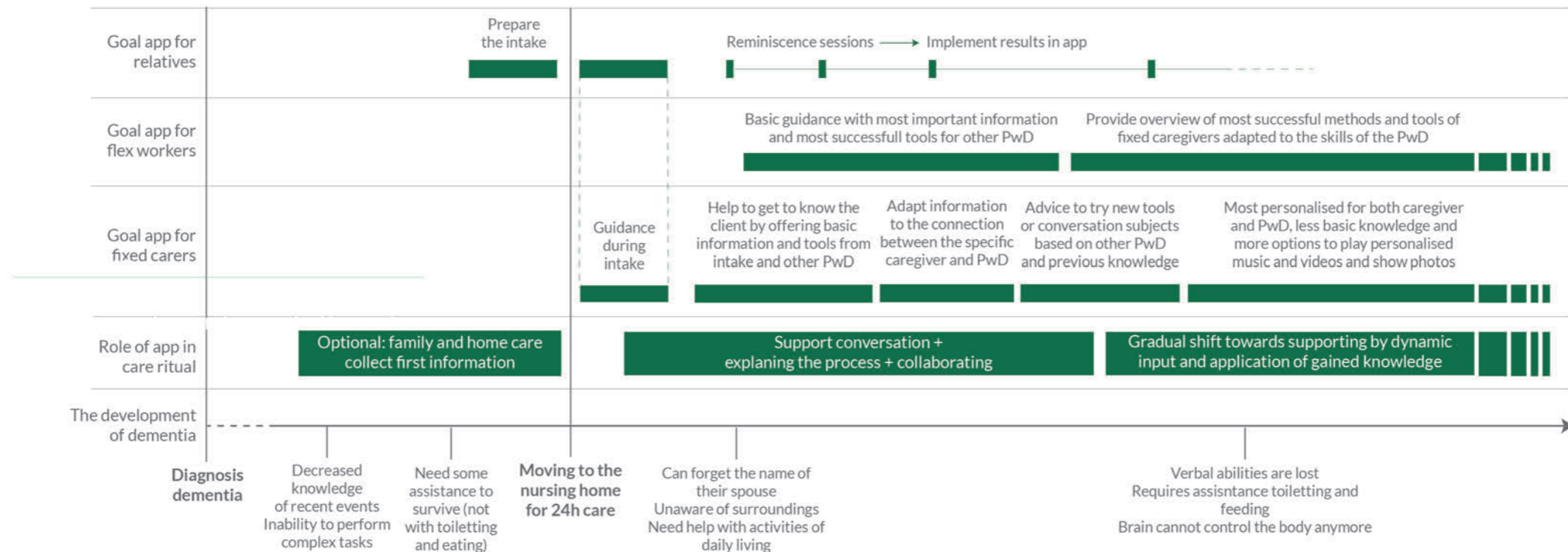


Figure 30: Overview of role of the app in the care ritual over time

8.2.1. Possible tools

The list of possible tools is long and can be split up in categories. The most important ones are explained below.

Providing information

The main function of Blink is providing information about the client. Without this information, the caregiver is not able to provide person-centred care in the first place. This information is about the preferences, history and wants and needs of the client. By providing a clear overview on this information, the caregiver can easily see what the main dos and don'ts are and what conversation topics can be helpful.

Ways to perform the care

The location, order and self-reliance of the client can differ during a specific part of the care ritual. When toothbrushing does not work out in the bathroom, it might work when the client is still in the bed. And when people always put on their shoes and socks while standing next to the door, it might cause confusion when a caregiver asks to put on the shoes on a chair on the other side of the room. Blink can provide an overview on how to perform the care and can challenge a caregiver to try out new things when the client shows problematic behaviour.

Ways to connect and to communicate

When a client moves into the nursing home, he or she commonly is still able to understand conversation and reply in a, sort of, logic way. Gradually, the client will lose this ability. When this happens, the caregiver can find new ways to communicate, for example by using icons, by touching the client or by singing. Blink can provide an overview on which ways to connect and communicate can help to bond more, provide the tools that are necessary to perform this and challenge the caregiver to try new methods of communication when the client shows problematic behaviour.

Music

The application of music during the performance of the care ritual can help to decrease the amount of problematic behaviour of a client with dementia (Clark, Lipe & Bilbrey, 1998). This effect is increased even more with the application of preferred music (Gerdner, 2000). Blink can support caregivers to use this preferred music to help prevent problematic behaviour, without having to find out what the preferred music of a client is. It can help by providing information of which type of music is beneficial during each part of the care ritual. Besides, it can challenge caregivers to try new types of music during the care.

Videos

Videos can provide the caregiver and the client of a break between the different parts of the care routine or, when the content is more abstract, can help during the care. Looking at a video together can help as a distraction or provide the caregiver with a conversation topic. When the video matches the interests of the client, it is more easy to state facts, relate to the events in the video and ask questions about the personal experience of the client in relation to the events in the video. By talking about the video, the caregiver needs less of an imagination. For the client, the video can spark memories. Blink can provide easy access to videos with topic that fit the history of the client to create this moment of distraction and communication that can help to strengthen the bond between the client and the caregiver.

Pictures

Pictures can be a powerful conversation topic as well. By uploading pictures from the client, memories can be sparked. Besides, pictures help to gain trust of the client in the environment and the caregiver. For example, looking at pictures of the old bathroom of the client can help to gain understanding in what is asked from the client. Blink can provide easy access to the pictures of the client. Those can, for example, be uploaded by the family.

8.2.2. Artificial intelligence

The application of Artificial Intelligence is best and most easy way to make Blink flexible to fit the needs of different clients and change over time and adapting the information in Blink to previous successes and experiences of specific caregivers. There are multiple ways in which the system will adapt to the connection between the caregiver and the client, based on the amount of times the caregiver and the client have worked together and the severity of the dementia (Figure 32).

Artificial Intelligence (AI) is the use of computer programs that have some of the qualities of the human mind, such as the ability to understand language, recognize pictures, and learn from experience (Dictionary, n.d.c). AI can take over cognitive tasks of humans. In this case, the AI works in the back-end of Blink and helps to create a personalised experience that changes over time. Besides, it helps to create an experience that is different every time of use, to make sure the interaction with Blink and the experience during the care stays interesting for both the caregiver and the client.



Figure 31: Creating a rich AI experience with the design principle deck

In order to develop a rich AI system, the AI design principle deck is used (Hermes, 2019). In 40 cards, a complete overview of the functions and requirements the back-end of the system of Blink (Figure 31). Some of the design principles have already been thought of, but help to define the design more. Others are new and add richness to the design. The most important insights are summarized below.



Figure 32: Overview of the changes in content over time

Intuitive AI

The AI should use predictive analytics to develop the best overview of activities that fits both the client and the caregiver. This should be presented in a way that fits the caregiver, by prioritizing the most important, or most preferred information. This information is collected by all stakeholders (the caregiver, other caregivers and the family of the client) and should be visualized in a congruent way, to help create a complete output. At last, intuitive AI is achieved by making the interaction with the AI more natural, for example by using natural language processing or voice recognition.

Beneficial AI

For the user, it must feel that the AI is of added value. There are two main ways to achieve this. First of all, the caregiver should feel a personal benefit of using the AI. This can be achieved by providing a feedback screen that allows caregivers to give input on the way the system works for them. Secondly, caregivers must recognize that they are contributing to the complete system and thereby help other caregivers. This can happen by providing feedback about the result of the information that has been added by the caregiver.

Responsive AI

Responsive AI is about the feedback that is provided by the system to the user and vice versa. First of all, the feedback that is provided by the AI should be adapted to the state, mentality and context of the user. By analysing the way the specific user is interacting and finding changes in the interaction over time, more specific tasks and feedback can be provided. Besides, the user should be able to provide feedback on the quality of the provided handles and summary of the overview. At last, the information that is provided by the system should be adapted to the moment the caregiver is using the system. In the morning, clients might have a different care ritual and tiredness can cause the client to need a more 'active feedback system'.

Personal AI

In order to motivate caregivers to use Blink, it is important that the system adapts to the wants and needs of the caregiver. This is the basis of Blink, but there are some important measures that need to be taken. First of all, the system should become increasingly personal. The more the caregivers use Blink for a specific client, the more specific it will get. The more a specific caregiver uses the system, the more the system will adapt to the frequently made choices and preferences. When a caregiver just starts using the system, the system will be less personal and more general. The more feedback the caregiver provides, the more successful advices the system will give.

Explainable AI

At last, it is important that the user understands that what the AI system does, and which information it uses and why. It should explain which information is shared with which stakeholders and what the influence on the choices of caregivers is when giving input to the system. This can be done by a small introduction before the first use and an information button on every screen. In this field, the caregiver can also provide input on the effectiveness of the provided output by the system.

Of course, the system uses the personal information of the client. The different methods and skills that are offered to the caregiver depend on the history and preferences of the client. However, the advice on methods is also dependent on the preferences and knowledge of the caregiver. The reasoning behind this should be extremely clear and explained every time a caregiver gives input to the system.

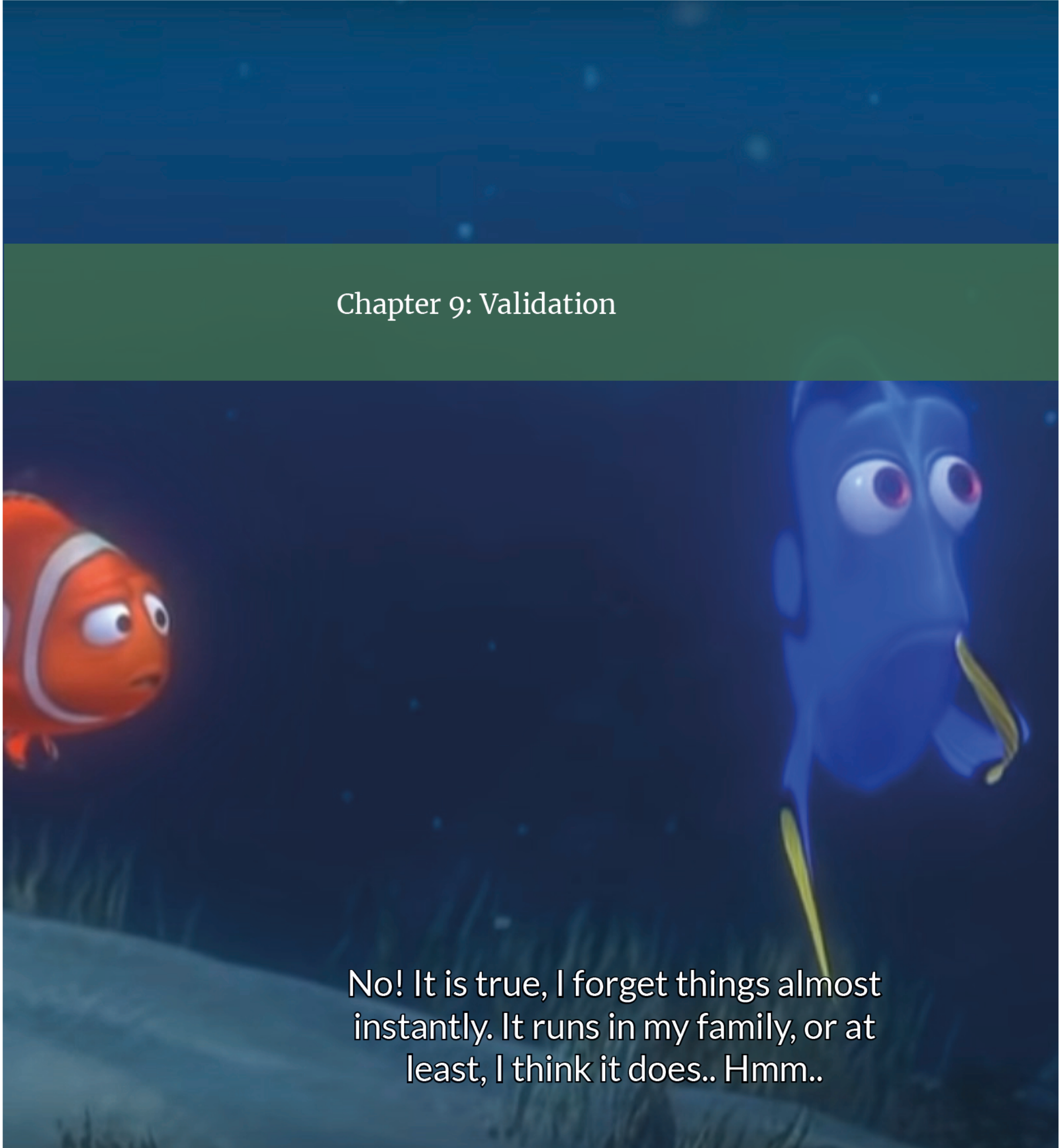
And since the system will deal with personal and medical information, the security of the system is extremely important. By logging in with the user name and password of the nursing home organisation and only enabling Blink to open when it is connected to a specific Wi-Fi network, the safety of the information is ensured.

Chapter 9: Validation

The initial design should be validated to find out about the user acceptance and the perceived usefulness of the different elements of the app. Furthermore, the validation should point out whether it is possible to use the app in the imagined contact moments. Three sessions are conducted. Two semi-structured interviews help to find the requirements organisations and caregivers have to feel Blink benefits the care ritual and in a questionnaire, caregivers are asked to evaluate the perceived usefulness and the perceived ease of use.

For people (or fish) with short term memory loss, validating can be difficult. Source:

Stanton, A. & Unkrich, L. (2003) Finding Nemo. USA: Pixar Animation Studios



No! It is true, I forget things almost instantly. It runs in my family, or at least, I think it does.. Hmm..

9.1. Validation 1: Program manager for innovation at Pieter van Foreest

The first validation session for Blink is conducted with Ad Blom. He is the program manager for innovation at Pieter van Foreest, the biggest care organisation in Delft. He is responsible for testing, trying and implementing innovations in care homes and is an ambassador of Dental Robotics.

Before the meeting with Ad Blom, the screens that are necessary to explain the main function of Blink are developed. This are mainly the screens that are used to guide the intake. The screens can be found in Appendix 8. The goal of the validation session was to find the options and concerns to implement Blink in the nursing home, concerning the use of Blink, the privacy behind it and the implementation of consisting solutions to provide person-centred care. For the validation session a semi-structured interview was used.

In general, Ad Blom was positive about Blink and its functions. He mentioned that Blink will help to make person-centred care a vivid topic in at the nursing home departments. He did believe Blink can help to improve the quality of care. On the other hand, he could not assess the usefulness of Blink for caregivers in their daily work and he suggested to talk to caregivers about the benefit of Blink.

Starting to use Blink

During his job as program manager for innovation at Pieter van Foreest, he experiences a lot of resistance from caregivers. They all have their own way of working and have the feeling that the application of something new will take too much time and take the attention away from the client and the interaction with the client. When they are obligated to try a new innovation, they will always

9.1.1. Results and conclusions

try it next to the current solution. The current solution of Ad is to find ambassadors, or believers, of the need of innovation. Having an ambassador in every team can help to gain enthusiasm among the entire team or find support of managers that have the ability to purchase new innovations.

Blink will have a big impact on the way caregivers work, which means the effort to start using Blink is high as well. In addition, Blink will only work well when enough people are using it. This is a big challenge that needs to be resolved before implementation. In order to use the preferences of the caregiver, it is important to know the preferences. Caregivers will need a good explanation on why they would provide this information in order to fill it in. On the other hand, individualisation for the caregiver can help to increase the satisfaction for Blink. For example, the believers of the need of innovation (the ambassadors) can try more new techniques, while laggards (slow adapters) can use the results of the ambassadors.

Privacy

Privacy is a very important factor. Contact information of relatives is already privacy sensitive information that needs to be stored securely. The basic information like preferences and the favourite music is not privacy sensitive on itself, but when it is connected to the history of a person, it is. An example can be that someone likes to dress up as someone of the other sex. The dressing is no sensitive information, but the reasoning behind it is. Securing Blink with the passport caregivers use to log into the online environment of Pieter van Foreest can help resolve the privacy issues.

Pieter van Foreest has its own app store. This app collection is the only way to download apps on a device that is provided by the organisation. All apps in this store are beneficial for people in the health care sector and meet the privacy requirements of the organisation.

Implementation in the current Electronic Health Record

Much of Blink is already documented in the current Electronic Health Record (EHR). One of the biggest irritations of caregivers is needing to do double work, like filling in the same information in two different places. By connecting Blink to the EHR or the EHR to Blink, this can be avoided. Ad mentioned the visual overview of Blink can help caregivers to update the information in the care plan sooner.

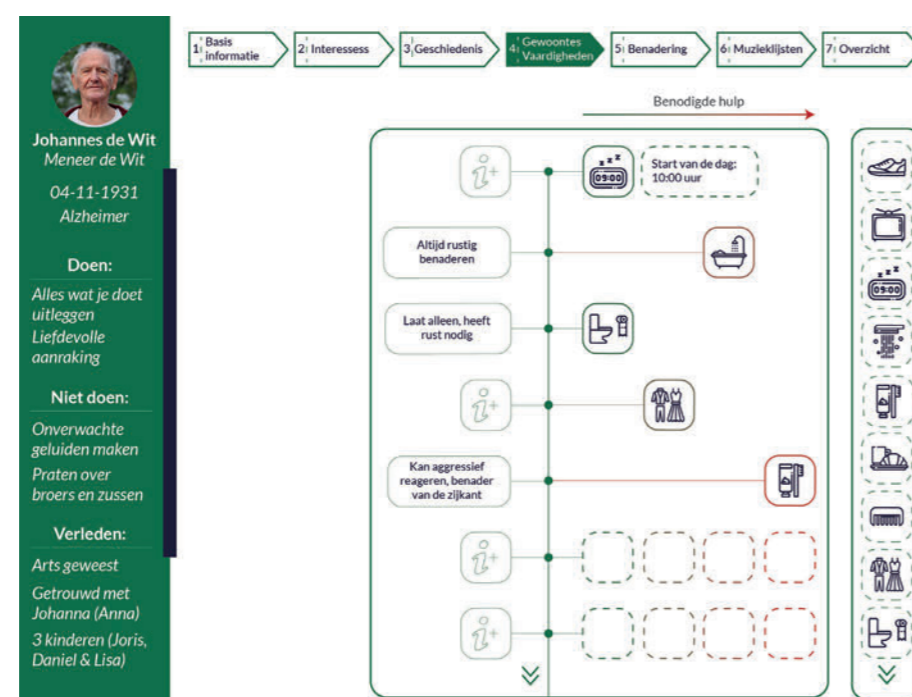


Figure 33: Part of the app that helps the caregiver to set up a personalised care ritual

The care ritual

Ad saw the most potential in the overview and the adaptability of the care ritual (Figure 33). This is currently already implemented in the EHR. However, this lacks overview and is not adaptable. Caregivers have the feeling a change in the care ritual in the EHR is too fixed and will not change anything until they are a 100 percent sure. Due to this, the plan is not up to date. Furthermore, most caregivers do not read the plan before performing care, because the plan is too extensive.

In addition to the use during the care, he mentioned that the care ritual could be useful during the multidisciplinary consultation with everyone involved in the care for people with dementia. By tracking what changed since the last meeting, the caregivers can stay motivated to

The next step

The most relevant functions that help to make this the main system to track the preferences of a client are the easy adaptability of the care ritual and the clear overview. He suggested to give information on who changed something, the option to add extra information and the possibility to change information without it immediately fixed. Besides, he mentioned that it can be beneficial to have a clear overview of 'dos and don'ts' to make sure Blink is also useful for caregivers that want to use Blink extensively. As a next step, the part of Blink that gives an overview of the care ritual needs to be developed further. This should have an option to change the level of needed help and give the option to add information about the motivation for changing the level of needed help.

9.2. Validation 2: Team manager Zorgboerderij Buitengewoon

The second validation session for Blink is conducted with Wilma Valkenburg. She is the team leader and manager of experience oriented care at Zorgboerderij Buitengewoon. This is a care farm close to Delft, that is part of Pieter van Foreest. The graduation student has conducted over 20 tests at this location over the course of a year.

Before the meeting with Wilma, the screens were developed further. These can be found in Appendix 9. The feedback of Ad Blom is taken into account in the changes that are made. The focus of the conversation is on the way Blink is used during the care ritual. Zorgboerderij Buitengewoon is already very experience-oriented and has the person-centred approach as a standard. However, in the ideal case, Blink is still of added value for the caregivers that already know the client very well and are trained to take the wishes and rituals of the client into account.

In general, Wilma could see the added benefit of Blink. However, for the care farm, she had the feeling it did not add enough. The employees of Zorgboerderij Buitengewoon already have a very person-centred approach during the care and the care plans of all clients kept up to date. For the employees at this location, Blink would be something extra, that is not really necessary. It can only be of added value when this becomes the main system.

She did mention that the content was very extensive and complete. Everything that is discussed during an intake session was implemented in the app (Figure 34). In addition, nothing was superfluous.

9.2.1. Results and conclusions

Implementing intention

The history of a client is important. This determines the way someone is working, the things someone likes and the things someone is scared of. What is even more important however, is the intention behind the history. The fact that someone did something, moved somewhere or worked somewhere, does not mean they intended on doing so. For example, long ago, it was almost as by definition that the oldest son took over the company of the family. In this case, the client might have lived his entire life as a company owner, while he or she actually wanted to go to university and become a doctor. This might only come to the surface when the dementia is developing further. During the intake, this should be taken into account.

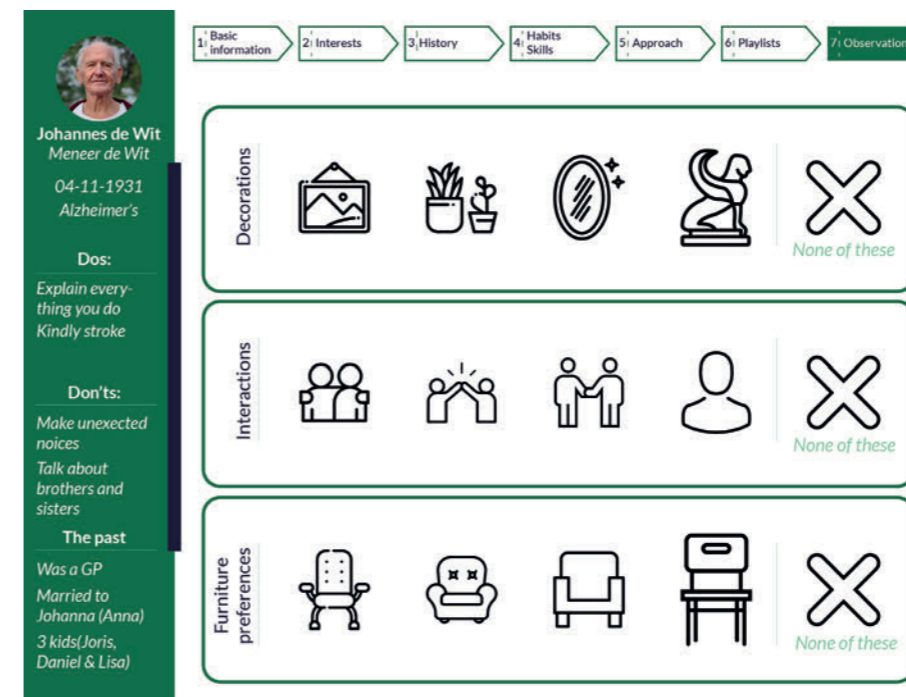


Figure 34: The screen that shows the overview of all functions used during the intake

The intake

Blink is complete and everything that is in Blink is also in the current care plan. Zorgboerderij Buitengewoon as an exceptional intake procedure. Employees of the organisation visit the prospective client and their informal caregivers in the home environment. This way, the client and their relatives are more at ease. Besides, it allows the employees to observe. They pay attention to the smallest details in order to make the adjustment to the new situation at the care farm as small as possible. At different, more common houses however, the employees just receive an email telling them a new client will arrive in two days. The employees then have to find out everything about the client during the first weeks. For these locations, an app like Blink is more beneficial.

Asking for feedback from the family

The family should be involved during the entire process. This can, for example, be done by having the family check the care plan as set up during the intake. During this check, the focus should be on recognizability and completeness of the content. When this is good, any further feedback should not be necessary.

Home care organisations

Wilma saw the most added benefit for home care organisations. The care system recently changed and due to that, people stay at home longer. Informal caregivers are often assisted by home care organisations, but they send different people every time. This prevents the care professionals from getting to know their client.

Since the system changed so recently (in 2015) the home care professionals are not use to working with people with moderately severe dementia yet. They do not get into the wants and needs of this group yet. The combination of the changing faces, that do normally not apply person-centred care to the right extend, helps to believe that Blink can be off major added value for clients and employees of home care organisation. This also helps to overcome the privacy boundaries as well.

Flexibility

The wants and needs of every organisation might be different and it would add value to have the option to personalise the content of Blink. This can be set up as a starting point before a department or care home starts using Blink. Over time, the content can be adapted by the use of AI.

9.3. Validation 3: Questionnaire with caregivers

Over the course of the graduation project, many professional caregivers participated in interviews, questionnaires and user tests. These participants are emailed to ask for feedback. A total of 35 caregivers is reached. 13 of them applied to the email and completed the questionnaire. This does not result in

For the questionnaire, the same screens are used as for the validation session with Wilma Valkenburg (Appendix 9). For the validation, the Perceived Usefulness and Ease of Use questions of Davis (1989) are used. Both the perceived usefulness and the ease of use are hypothesised as determinants for user acceptance, for both current as self-predicted future use. For both cases the perceived usefulness is noted as most significant.

The questions and results of the closed questions of the questionnaire can be found in Appendix 10. The most important insights are presented below.

Overall, caregivers are positive about the perceived usefulness and ease of use (Figure 35). The average perceived usefulness is higher than the average perceived ease of use. Overall, caregivers are willing to use Blink in their job (Figure 36). Almost half of

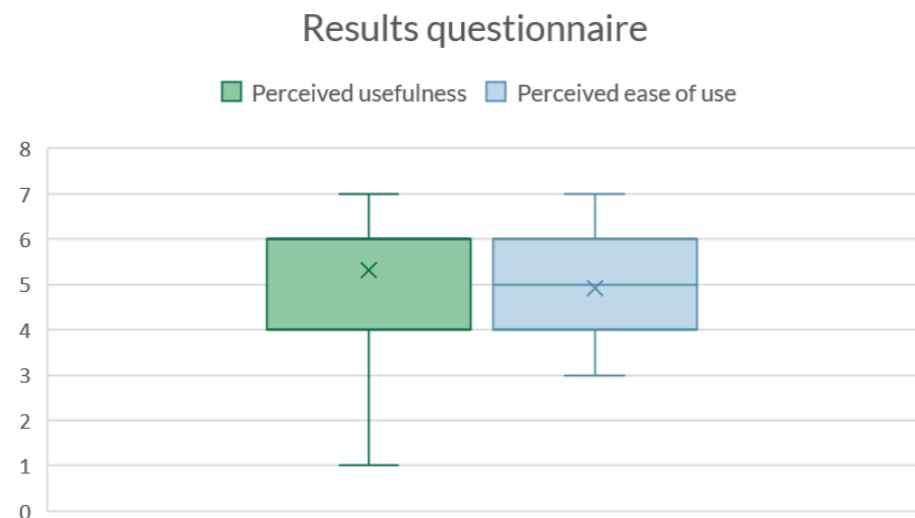


Figure 35: The overall acceptance of Blink is positive, only outliers were negative about the app

9.2.2. Acceptance

the participants is not sure about the use of the app. They almost all mentioned that the app is not complete enough to have a valid judgement. The only participant that said not wanting to use the app had major concerns about the privacy and the overlap with the care plan.

Would you use the app?

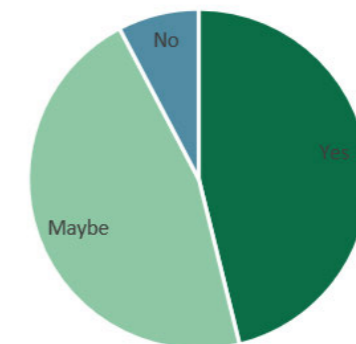


Figure 36: Almost half of the participants say they would like to use the app, the same amount says they are not sure

Even though the perceived usefulness and expected easy of use is positive, the participating caregivers had some concerns about Blink. The main concerns are listed below.

Overlap with the care plan

The app has everything the existing care plan also has. This brings concerns about the double work this leads to. This is something caregivers try to avoid. Of all double tasks at least on is avoidable. This takes time, which results in less valuable time with the client.

Besides, some of the participants are wondering how much time it will take to keep the system up to date. Both concerns are justly. They are however, already refuted.

By implementing the information from the current care plan in the system and updating the current care system automatically when changes are made in Blink, this pains are avoided.

9.3.1. Concerns

Privacy

Since the information in Blink is currently collected in the care plan and is sensitive to privacy, this evokes some concerns. However, by securing Blink with the credentials of the care home, and preventing the app to work on another network than the secured network of the care home, this can be avoided.

Incomplete information

Many of the caregivers have the feeling they cannot determine the ease of use, due to the lack of screens. This can be the result of two things. Firstly, the use cues in the screen might not be clear enough. This can be solved by having a professional User Interface (UI) designer look at it. The second reason can it is hard for the participating caregivers to imagine the use of Blink during the care ritual. This should be tested by developing Blink a bit further and having caregivers try it during the actual care. The same questionnaire can be used to evaluate the perceived usefulness and the ease of use to determine the overall user acceptance.

Besides the perceived usefulness and ease of use, the participating caregivers were asked about the different functionalities in the app. They were asked if they missed any, and if there were functionalities that are not relevant in their opinion.

To be added

Most participants felt the app was complete (enough). A few recommendations came up:

First, add a function that enables informal caregivers to add information. This was already intended. Second, add information on how to perform difficult tasks in general (e.g. how to perform oral care), instead of only having the client specific information. This is a valuable addition to the app. On the other hand, it might take away the autonomy of the caregiver. If all is well, they have learned to complete the care ritual in their education. It should be up to the caregiver to choose whether this is in the overview or not. Third, add a function to fill in and look at the history of the vital values (e.g. temperature, weight, heart rate). This makes the information in Blink more complete, but is not related to the application of person-centred care. This should be implemented after consultation with the care home organisation.

To be removed

None of the participants mentioned that Blink had too many functionalities.

It became clear that caregivers see added value in the app and that they generally believe that it can be of benefit during their work. They are especially positive about the way it would make their work more effective and easier to complete. This has, for now validated Blink sufficiently.

9.3.3. Extra functionalities

9.3.2. The next step

9.4. Improving the design

The main idea behind the design is validated. The caregivers that participated in the questionnaire and the participants of the interview saw the benefit of the use of Blink during the care and using it as a guidance during the intake. However, there are some limitations to the way the design was validated.

The design was validated in three sessions. The first two sessions were qualitative, the third one was more quantitative. For this session however, the amount of participants was not high enough to deliver significant results. The input gained from this session can only be used as an inspiration. In addition, the caregivers that voluntarily participated in the questionnaire. This may have caused the participants to not be representative for the final user group, since these people have an interest for innovation.

For all sessions, the design is not validated in context and the app is not completed. The validation sessions thereby only serve as a guidance on the general idea behind the design, the different functionalities of the design and the moments and ways the app is used.

For further validation, a more complete version of the app, that is personalised to the wishes of a caregiver and that truly fits the connection between the client and the caregiver, should be tested during the care ritual and the intake session.

Nevertheless, the insights help to create a more elaborate design.

9.4.1. Limitations

From the three sessions, a two main concerns can be found, that should be resolved before the design is developed further.

Privacy related concerns

The data in Blink is sensitive to privacy. It will contain the data from This is the reason for doubts for almost all participants of the validation sessions. This can be solved by taking the following actions:

- The app should secured with a login. For example, caregivers can use their personalised login credentials to log in to Blink.
- All data should be stored on a secured server, instead of in the app. As a result, the app cannot be used without internet.
- As an addition, Blink can be set up to only connect to the network in the care home using network device authorisation. However, Nedap ONS, the current system Pieter van Foreest uses for the care plan, can be used via an app from home (Nedap, n.d.a).
- Blink can be distributed by Dental Robotics or the care home organisation, without adding it to an app store available to the public. Pieter van Foreest already makes use of an app store developed especially for the organisation. It is not possible to download from another location on the devices provided by the organisation

9.4.2. Main insights

Time related concerns

The time pressure for caregivers is high. This is one of the main reasons for not applying person-centred care in the first place. This concerns are expressed in the following ways:

We already have a system, this will mean double work

The data from the current care plan that is used by care home organisations should be imported on the app, and vice versa the data that is collected in the app should be synchronised with the data in the current plan.

It will take a lot of time to learn how to handle this system

This is the biggest hurdle for Blink. In general, caregivers have a low level of adaptation for new innovations. They see the potential problems an innovation far before they see the potential benefit. This will keep them from fully adapting the innovation. Two main solution directions can be determined.

In the first scenario, the care organisation can decide to immediately switch completely from the old care plan to Blink. This will force the caregivers to apply Blink whatsoever. As easy as this may sound, it is not a realistic and preferable solution. Most probable, care organisations will slowly implement Blink in the organisation and use it next to the current care plan. In this phase of the implementation, the synchronisation with the care plan is the most important. This scenario forces to adapt to the system on the job, resolving any problems during the use of the app.

The second scenario is more realistic and thereby more desirable. In this scenario, the app is developed in a way that makes it the most easy and pleasurable to use for the caregiver as possible. First of all, this means that the flows in the app should be simple and intuitive and that the most important information is presented in the most prominent place on the screen. Secondly, this means that it does not cost any effort to start using Blink. And lastly, this

means that caregivers are enthusiastic about Blink, and keep using it. Most preferably, the use of the app should turn into a habit. For the first solution, an experienced User Interface designer can be hired. He or she can develop an app that fits the wants and needs of the caregiver and test this properly.

The second aspect is the most important and most difficult to apply. Everyone is stuck in their own routines and since Blink is replacing a routine that is a prominent part of the current way of working, it will be difficult to achieve this. When this is executed well, the third step of the adaptation will follow automatically.

Achieving this asks for several measures.

NFC chips

Near Field Communication chips (NFC chips) can detect and then enable technology in close proximity to communicate without the need for an internet connection (Faulkner, 2017). Stickers with NFC tags are easily obtainable and are available for around €0,15, consumer price (AliExpress search: nfc sticker, 2019). These NFC stickers can be placed around the nursing home in the team room and on specific locations in the rooms of the clients. Once logged in, the caregiver can easily navigate between the different screens in Blink by tapping a NFC chip. For example, when the caregiver is in the bathroom, tapping the chip will redirect the app to the information screen of the toothbrush ritual. As preferred, tapping the chip can also help to start playing music or a video, without any effort.

Besides the easy navigation, the chips can also be used as a reminder for the caregiver. Seeing a chip during the care ritual, can be a trigger to use the app.

Design for habit forming products

In Hooked, Eyal & Hoover (2014) describe a method to design habit forming products. In a four-step approach, the designer is challenged to design a product that nudges a consumer to use a product. The approach helps designers to build product that help people doing what they always already wanted to do, but for the lack of the solution did not do before. This fits within the vision of Blink, that wants to enable caregivers to work via a person-centred approach.

The four step approach starts with creating by creating a trigger, that motivates people to perform an action. When this action is taken, the product should provide the user with a variable reward and at last, to make sure people keep using the product, it should make sure people make an investment in the product.

For Blink, the first two steps are the most difficult to achieve. The AI in the back-end of the system takes care of the variable reward, and the investment. The application of the Hooked method can be found in Figure 37.

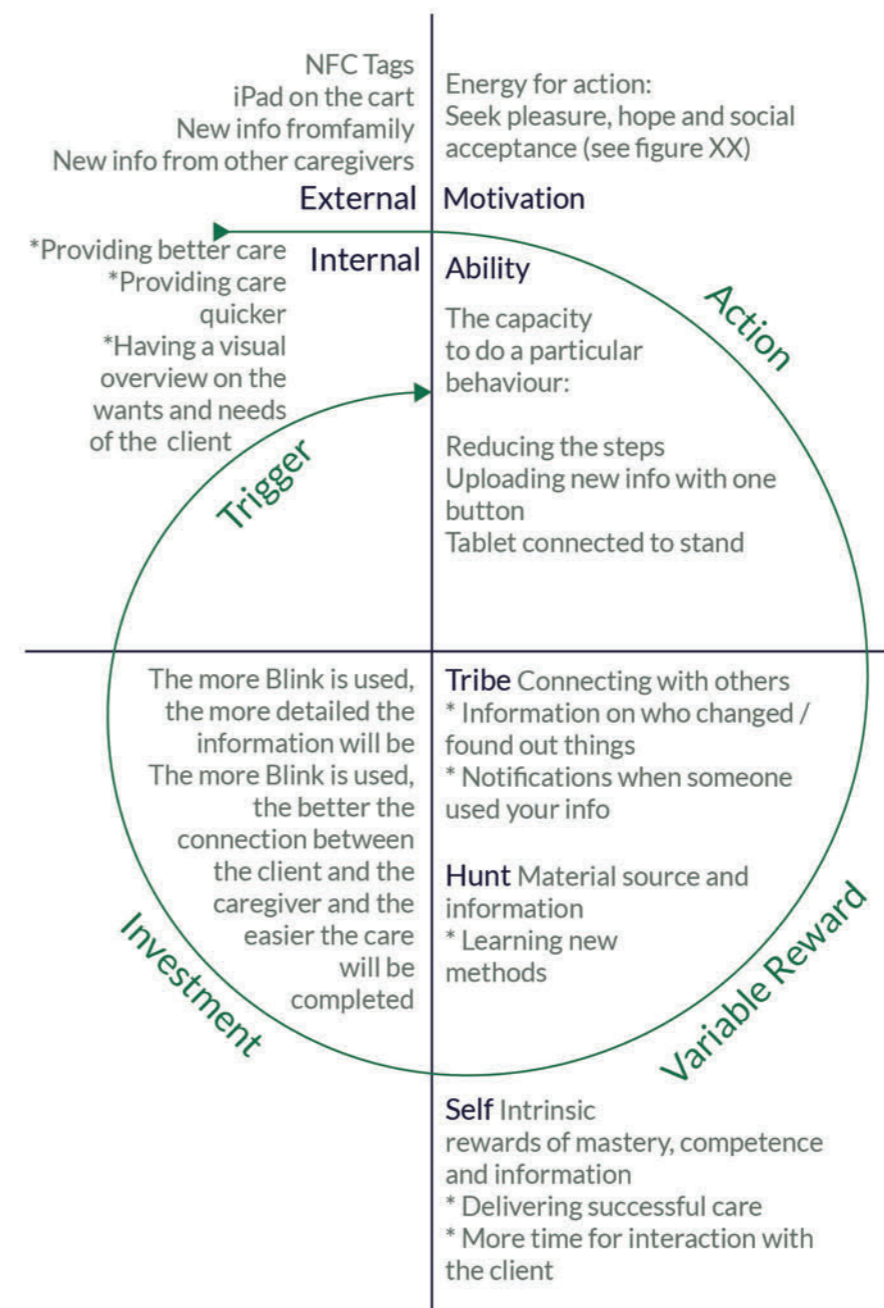


Figure 37: Implementation of the Hooked model

9.4.3. Scenarios

The goal is to make Blink beneficial for both organisations that already have a person-centric approach and organisations that do not have this person-centric approach at all. Two possible scenarios are developed, that explain the intended value of Blink for these organisations (Figure 38).

In scenario 1, the way Blink is involved in the care ritual at an organisation with a person-centric approach is described. In this scenario, the app is used during the intake session, that takes place at the house of the prospective client (Figure 39 and Figure 40).

The informal caregivers of the client have already prepared the intake by using the app over the past few months. The information is already almost complete and the caregivers of the nursing home can spend all the time on observing and discussing the details of the care plan. The moment the client moves in to the nursing home, all necessary information is there. Blink helps caregivers to provide the needed care, by updating the needs of the client as the dementia progresses. The advised tools and methods can be specific. Due to this, the caregiver will keep learning about the client, but the gain in knowledge does not progress as fast.

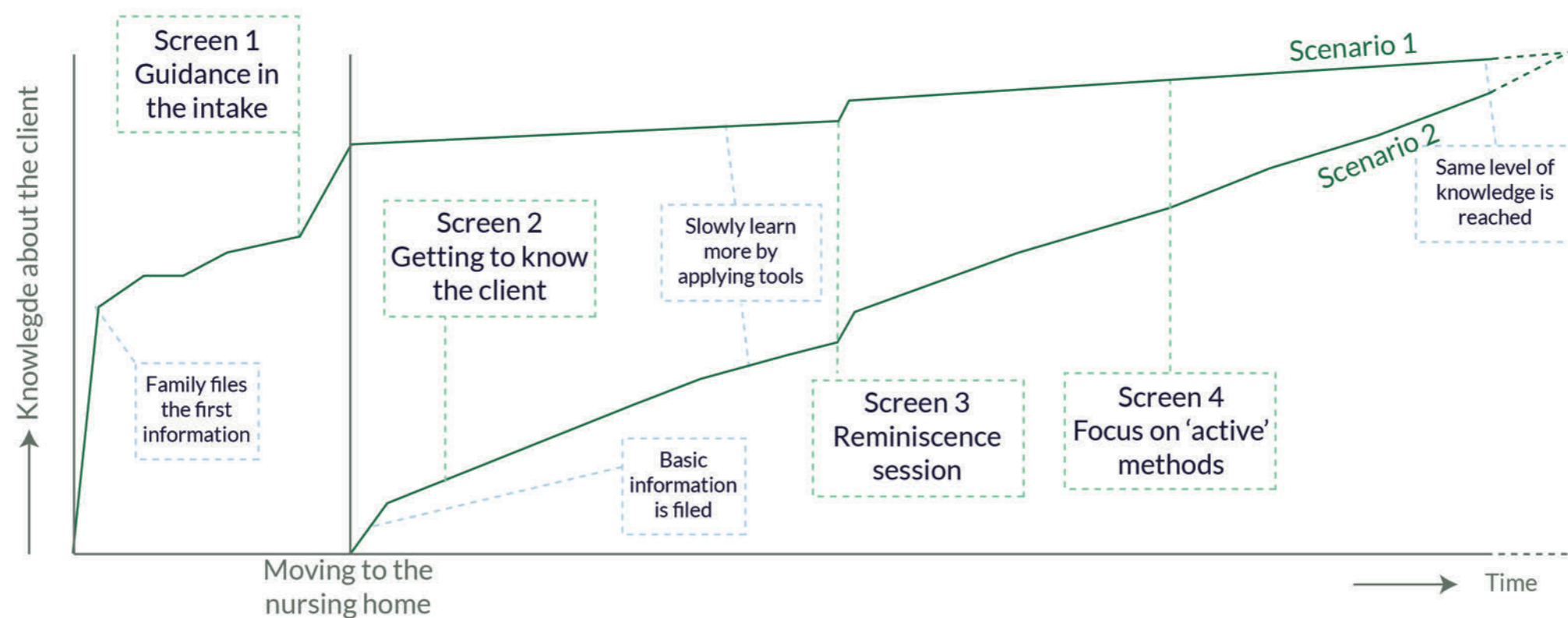



Figure 38: The gain of knowledge about the client for scenario 1 and 2

Figure 39: Screen 1.1: The intake in scenario 1. The caregiver is challenged to pick the icon that fits the most to the observed situations



Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Dos:
Explain everything you do
Kindly stroke

Don'ts:
Make unexpected noises
Talk about brothers and sisters

The past
Was a GP
Married to Johanna (Anna)
3 kids (Joris, Daniel & Lisa)

1. Basic information

2. Interests

3. History





4. Habits Skills

5. Approach

6. Playlists






7. Observations

Decorations

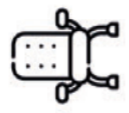


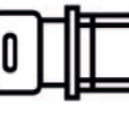

None of these

Interactions


None of these

Furniture preferences

None of these

135



Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Dos:
Explain everything you do
Kindly stroke

Don'ts:
Make unexpected noises
Talk about brothers and sisters

The past
Was a GP
Married to Johanna (Anna)
3 kids (Joris, Daniel & Lisa)

1. Basic information

2. Interests

3. History





4. Habits Skills

5. Approach

6. Playlists






7. Observations

Decorations

None of these


Interactions

None of these

Furniture preferences

You chose:



Add something?


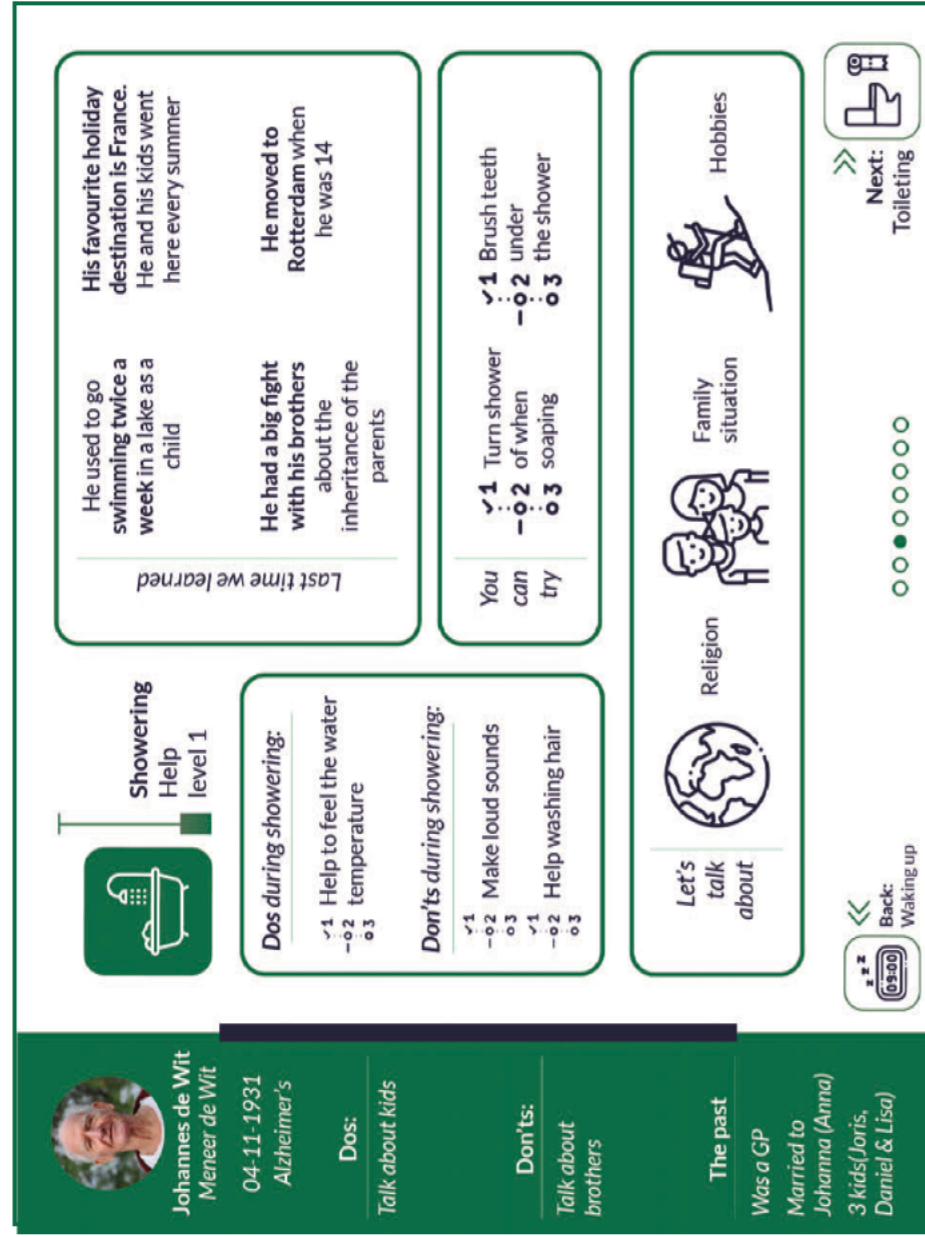


Figure 40: Screen 1.2: After selecting the most representative icon, the caregiver is asked to confirm and add information. This can also be done later. A small reminder is sufficient

Figure 41: Screen 2.1: Blink in the first weeks in scenario 2. Caregivers are encouraged by providing topics and basic tools for better care



In scenario 2 (Figure 38), the caregivers in the nursing home receive an email about the arrival of the prospective client. These caregivers do not know anything the client moves in and only the essential information regarding the care, like the medicine intake and the medical information, is filed. All information about the preferences regarding the care and the history of the client is missing. Since this is the standard, the caregivers are not used to

providing person-centred care at all. The effort is simply too high for benefits they get in return. In this scenario, Blink helps to get to know the client, without putting in extra effort (Figure 41 and Figure 42). It provides conversation topics and basic tools that help to get a basic understanding of the wants and needs of the client. This way, caregivers can learn fast and create a connection with the client.

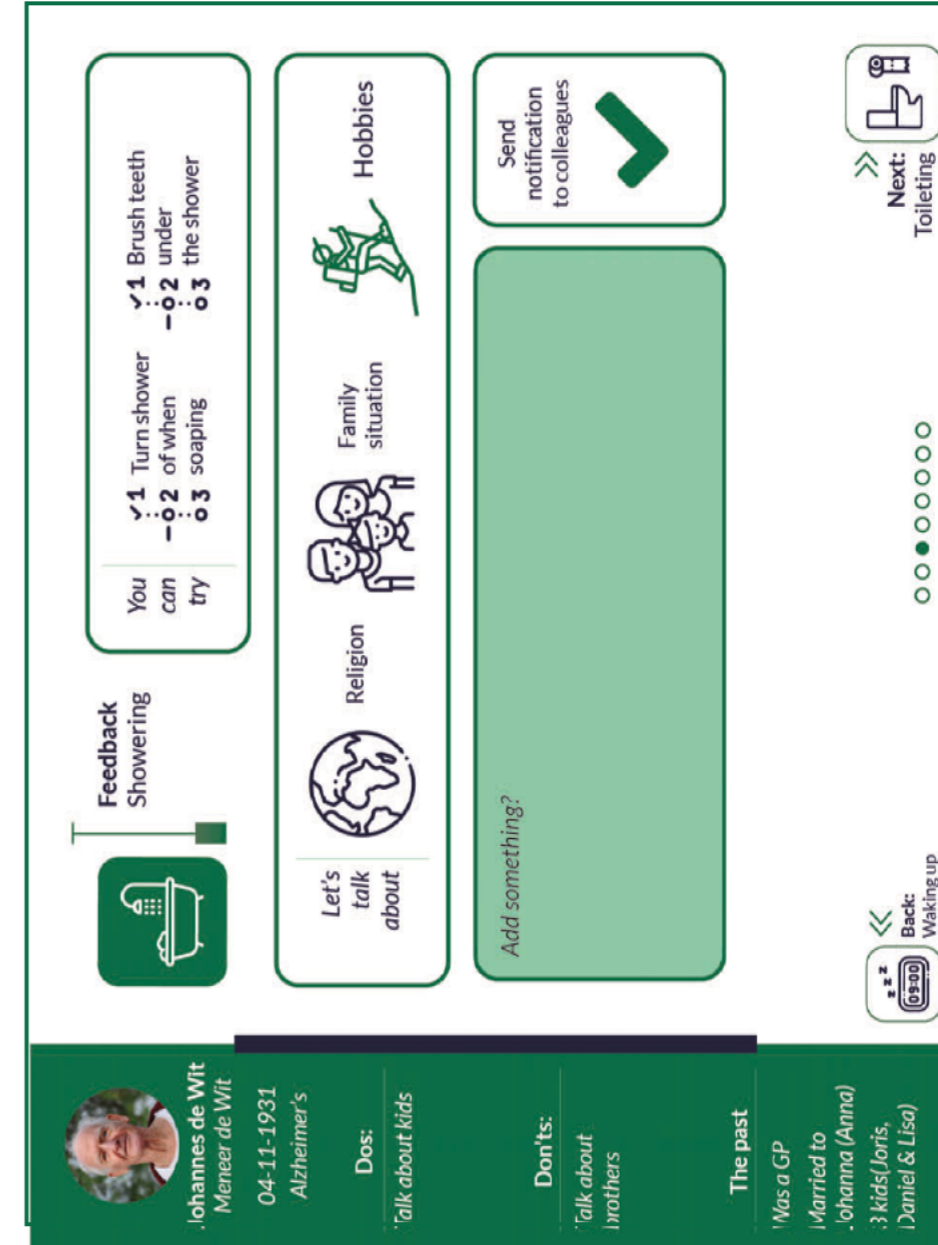


Figure 42: Screen 2.2: The caregiver is asked to provide feedback on the need information. When something important came up, the caregiver can send a notification to colleagues

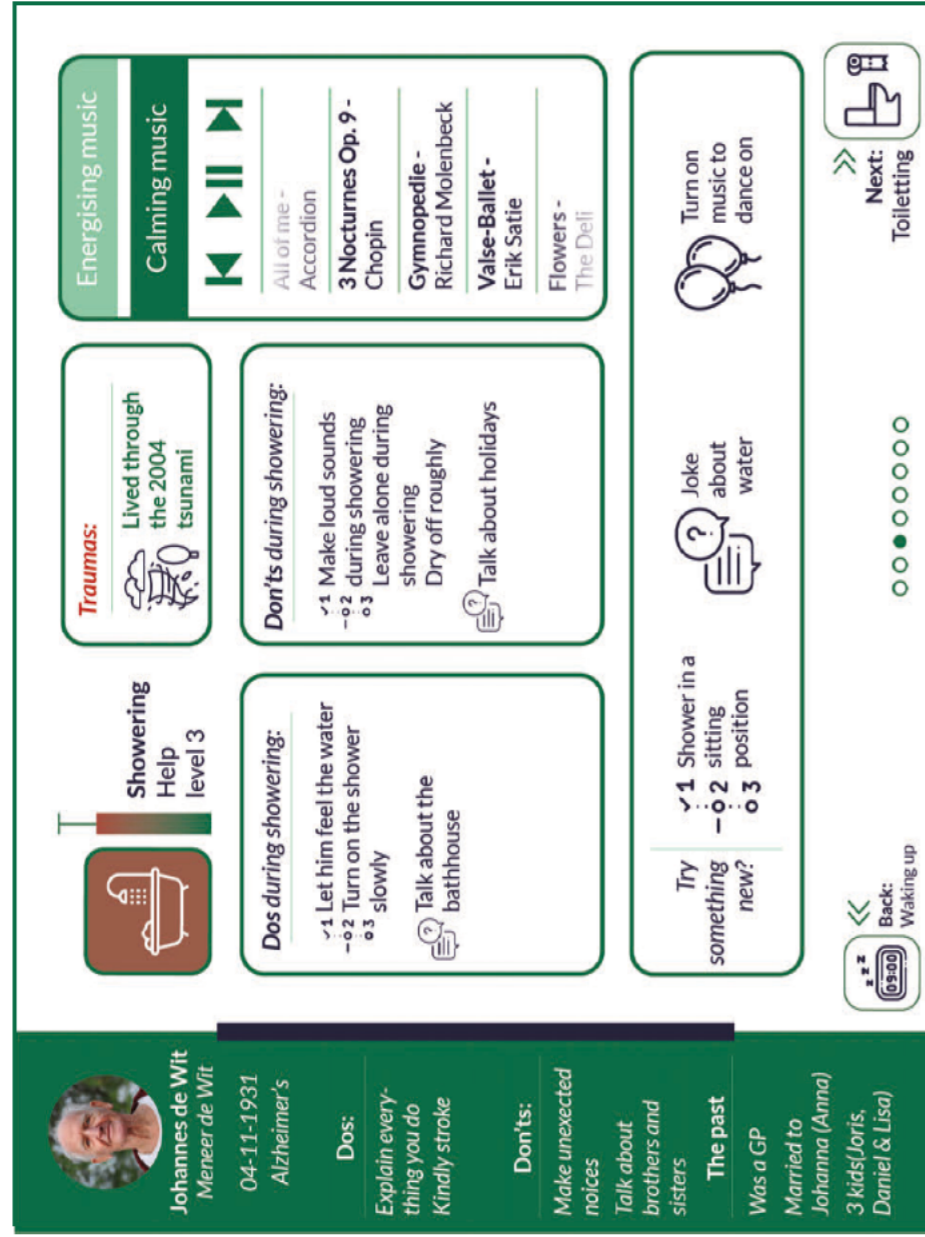
and relatives can use Blink to organise a reminiscence session. It guides the family member or the caregiver through pictures of the past, explains how to approach the client during the reminiscence session and save the gained information to use during the care (Figure 43 and Figure 44). The way the family or caregiver is

Figure 43: Screen 3.1: A reminiscence session, when someone just moved in the nursing home. The focus is on talking, the tips on how to have a good conversation

guided will depend on the development of the dementia. When a session is organised when someone just moved in, the session will be focused on having a conversation, while the session will be mainly focused on recognition when the client has moved to the nursing home longer ago.

Figure 44: Screen 3.2 A reminiscence session when the client can talk less. The focus is on observing and listening, instead of talking

Figure 45: Screen 4.1: Blink after a few months, the dos and don'ts are still in the main screen, it has options to try new methods and to turn on music



For both scenarios the intended end state is one where the caregiver has a rich overview of the background information of the client, that helps to provide person-centred care in the most literal form (Figure 45 and Figure 46).

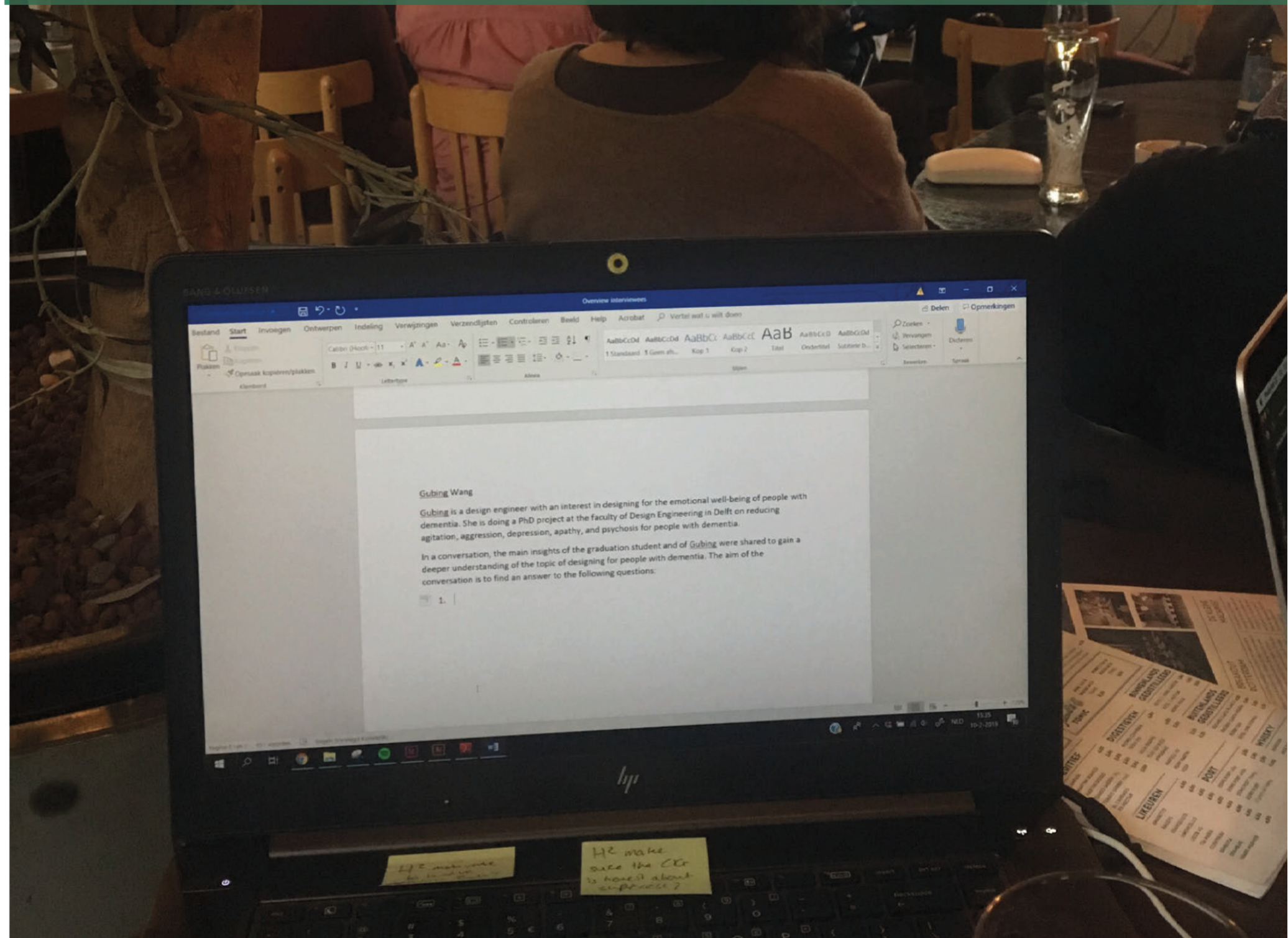


Figure 46: Screen 4.2: The focus on active methods to provide person-centred care. The caregiver now knows the client, and the main dos and don'ts are not the priority anymore.



Chapter 10: Rounding up

In this chapter, the design is evaluated, by looking at the initial design goal and design requirements. Next, recommendations for further development are described. At last, the a personal reflection of the design process and the end result is described.



A different workplace can help to gain new inspiration. Especially when this different workplace is at a Jazz concert

10.1. Evaluation of the end result

10.1.1. Design goal

All the way at the beginning of the graduation project, the design goal was determined (Chapter 1.1). After the analysis phase, the design requirements were composed (Chapter 6). The end result is evaluated to find potential flaws and recommendations for further development.

The design goal is as follows:

Increase the acceptance of the Dental Robotics toothbrush among people with dementia and their caregivers, by creating a more pleasant experience for both.

Blink enables caregivers to apply person-centred care (Figure 47). This, and the addition of the application of preferred music, has been proven to be a successful method to prevent and avoid problematic behaviour. A part of this approach is the application of experience oriented care giving. In the validation, has become apparent that the Blink is supporting this experience oriented care giving.

So in theory, Blink supports the caregiver in providing experience oriented and person-centred care. This will help to reduce the amount of times the client will show problematic behaviour. As a result a more pleasant experience during the care is created. When this is achieved, the overall care experience will be improved. Since tooth brushing is a (a complicated) part of the care giving ritual, the experience during this part of the care will also be more pleasant. This will lead to a higher acceptance of the toothbrush.

The effectiveness in during the care ritual is not tested, yet. In order to prove this, Blink should be developed further. At least, caregivers should be able to look into the basic information and apply some tools to perform better care. This is the first step of the further research.

The Dental Robotics approach

Dental Robotics will develop, support and distribute the app. For the company, the main priority is the acceptance of the toothbrush among people with dementia. When the complete care ritual can be completed faster and the interaction between the caregiver and the client is more pleasant, but the acceptance of the toothbrush did not increase, there is no purpose in the app for Dental Robotics.

As explained above, the tooth brushing is a complicated part of the care. This, combined with the focus of Dental Robotics on tooth brushing, the main focus of the app should also go to this aspect of the care. By saving all the extensive methods, that have a guaranteed success for a specific client, for the tooth brushing, the success of this part of the care can be ensured.



Figure 47: Fulfilling the design goal

10.1.2. Design requirements

Time saving

Saving time is the main priority of Dental Robotics. This is also the biggest concern of caregivers and care home organisations. Caregivers experience a huge time pressure and for care home organisations, time is money.

The amount of time that Blink saves depends on the way it is applied (Figure 48). By applying some of the tools in the app, including watching a video, more time is needed to complete the care than the care would take without Blink. These solutions might only be used as a last resort, or when the rest of the care is performed fast. The strength of Blink is the freedom caregivers have to apply the method they see most fit for the specific care moment. When caregivers are short on time, they can decide to only use tools that can be used during the original care moment and when they have a bit more of a quiet moment, they can try new methods, even if that takes a bit more time.

Even deploying a method that can be used during the original care, might take extra time. The app needs to be controlled, the caregiver needs to log in and needs to carry the tablet around. However, the goal of Blink is to prevent problematic behaviour. This behaviour can prevent a caregiver from delivering the care in

the shortest time possible. In some cases, several tries are needed to complete the care, or the caregiver needs to take time to calm the client.

Flexibility

By applying the AI in the back-end of the system, Blink is as flexible as it can be. The flexibility is the main selling point of the app.

Caregivers have learned from experience which actions are necessary to provide good care and are able to recognize the different kinds of problematic behaviour. Blink should not aim to take over this task but support the caregiver to determine the kind of actions that are necessary. By providing the caregiver with an overview of the most common reasons for problematic behaviour and possible ways to solve this behaviour, they can provide the best care quicker.

The AI helps to adapt the situation to specific needs of the client. After an initial setup, Blink can provide tools and advice for the caregiver for the specific needs of each client and adapt these needs as the dementia progresses.

Not only every client is different, every caregiver is also different. As mentioned above, caregivers know which actions are necessary to provide good care. Every caregiver has their own set of tools that they have internalised. The AI in Blink can match the content to the specific set of tools of each caregiver, by learning from the choices a caregiver makes. Still, the preferences and needs of the client are the most important and if the standard toolkit of the caregiver does not match this, the preferences of the client are prioritised. In these moments, the curiosity of the caregiver must be sparked by providing new, out-of-the-box approaches that he or she has not used before.



Figure 48: The way Blink saves time

Connection between the client and the caregiver

During the analysis phase, it became apparent that the connection between the caregiver and the client is vital for the mood of the client. The client is sensitive to the mindset of the caregiver and the first impression can determine the success of the entire care ritual that follows that first impression. Blink provides the caregiver with a quick insight of the main dos and don'ts in the approach towards the clients to make sure the caregiver has a lower chance of setting the wrong tone.

Autonomy

Currently, Blink is not supporting the autonomy of the client enough. It does provide an overview of the amount of help a client requires with every part of the care and the recommendations of Blink can be more about working together when the client is still (fairly) independent for a specific task. However, it does not support the caregiver enough in supporting this autonomy. For some caregivers, giving as much autonomy as possible might be the standard approach for the care, but for others Blink should nudge them into this approach.

Confidence of caregiver

Since the client is sensitive to the vibe of the caregiver, the confidence of the caregiver about the use of the automatic toothbrush is vital to the use of the toothbrush. When the caregiver is hesitant to use the toothbrush, the client will feel the doubt of the caregiver and cooperate less. When the caregiver prefers, Blink can provide information on how to provide the different steps of the care. Especially with the use of a new product, such as the automatic toothbrush, this can help to gain confidence.

For other situations, the availability of tools and background information can already provide the caregiver with a feeling of confidence, without actually having to use the information or tools. When the caregivers feels strengthened by Blink, this might already be enough to provide better care, whatsoever.

Not only written

This is the most easy requirement to evaluate. Blink is not only written, but is a combination of text, visual information and buttons to apply music and videos during the care ritual. Caregivers can provide visual feedback on the success of a tool they have tried and can add extra information in text when they have time. This allows them to always provide the system with input, how short on time they are.

In general, Blink meets the requirements and fulfils the design goal. For some parts however, extra validation is needed before it is completely developed.

10.1.3. Conclusion

10.2. Recommendations

The project is not finished yet. Some steps need to be taken to ensure the success of the app and to make Blink ready to market. First of all, the app needs to be developed more. For the front-end, an UI designer should look at the interface and this should be tested in context with the user.

For the back-end, four main steps need to be taken. Firstly, the AI should be designed. It is not necessary that Dental Robotics does that. The tasks of the AI are not too complicated and multiple solutions can be implemented to fulfil these tasks. Examples are SAP Leonardo (SAP, n.d.), Adobe Sensei (Adobe, n.d.) and Salesforce Einstein (Salesforce, n.d). These are ready made solutions that can be implemented in any app. The main concerns to decide which solution fits best should be the price, the functionalities and the privacy handling of the data.

Secondly, a first database should be set up with tools and methods that caregivers currently use when they face problematic behaviour. This helps to lower the effort of using Blink during the first period of implementation. The first analysis for this is already done during the graduation project, and is visualised in Figure 12 on page 49, that shows the main categories of solutions caregivers use. This needs to be deepened and supplemented with new information. The best ways to gain this information is doing interviews with caregivers and observe during the care ritual. Next to the database of tools and methods, a video (Youtube.com) and music (Spotify) application should be integrated in Blink.

Thirdly, the options for the integration of the information from the current care plan solutions needs to be researched. The most popular solutions for Electronic Health Record (EHR)for care homes are ONS Nedap (Nedap, n.d.b) and Ysis Gerimedica (Gerimedica, n.d.). For these EHR systems, the options for the integration of the data in Blink and the import of information from Blink should be discussed. For every new client of Dental Robotics, the options can be discussed. When a potential client does not have a contract with Nedap or Gerimedica, the implementation of a new EHR system should be researched. By working this way, the portfolio of Dental Robotics can slowly increase.

Lastly, the exact needs for privacy need to be determined. By defining these needs, the requirements care organisations have can be set and met.

The Dutch care system changed in 2015 (Ministry of Health, Welfare and Sport, 2016). From that moment on, people with dementia are encouraged to stay at home for as long as possible. This is beneficial for both the patient and their relatives, since the home situation is more familiar. However, when someone stays at home longer, they require more and intensive care, for which informal caregivers are not trained.

In order to support the informal caregivers, home care organisations are deployed. However, Elly Duijf, the initiator of the project 'De mond niet vergeten', explained that home care organisations and their employees do not have experience with caring for people that would have already moved to a nursing home according to the old care system.

10.2.1. Implementation in the home care industry

During the validation sessions, the need for the home situation for such a solution came up multiple times. For example, Wilma Valkenburg mentioned that nowadays, people that move into the nursing home, already have difficulties communicating, while this was not the case before 2015 (Figure 49).

Since home care organisations are not yet adapted to the needs of the clients with moderate to severe dementia. Every day, someone else will come by to help with the daily care. This way, the client with dementia will not get familiar with the caregiver and vice versa, while the severity of the dementia does require this to be able to perform good care.

For employees of home care organisations, Blink can provide a clear overview of the most important information about the client and explain the most important dos and don'ts. It can help to get an understanding of the importance of this client group that is new to them, but will grow over the coming years. The app can be managed by the informal caregivers and as soon as someone moves into the nursing home, an extensive database can be transferred to the nursing home employees. At their turn, they can keep providing person-centred care using the information that was build before.

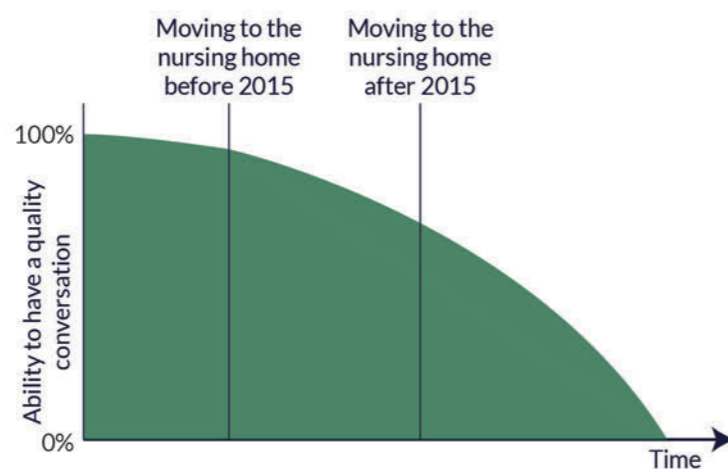


Figure 49: Effect of the change in the care system on the ability to have a quality conversation in the nursing home

10.3. Conclusion

Blink is an app with great potential, that will help to truly improve the quality of life for people living with dementia. It can help caregivers to better understand their clients and enjoy their work more. It grabs a big problem for caregivers, and makes a solution reachable. And last but not least, it can help Dental Robotics by increasing the acceptance of their toothbrush in an important user group, to eventually reach the aim: Changing the way the world thinks about brushing teeth.

This leaves us with nothing to say but,
“Have you already Blinked today?”

10.4. Reflection

From the beginning and throughout the project, I have heard from many people that it simple cannot be done. That I took on a challenge that could not be solved. That I was working on a project without an end. Never, did it stop me. At the beginning of the project, I did not recognize that. Why would this be complicated?

I kept this feeling for around six weeks. In those weeks I was reading, interviewing and thinking. I started to understand what dementia is, why people with dementia had problems with the toothbrush and how I could possibly solve these problems. Or at least I thought. During the first user test, the tooth brushing went dramatically. With the intervention, it went even worse than without it, as I experienced during my internship.

This set me off a little bit. It made me realize that in the context of people with dementia, and reading about the background was not going to cut it. Even though I realised this, it made me very careful. I was afraid to go back to the nursing home again and fail magisterially again. I spend a lot of time researching, reading and finding background information. This time however, the background information was more about what people with dementia still can do and what is important for them.

From that moment on was pushed (and pushed myself a little bit) to go out there more, and learn from the real deal. I tried to combine this with desk research, to give myself a bit of security when I was out there. And in the end, this resulted in Blink, the app for personalised care. It took me a few drifts, away from the care ritual and away from the acceptance, to finally land on an intervention that caregivers believe in, although I did not have the skills to make it fully operate to test it in context.

Concluding, I learned a lot. I stepped out of my comfort zone.

Normally, I was afraid to call to order pizza, and now I did interviews over the phone with important people in the care industry, that I had never met before. I put my questionnaire in Facebook groups with over 10000 members and I cycled to nursing homes all over Delft and Rotterdam, hoping they would invite me in for a test.

At the same time, these user tests were a crazy experience. I do not like unexpected behaviour, and let that just be what is second nature to people with dementia (or at least, that is how we experience it). Anneke van der Plaats said: "When you can connect with people with dementia, you can connect with everybody.", and I vouch for that quote. During the past year, during my internship and my graduation, I have learned the true meaning of user-centric design. For me, this is not only developing a product with the user in the back of your mind. It is about fully understanding what this user wants and needs, how hard it may be to find out.

And if people tell me something cannot be done, I will think back of this project and know that for every problem in the world, there is a solution.

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Appendices

Appendix 1. The brain

The nerves

In an interview with Pam van Touw, Nano biologist, the overall operation of the brain is discussed. The insights of this interview, supplemented with information from the course guide 'Biology and Human Behavior: The Neurological Origins of Individuality' written by Prof. Robert Sapolsky gives a brief and simplified overview of the operation of the brain.

A human brain consists of approximately 100 billion nerve cells and over 1 trillion supporting cells. The supporting cells stabilise the tissue and make sure the nerve cells receive nutrients and that waste is discharged. Nerve cells are responsible for the processing of all cognitive functions of the body. The neuron cells can be primarily found in the Central Nervous System (CNS): the brain and the spinal cord. Besides that, the neurons can be found in the peripheral nervous system, which connects the CNS with the limbs and organs. The brain is responsible to control most of the activities of the body. It consists of multiple areas, that are all responsible for different kinds of processes. The most important area for the memory system is the hippocampus.

Every nerve cell consists of a body, dendrites and axons. In the body, the energy of the nerve cell is produced. The dendrites and the axons connect different nerve cells to each other via synapsis. In the synapsis of the axon, neurotransmitters are saved to be activated in certain situations. When the neurotransmitters are activated, they release chemical energy towards the receptors at the synapsis of the dendrites. This way, the neurons are able to transfer their action potential and thereby transfer information.

Learning

Science now assumes that, if a transfer of neurotransmitters has occurred, the strength of synaptic communication is higher, which makes the likelihood of this specific transfer happening again bigger. This is the basis of learning. This process is called Long-term Potentiation (LTP). After the first stimulation of a synapsis, the synapse becomes potentiated (or hyper responsive) by stimulating

the dendritic spine in a dense cluster of rapid action potentials by releasing glutamate into the synapses. The potentiation increases the likelihood that a single neuron can cause an action potential, which makes the pathway of that specific connection between the axon and the dendrite stronger. Due to the higher strength, that specific pathway is more readily than before. The next time a neuron related to a specific subject is triggered, it is more likely that his pathway is used to transfer 'information'. It is expected that, for every memory, a specific network of neurons is activated. These networks are interrelated and connected between brain areas. In such a network, the different neurons serve as layers for the memory: every layer is more sophisticated and more specialised to help understanding and specifying the memory.

Every neuron needs the information of the previous neuron to determine what it is dealing with and how it should transfer the information further. This could be simplified by comparing it to a 20 questions flowchart, where different parts of the memory are judged. Figure 1 is a simplified representation of this process. These different networks of neurons are not only connected within the network, but the different networks are also interconnected and by triggering the different networks, a memory is evoked. The more a person uses a specific network of neurons, the faster this specific network will be triggered. Due to this, memories that are evoked more often, for example because they are created long ago, are more likely to be triggered and are more likely to have multiple 'routes' to trigger that specific network.

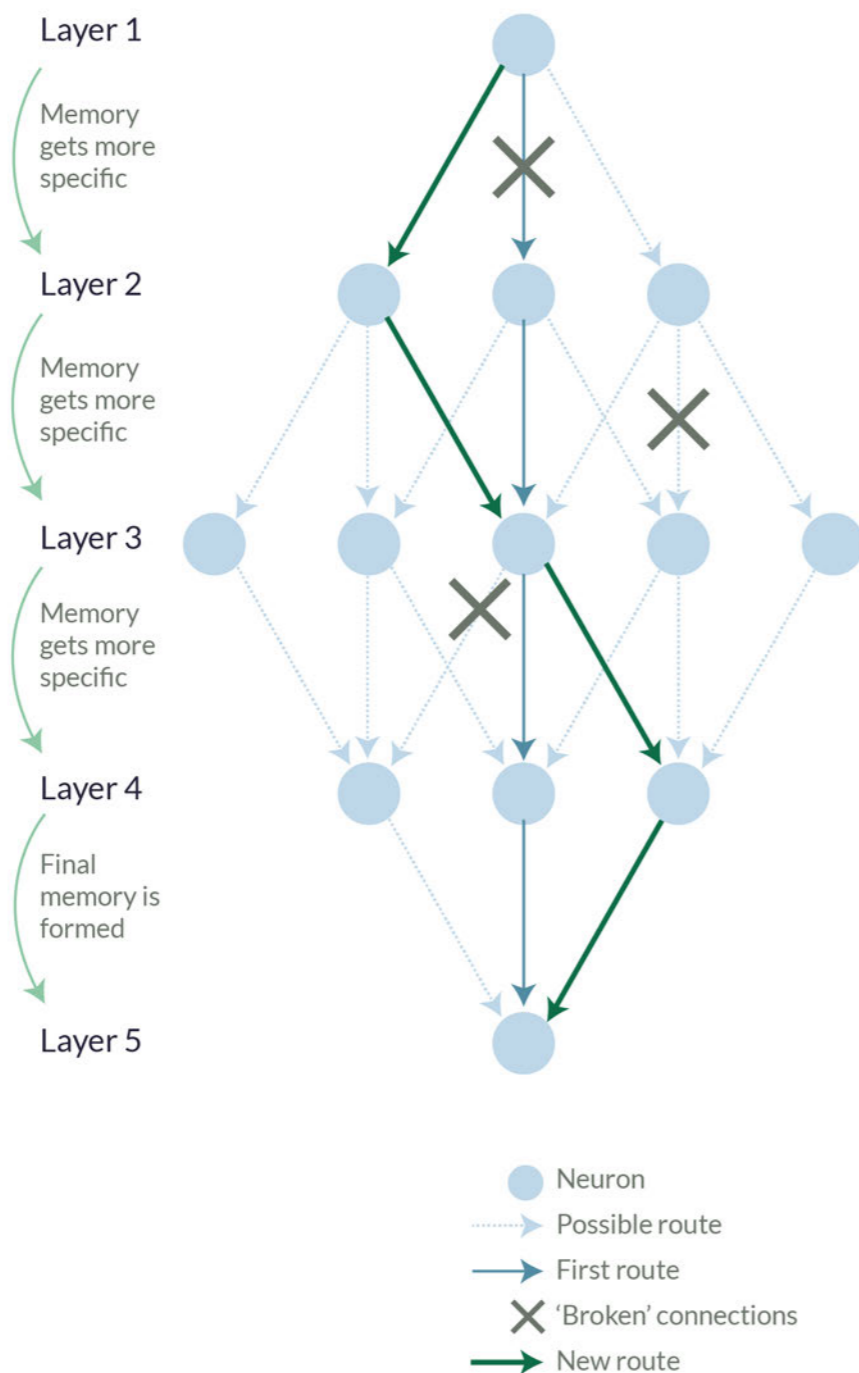


Figure 1: A simplified representation of how the neurons in the brain work.

However, the human brain is not static. It is a dynamic system in which different connections between different neurons can be used to create the same outcome. When a neuron is demolished or an embolism takes place in a part of the brain, the brain cannot use that specific 'route anymore'. The brain is flexible to make sure it can still retrieve the information, even though it needs to use another way to do so. The green arrows and grey crosses in Figure 1 show the flexibility of the brain.

Nevertheless, it is possible that the healthy brain forgets something. Even though there are multiple ways to activate one network of neurons, it is possible that the neural network takes a 'detour' which will result into not reaching the intended part of the brain that is responsible for a specific memory. The chances of this happening are higher when the memory or the action that is intended is spread over multiple areas of the brain, since the interconnection between the areas is less extensive than the connections within the different areas. This happens more often when someone is suffering from a brain disease, for example from dementia, or when someone is suffering from long-term stress.

Forgetting

Alzheimer's disease

70% of all people that suffer from dementia have Alzheimer's disease (Alzheimer Nederland, n.d.). Neuroscientists are not completely sure, but they do expect Alzheimer's disease is caused by plaques and tangles in the brain. The plaques and tangles will be visible on a PET scan and soon the presence can be indicated via a blood test. However, some people do develop the plaques and tangles, but they do not show any of the symptoms (Teunissen, 2018). This makes the research to Alzheimer's disease and dementia complicated and uncertain.

A plaque is an accumulation of dead neural cells, glia cells (supporting cells) and parts of amyloid proteins. Normally, the body demolishes the amyloid protein, but when someone suffers from dementia the blood-brain barrier fails and does not transport the amyloid away anymore. The plaque accumulates between the cells in the nerve system. This prevents the neurons from passing information. This process is accelerated when the glia cells are overactive. The glia cells then demolish too much amyloid cells. At the same time, in the nerve cells, tangles form. These mainly consist of twisted Tau protein. Due to the changed shape of the Tau protein, the transportation of nutrients within the cell becomes more difficult. Eventually, the cell will die.

Appendix 2. Questionnaire

Since the questionnaire was intended for Dutch (informal) caregivers, the questionnaire was conducted in Dutch. Due to privacy reasons, the direct results are not published but are available on request.

Allereerst hartelijk dank voor uw medewerking! Ik ben bezig met het ontwerpen van een automatische tandenborstel voor mensen met dementie. En dat kan ik niet alleen!

Eerst een beetje over de opdracht: Tandepoetsen is voor mensen in verzorgingstehuizen vaak niet mogelijk. Verzorgers moeten dit dan overnemen, maar dit is heel moeilijk. Het is ingewikkeld om overal te komen en om goed te voelen wat je doet. Daarnaast ervaren verzorgenden vaak een tijdsdruk. Om dit probleem op te lossen heeft mijn afstudeerbedrijf, Dental Robotics, een automatische tandenborstel ontwikkeld die alle tanden tegelijk poetst. Omdat alle tanden tegelijk gepoetst worden duurt het veel korter en hoeft de borstel niet heen en weer bewogen worden.

Het product is een enorme verbetering voor mensen met lichamelijke problemen. Maar, het gebruik nieuwe producten is voor mensen met dementie vaak een uitdaging. Als iemand met dementie een nieuw product moet gebruiken, waarin verschillende en soms complexe handelingen voor nodig zijn, lukt dat vaak niet. Het doel van mijn afstudeerproject is om te zorgen dat de automatische tandenborstel voor mensen met dementie ook een verbetering is in vergelijking met de huidige mondzorg.

Ik ben zelf geen ervaringsdeskundige, en daarom wil ik graag goed begrijpen waar mantelzorgers en verzorgenden tegenaan lopen bij de zorg in het algemeen en bij het tandepoetsen. Ook ben ik op zoek naar dingen die juist wel goed werken, zodat ik die misschien in het ontwerp kan verwerken. Ik geloof dat een ontwerp nooit goed kan zijn als je niet hebt geluisterd naar de eisen en wensen van de mensen die het product gaan gebruiken.

Introduction

Ik zou u willen vragen om de onderstaande vragenlijst in te vullen, zodat ik mijn doel kan bereiken en ervoor kan zorgen dat de mondzorg van mensen met dementie kan verbeteren. Door het invullen geeft u toestemming voor het gebruiken van uw antwoorden voor het schrijven van mijn afstudeerscriptie. De resultaten zullen volledig anoniem verwerkt worden. U kunt, zonder opgave van reden, elk moment stoppen met het beantwoorden van de vragenlijst, de resultaten tot dan toe kunnen alsnog gebruikt worden voor het onderzoek. Als u niet gemakkelijk bent met het beantwoorden van een vraag kunt u deze altijd overslaan of 'dat beantwoord ik liever niet' aanklikken.

Over u

Om een goed beeld te krijgen van wie de vragen beantwoord, wil ik eerst graag een beetje weten over u.

Ik *

- ben mantelzorgver van iemand met dementie
- ben professioneel verzorgende
- heb zelf dementie
- wil deze vraag liever niet beantwoorden
- Anders...

Komt u in uw dagelijks of professionele leven in aanraking met iemand met dementie of heeft u zelf dementie?

- Ja
- Nee

Bedankt!

Helaas komt u niet in aanmerking voor het onderzoek. Alsnog hartelijk bedankt voor de moeite!

Figure 2: Categorising the participant

Figure 3: Follow up when someone does not want to answer the question or answers 'other'

Figure 4: Screen when someone is not in touch with people with dementia

Hoe lang geleden bent u gediagnosticeerd met dementie?

- Minder dan 3 maanden geleden
- Minder dan 6 maanden geleden
- Minder dan 1 jaar geleden
- 1 tot 2 jaar geleden
- 2 tot 3 jaar geleden
- 3 tot 5 jaar geleden
- 5 tot 7 jaar geleden
- Beantwoord ik liever niet

Zijn er dingen waar u tegenaan loopt in het dagelijks leven? Zo ja, waarmee precies?

Korte antwoordtekst

Heeft u manieren om dit op te lossen?

Tekst lang antwoord

Poetst u nog zelf uw tanden?

- Ja
- Nee
- Beantwoord ik liever niet

Zijn er dingen die niet goed gaan bij het tandenpoetsen? Zo ja, wat gaat er niet goed?

Tekst lang antwoord

Person with dementia

Figure 5: How long ago have you been diagnosed to find out about the severity of the dementia

Figure 6: Daily challenges for someone with dementia

Figure 7: The toothbrush situation and the main challenges

Figure 8: Solving tooth brushing problems

Hoe lost u die problemen op?

Tekst lang antwoord

Waar moet de nieuwe tandenborstel aan voldoen om voor u een voordeel te bieden?

Tekst lang antwoord

Gebruikt u producten of hulpmiddelen die speciaal gemaakt zijn voor mensen met dementie? Zo ja, welke producten?

Tekst lang antwoord

Wat vindt u fijn aan die producten?

Tekst lang antwoord

Wat kan er beter?

Tekst lang antwoord

Hoe lang zorgt u al voor iemand met dementie?

- Minder dan 6 maanden
- Minder dan een jaar
- 1 tot 2 jaar
- 2 tot 5 jaar
- 5 tot 10 jaar
- Meer dan 10 jaar
- Beantwoord ik liever niet

Informal caregiver

Figure 10: Years of experience with caregiving to determine experience and severity of the dementia

Waar woont uw naaste met dementie?

- Thuis
- Thuis met thuiszorg
- Inwonend bij een mantelzorger
- Inwonend bij een mantelzorger met thuiszorg
- In een verzorgingstehuis
- Beantwoord ik liever niet
- Anders...

Gaat de persoon waarvoor u zorgt naar de dagopvang?

- Ja
- Nee
- Beantwoord ik liever niet

Hoe lang werkt u al met mensen met dementie?

- Minder dan 6 maanden
- Minder dan een jaar
- 1 tot 2 jaar
- 2 tot 5 jaar
- 5 tot 10 jaar
- 10 tot 20 jaar
- Meer dan 20 jaar
- Beantwoord ik liever niet

Figure 11: Living situation of the person with dementia

Professional caregivers and other experts

Figure 12: Years of experience with people with dementias

Informal caregivers, professional caregivers and other experts

Figure 13: Problems with people with dementia in general

Figure 14: Experience with brushing the teeth of someone with dementia

Figure 15: Problems and solutions while brushing the teeth of someone with dementia

Loopt u wel eens ergens tegenaan in de omgang met iemand met dementie? Zo ja, waartegen?

Korte antwoordtekst

Hoe probeert u dit dan op te lossen?

Tekst lang antwoord

Poetst u wel eens de tanden van iemand met dementie? *

- Ja
- Nee
- Beantwoord ik liever niet

Zijn er dingen die niet goed gaan bij het tandenpoetsen? Zo ja, wat gaat er niet goed?

Tekst lang antwoord

Hoe lost u die problemen op?

Tekst lang antwoord

Waar moet de nieuwe tandenborstel aan voldoen om voor u een voordeel te bieden?

Tekst lang antwoord

Gebruikt u wel eens producten of hulpmiddelen gebruikt die speciaal gemaakt zijn voor mensen met dementie? Zo ja, welke producten?

Tekst lang antwoord

Wat vindt u fijn aan die producten?

Tekst lang antwoord

Wat kan er beter?

Tekst lang antwoord

Indien dit nodig is, hoe legt u dan uit aan iemand met dementie hoe het product gebruikt moet worden?

Tekst lang antwoord

Het positieve dingen boek

Naast het oplossen van de problemen met het tandenpoetsen, ben ik ook bezig met het maken van een 'positieve dingen boek'.

Het leven met dementie en het zorgen voor mensen met dementie kan heel zwaar zijn. Er zijn vele moeilijke momenten, maar er zijn ook altijd leuke momenten. Er kunnen hartverwarmende dingen gebeuren en er kunnen grapjes gemaakt worden. Omdat ik zelf heel veel hou van vrolijkheid en graag overal het positieve van bekijk, zou ik deze positieve momentjes graag verzamelen in een boekje.

Ik zou het heel leuk vinden als u uw meest favoriete moment zou willen delen. Dan kan ik die bij elkaar voegen! Dit hoeft natuurlijk niet. Als u geen behoefte heeft om dit te delen kunt u gewoon doorgaan naar de volgende pagina.

Mijn favoriete moment is:

Tekst lang antwoord

Figure 16: Products designed for people with dementia

Figure 17: The book of positive events

All participants

Figure 18: Thank you and collecting e-mail addresses

Bedankt!

Heel erg bedankt voor uw hulp! Met uw antwoorden kan de tandenborstel beter aansluiten op de behoefte van mensen met dementie en de mensen die hen verzorgen.

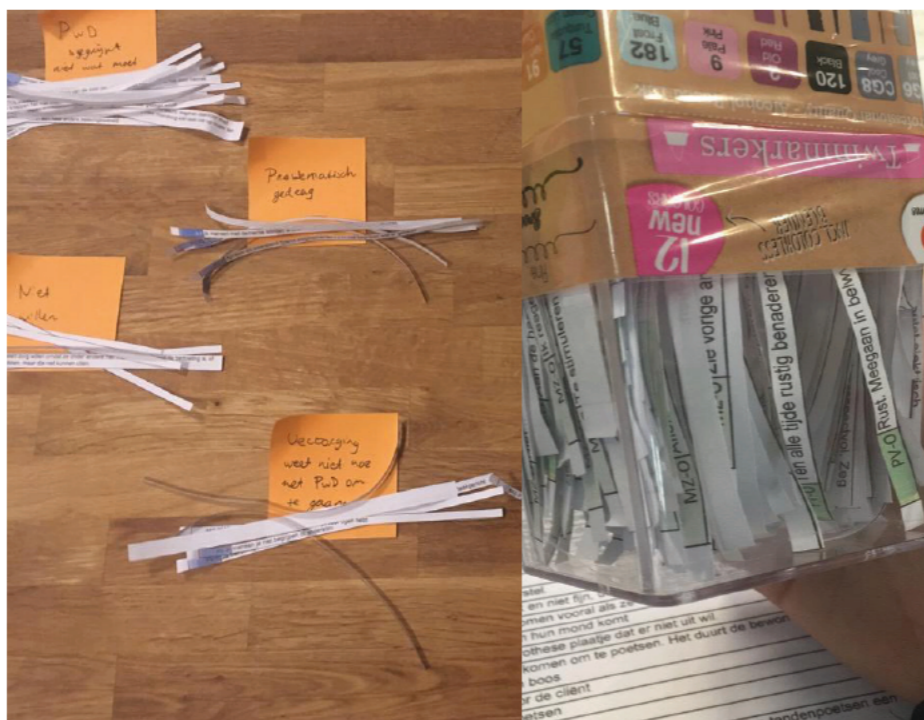
Wilt u nog meer dingen kwijt, of heeft u nog opmerkingen?

Tekst lang antwoord

Mag ik u in een later stadium van het project nogmaals benaderen? Zo ja, vul dan hieronder uw e-mail adres in.

Korte antwoordtekst

Figure 19 and 20: The evaluation of the questionnaire



Appendix 3. The dementia glasses

'De dementie bril' is a tool developed by D'mentia (figure 2). It is a 360° Virtual Reality experience that helps the user to get an understanding of the perception of the world of people with beginning dementia (Dementiebril, 2016). They are still able to live at home, but need some support in their daily tasks. The tool is developed to help informal caregivers to better support their spouse or client.

Alzheimer Nederland has four 'Dementia glasses' in their possession. Nursing homes and day care organisations can borrow the glasses to be able to let their employees and informal caregivers of their clients use the glasses to experience the struggles people with dementia face. This can help to provide better care. On the 24th of September, the day care organisation in the Vermeertoren in Delft opened their doors to let the public try the glasses.

The glasses show different situations from the perspective of someone with beginning dementia. Figure 3 shows an overview of the events in the video and the way the person with dementia handles the events and the problems that occur during the events. Besides, it shows how the way the caregiver reacts to the behaviour of the person with dementia impacts this person.



Figure 21: The Dementiebril. Source: <https://dementie.nl/nieuws/bril-laait-je-ervaren-wat-het-om-dementie-te-hebben>

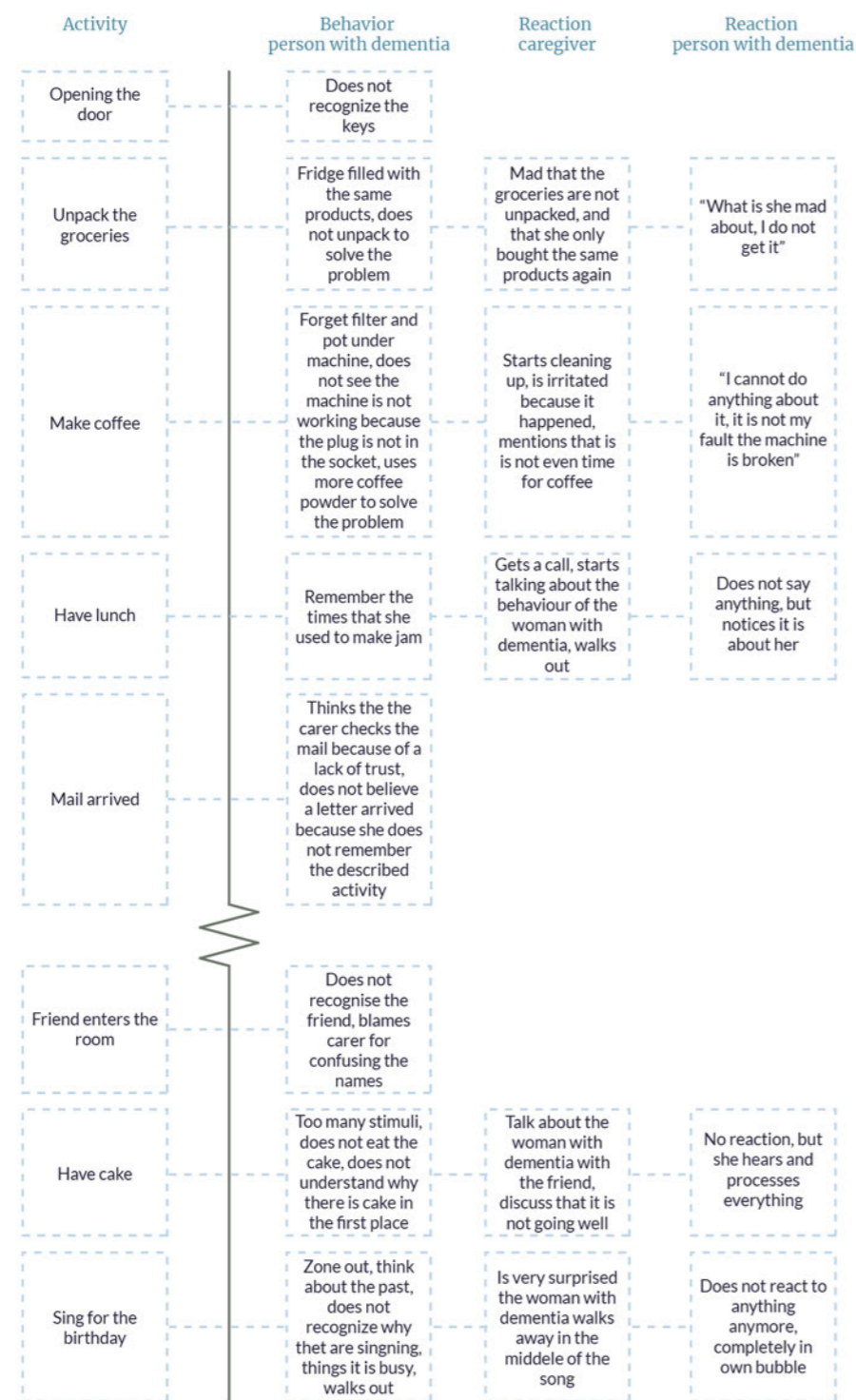


Figure 22: Overview of the events in the Dementia Glasses

The glasses appeared to be very popular. The entire afternoon, there was a queue of people that wanted to try the glasses. At the moment I was trying the glasses, there was also a man, whose wife was living in a nursing home for three years now. He did not even use the glasses but he was very emotional. He had the feeling the glasses would take him back to the moment his wife was in this phase and he could not handle this. For me this showed the effectiveness of the glasses. For the first time, I noticed the extreme grief that is behind this terrible and unpredictable disease.

Daily activities become harder, because a person with dementia cannot see the logic of each step anymore. They do not look further than the routine as in their head. When something in the process is different than usual (e.g. the power plug is not plugged in), it is not possible to fulfil the activity. When something is different, the process is disturbed and they forget to do parts of the activity.

They can get stuck in old routines and have selective memory. This results, for example in bringing only two products from the supermarket and bringing those products every time.

Main learning points

The person with dementia is very sensitive to the behaviour of their caregivers and the people around them. They will notice when someone is talking about them. While wearing the glasses, you were confronted with this behaviour, and even though it is not about the wearer of the glasses, it did hurt a bit.

It is very important not to get mad at a person with dementia, they cannot do anything about the mistakes they made and often already forgot they were the ones that made the mistake. Becoming mad at them will confuse them and will make them insecure.

They lack a filter and cannot handle a lot of sounds at the same time. When it is too busy, they will zone out and forget their environment. Due to this, big, social gatherings might not be suitable anymore and it might be better to not invite the person with dementia anymore, even though that might feel bad.

Appendix 4. Example products

Robot cat

What is it?

The robot cat is an interactive device that reacts to petting, movement and hugging. The device makes cat sounds and moves like a cat.

Benefits?

The cat encourages people to interact. It is in the nature of people to like cats, which encourages even more.

Negatives?

People with mild dementia recognize that the cat is a robot. This can be upsetting. Besides, the cat gets very dirty and is not washable.



Source: <https://www.robotzorg.nl/product/interactieve-kat-voor-gezelschap/>

Paro

What is it?

Paro is an interactive robot seal that reacts to stroking and sounds. It moves and makes seal sounds.

Benefits?

Paro can learn to show preferred behaviour. It reacts to different input from the user, to make it fit for people with moderate to severe dementia.

Negatives?

People with mild dementia recognize that the cat is a robot. This can be upsetting. Besides, Paro is very expensive (€5000,-).



Source: <http://www.parorobots.com/index.asp>; <https://www.zorgvoorbeter.nl/veranderingen-langdurige-zorg/robots-in-de-zorg/paro>

The Bus

What is it?

The Bus is a design by a nursing home in Doetinchem. They filmed all roads in the environment and display it on screens in a replica of a bus

Benefits?

The Bus evokes reminiscence in an open way, the people with dementia using the bus can be passive and the environment changes.

Negatives?

The Bus is not flexible. For every nursing home, a new video of the environment needs to be filmed. This makes the solution expensive.



Source: <https://www.nytimes.com/2018/08/22/world/europe/dementia-care-treatment-symptoms-signs.html>

BikeLabyrinth

What is it?

BikeLabyrinth is a system that allows people to make an interactive bicycle tour through familiar cities or environments on a hometrainer

Benefits?

The BikeLabyrinth provides an engaging way for people with dementia to move and explore an environment, without any danger

Negatives?

The direction choosing moments can be too complex for people with (moderately) severe dementia.



Source: <https://www.fietslabyrinth.nl/>

KozieMe

What is it?

A KozieMe is a soft pillow that plays sounds when it is touched. The intervention is also available in a wall (KozieWe) to use together.

Why does it work?

Music is very personal and has a great influence on a person with dementia. In addition, the KozieMe gives direct feedback.

Why does it not work?

The KozieMe only plays sounds when it is touched, this does not encourage a person with severe dementia to start playing with it.



Source: <https://kozie.com/kozieme/>

Tessa Tinybot

What is it?

Tessa is a tinybot that plays auditory reminders. The goal is to support the daily structure and suggests to do activities.

Benefits?

The robot gives reminders, without taking away the feeling of autonomy of the person with dementia.

Negatives?

The Tessa is not flexible, the times have to be set beforehand. Besides, the robot is only fit for people with beginning dementia



Source: <https://www.tinybots.nl/>

CRDL

What is it?

The CRDL is an interactive device that translates physical interaction between people into sound to enrich the interaction.

Benefits?

The initiative can come from both the person with dementia and the other party. Besides, the device gives direct feedback.

Negatives?

The device only works when both parties touch the device. It can be hard to encourage someone with dementia to keep a hand still.



Source: <https://crdlit.com/>

BeleefTV

What is it?

The BeleefTV is an interactive screen that can display games and play music and videos.

Benefits?

The TV has many options and is flexible in use for people with beginning to severe dementia

Negatives?

In many of the games, it is possible to make mistakes. This can have a negative effect on people with dementia.



Source: <https://www.debeleef.tv/>

Tovertafel

What is it?

The Tovertafel is an interactive projection that engages people with dementia by playing games

Benefits?

The Tovertafel is created together with carers and people with dementia. This helps to create a more engaging experience.

Negatives?

The device is fixed to the ceiling, which causes it to be inflexible. Due to this, the Tovertafel is not used that much.



Source: <https://tovertafel.nl/>

Experience table

What is it?

The experience table is a movable interactive TV screen that offers relaxation, experiences and stimulation of the brain with apps.

Benefits?

Bla
Bla
Bla
Bla

Negatives?

Bla
Bla
Bla
Bla



Source: <https://www.belevenistafel.nl/>

Appendix 5. Background information of the interviewees

Amarins Bellinga

Amarins is a recent IDE graduate that graduated on a design to improve the quality of life for people with dementia. This resulted in 'MyFavourite', that helped to prevent stress and wandering for people with dementia.

The goal of the interview was to find the main challenges during the design with and for people with dementia. An semi-structured interview was conducted that aimed to answer the following questions:

1. What are the biggest challenges when doing user tests with people with dementia?
2. Which things should be taken into account during the preparation of a user test?
3. Are there other things that are important during the planning and conducting tests?

Pam van Touw

Pam is a recent graduate at the faculty of Nano biology. During her studies, she did a minor in the field of neuroscience. She is able to simplify the neuroscience of the brain to make it understandable for layman.

The goal of the interview is to gain an understanding of the way the human brain works to find out how dementia can influence the behaviour. A semi-structured interview was conducted that aimed to answer the following questions:

1. How does the brain store information?
2. How can the storage of information go wrong?
3. Why do you sometimes forget things?
4. What is the effect of dementia?

Helene is a dental hygienist. She works four days per week in a dental practice in Rijswijk. When her mother was diagnosed with dementia, she started working as a dental hygienist for elderly. She works for Noviacura (a mobile dental organisation for elderly people) in the Rotterdam area for nine months now.

The goal of the interview and observations were to find the biggest challenges an oral care professional face during the performance of oral care for elderly with dementia. The main research questions during the observations were:

1. What are the biggest challenges the dental professionals face during the oral care?
 - a. How do they handle these problems?
 - b. Do they have any tips and tricks to perform better oral care?
2. How do they explain the nurses in the nursery home how they should handle oral care?
3. What do they think of the Dental Robotics brush?
 - a. When will it add something?
 - b. What does it need to make it work?

Gerben is a former care professional that currently trains other care professionals on how to deal with aggression and problematic behaviour of people with dementia.

The goal of the interview is to find out which approach he uses to identify and solve problematic behaviour. A semi-structured interview was conducted that aimed to answer the following questions:

Helene Eijkenboom

Gerben Bergsma

Veerle Molenaar

1. How do you deal with problematic behaviour
2. Do you have 'tricks' to turn the behaviour of people that are not cooperative around?
3. I read an article about the 'mode'. What does this mean?
4. Are there things you always try first?
5. How is the education about this?
6. How do you communicate the insights with the nursing personnel?

Veerle is a learning to become a professional caregiver. During her education, she has worked in multiple nursing homes taking care of people with dementia.

The goal of the interview is to find out what the biggest challenges for professional caregivers are and how they generally deal with these challenges. A semi-structured interview was conducted that aimed to answer the following questions:

1. What do you think of working in a nursing home?
 - a. What do you like most?
 - b. What are the biggest challenges you phase?
2. Do you have a personalised approach for everyone?
 - a. Do you know all your clients, or do they differ every time?
 - b. How do you know how to approach someone?
3. Have you brushed the teeth of clients before?
 - a. How do you feel about that task?
4. How do you deal with people that are not cooperative?
5. Do you have 'tricks' to turn that behaviour around?
 - a. In general?
 - b. And for toothbrushing in particular?
6. Have you tried explaining a new product to someone with dementia?
 - a. How did you do that?
 - b. Are there things you cannot say, for example because they will not understand it?

Elly Duijf

Elly is one of the initiators of the initiative 'De mond niet vergeten' that aims to improve the quality of oral health among frail elderly by educating health care professionals on the importance of good oral health and on ways to achieve this.

The goal of the interview was to find the main problems caregivers face when providing oral care. A semi-structured interview was conducted that aimed to answer the following questions:

1. How did your advice on defensive behaviour came about?
2. Did you also look into the problems with severe behaviour?
3. What are important aspects to take into account during the design?
4. What challenges did you phase during the initiation of the project?
5. What is your favourite intervention for people with dementia?
6. What aspects should an intervention contain to be successful?
7. What is the best intervention against problematic behaviour of people with dementia?

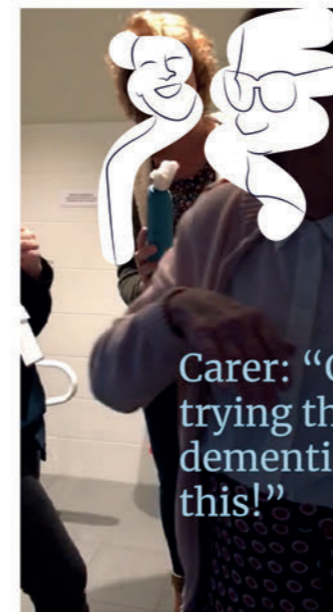
Gubing Wang

Gubing is a design engineer with an interest in designing for the emotional well-being of people with dementia. She is doing a PhD project at the faculty of Design Engineering in Delft on reducing agitation, aggression, depression, apathy, and psychosis for people with dementia.

In a conversation, the main insights of the graduation student and of Gubing were shared to gain a deeper understanding of the topic of designing for people with dementia. The aim of the conversation is to find an answer to the following questions:

1. What products for people with dementia are currently out there?
 - a. Why are they inspiring?
2. Which papers, websites, books should I still check out?
3. What is the best design approach?

Appendix 6. Results of the binder test

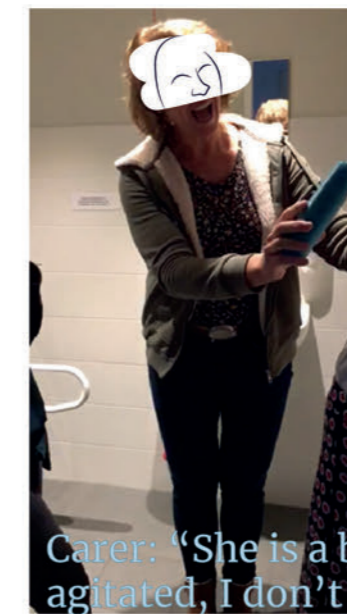


Carer: "Come on, we are trying this"
Person with dementia: "I don't need this!"

Because, in the introduction, there was mentioned that the successrate depends on the interaction between the client and the carer, the carer was trtying a bit too hard, and the person with dementia noticed this.

The binder was not flexible enough and did not support the carer when the person with dementia walked away and the interaction was different than planned.

The carer did not say everything in the binder, but instructed the person with dementia via her own method. She missed some important information.



Carer: "She is a bit agitated, I don't know, shall we try it?"
Person with dementia: "Do it yourself"

Person with dementia:
 “And what do I have to do now?”



The interaction was way different compared to normal brushing. Due to this, rinsing the mouth went less well than normally.

The carer tried longer than she normally would, because of the instructions in the binder

Carer: “Shall I show how to do it?” **Person with Dementia:** “No that is not necessary my love”



Person with dementia: “I have done it really well”
Carer: “You have done it reeeaaaally well”



Carer: “Have you seen this before?” **The person with dementia starts reading the binder**

It is important to genuinely care for the person with dementia. This moment made sure the next test went better.



The binder was distracting for the person with dementia. He tried to read it and was completely distracted from the carer. For the carer reading the binder also took some time, which was distracting, instead of calming.



Carer: "Can you open your mouth?" **Person with dementia:** "What now?"

The carer almost automatically mirrored the behaviour to make sure the person with dementia would open his mouth

Person with dementia: "Tss, tss, tss" **Carer:** "Yes, brushing! Like that!"

The carer mentioned that she had the feeling the binder was a bit patronizing. All carers know that they have to stay calm and that the need to explain everything. They do not need such direct orders.



The explanation of the purpose of the product was clear enough for the person with dementia to get an association with normal toothbrushing.



Carer: "You passed!!" **Person with dementia:**

"Yeeeeeeeeesss!!!!" **Carer:** "Well, at least, he really likes it"

The person with dementia was very enthusiastic throughout the test. The carer mentioned that the colleague I had with me to the nursing home looked very much alike on of the favourite volunteers of the person with dementia

The carer felt uncomfortable for keeping the toothbrush in the mouth of the person with dementia and did not talk about anything else than that it would be almost over for the full 30 seconds

Carer: "Very well, very well, very well, we are brushing your teeth, and I think we are almost brushing for a minute now. We are almost done, a few more seconds and it is done!"



Appendix 7. Design for happiness card-deck

Self-determination

“Self-determination represents our desire to be free to make our own choices” For caregivers this human goal means that they can decide to use a tool or not, or which tool they want to use. Their experience with the occupation of providing care for people with dementia can help them to make these decisions. For clients with dementia, self-determination is less obvious. However, to provide true person-centred care, it is important that the client can also have a say in the use of certain tools or tricks or to talk about certain topics. When someone just moved into the nursing home, they can really speak up, but as the dementia gets more severe, this is not possible anymore. By that time, it is important that the caregiver pays close attention to the opinion of the client.

Exploration

“Exploration is achieved through activities that enable us to discover or observe new things, to change the known into the unknown, or to seek out new information.” In the app, this human goal can be reached by providing with new information, tips or tricks as the app is used more. By applying the new information together, the connection between the caregiver and the client can grow stronger and the caregiver can be challenged to apply new methods. For caregivers that do not know the client, the app can help to prepare for the care by providing a clear overview on the main ‘dos and don’ts’.

Curiosity

“Curiosity refers to our ability to find subjects and topics fascinating and to take an interest in all ongoing experience for its own sake.” This character strength can help to initiate the use of the app. By providing new knowledge every time the app is used, the caregiver can be triggered to look into the app before the care takes place, even though they already know the client very well.

Love of learning

“Love of learning refers to our ability to master new skills, topics and bodies of knowledge.” This character strength can help to motivate caregivers to apply better care. When someone is motivated to seek out for new opportunities to learn, the app can

provide information that a caregiver is not familiar with yet. For a fixed caregiver, this can be detailed information, for a temporary caregiver, this can be basic information that helps to provide the care at all.

“Joy arises when something good happens to us; we fulfil a need, achieve something or make progress towards achieving a goal.” An understanding of this emotion helps to think beyond applying good care. For a caregiver, this can be a goal, but in order to achieve a feeling of Joy, the success should be outstanding or should be able to be shared with others. This can, for example, happen when a major problem during the care is solved with one of the new tools or tricks, or when something humorous happened. For the latter one, the caregiver can write this down in a special page of the app. All these little stories will be collected and bundled in a book of positive events (Supplement 3).

“Individuality is achieved through activities that enable us to develop or express beliefs, values, self-concepts or features that are uniquely personal, special or different.” This human goal was already a very clear subjective for the client, since this is the core of the legacy of person-centred care. However, for the caregiver, individuality was neglected. All caregivers have their own way of working and all caregivers have a different connection with every client with dementia. By applying individuality for the caregiver as well, the app will provide better guidance, be more successful and will be more fun to use for the caregiver. This will lead to a more holistic design for happiness.

“Resource acquisition is achieved through activities that obtain the approval, emotional support, task assistance, advice, material aid, or validation from others.” In order to achieve this human goal for the caregiver, it is important that the information, fails and successes are shared with other caregivers. By helping each other an being able to use the experiences of others, the value of the

Joy

Individuality

Resource acquisition

Transcendence

app gets richer and thereby more relevant to use. These success can be with one specific client with dementia or with others, even at another location. By applying the successes of others and combining this with the knowledge about similarities and differences between the specific caregiver and the specific client, a more interesting and varied output can be delivered.

“Transcendence represents our desire to go beyond the ordinary thoughts and feelings of everyday life. It is achieved through activities that enable us to transcend to extraordinary states of functioning, provide us with peak experiences, or stimulate feelings of flow or elevation.” The app can help caregivers to achieve this human goal by providing tips and tricks that they have never thought of before. The database of options, tools and tricks that is provided should be innovative and profound, and should be supplemented by the previous experiences of other caregivers to help reach this extraordinary state of functioning without having to put much effort into finding solutions.

Inspiration

“Inspiration arises when we encounter something that triggers our creative impulses, or when we suddenly get a new idea or see the world in a different light.” After the use, the caregiver might have performed the care with success, or without it. In any case, the caregiver has tried a new method or trick, that might trigger the emotion of inspiration to try out something else next time. In these cases, the caregiver must have the option to note this down in the app, and be notified the next care moment.

Positive self-evaluation

“Positive self-evaluation is achieved through activities that maintain or increase our competence and our sense of self-confidence, pride or self-worth.” The main job of caregivers is to provide the client with good care. This can go one way or another, but when the care moment is pleasant, the caregiver can get more satisfaction from the job and in the end, achieve the human goal of positive self-evaluation.

Honesty

“Honesty refers to our ability to be genuine and authentic, acting sincerely and transparently and being true to ourselves, as well as to others.” It might still happen that the caregiver is not successful in applying the care at one moment. The tool or trick that is used at that moment, is not fit for the specific client. The system, and thereby other caregivers, can only learn and improve when caregivers are able to provide the system with reliable information. Previous research from Dental Robotics has shown that caregivers are often not trustworthy about the tasks they have fulfilled during the care and the quality of those tasks. In this case, it is important people do self-report truthfully. However, the need of honesty can be avoided by measuring the success rate by the time that was needed for a task, or by using facial or sound recognition to evaluate the happiness after performing a task.

Appendix 8. Screens validation session 1



Figure 23: Home screen

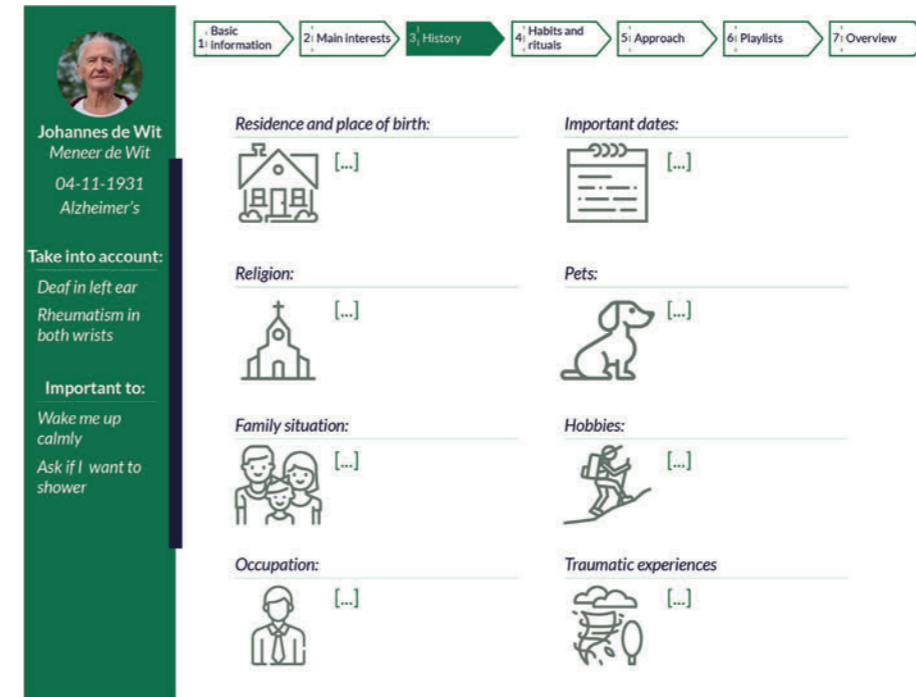


Figure 25: History



Figure 24: Basic information

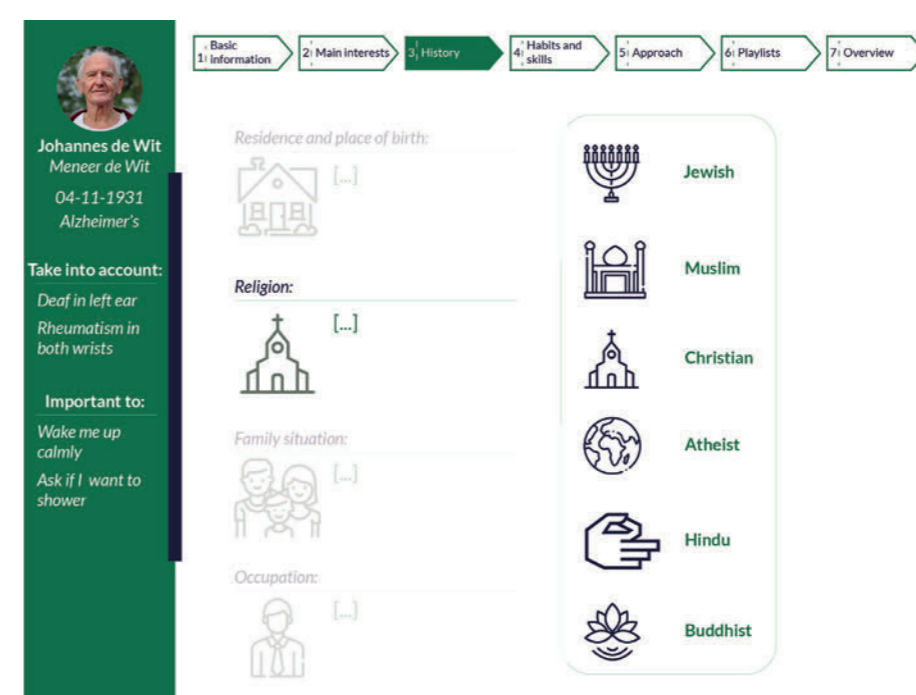


Figure 26: Completing the history

Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Take into account:
Deaf in left ear
Rheumatism in both wrists

Important to:
Wake me up calmly
Ask if I want to shower

Navigation: 1: Basic Information, 2: Main interests, 3: History, 4: Habits and skills, 5: Approach, 6: Playlists, 7: Overview

Residence and place of birth: [...] (house icon)

Religion: Atheist (globe icon)

Family situation: [...] (family icon)

Occupation: Doctor (doctor icon)

Important dates:
04-04-1956: Wedding day
13-11-1961: Birth of Bruno
23-06-1965: Birth of Rob
21-12-2017: Wife passed away

Pets: [...] (dog icon)

Hobbies: [...] (skier icon)

Traumatic experiences: [...] (wheelchair icon)

Figure 27: History partly completed

Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Take into account:
Deaf in left ear
Rheumatism in both wrists

Important to:
Wake me up calmly
Ask if I want to shower

Navigation: 1: Basic Information, 2: Main interests, 3: History, 4: Habits and skills, 5: Approach, 6: Playlists, 7: Overview

Amount of help needed: (arrow pointing right)

Start of the day: --:-- AM/PM

Vertical timeline with 7 empty dashed boxes for help level.

Vertical toolbar with icons for various activities: shower, bed, clothes, wheelchair, etc.

Figure 28: Empty care ritual

Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Take into account:
Deaf in left ear
Rheumatism in both wrists

Important to:
Wake me up calmly
Ask if I want to shower

Navigation: 1: Basic Information, 2: Main interests, 3: History, 4: Habits and skills, 5: Approach, 6: Playlists, 7: Overview

Amount of help needed: (arrow pointing right)

Start of the day: 10:00 AM

Timeline entries:
- Always ask carefully before taking action (shower icon)
- Leave alone, needs the comfort (bed icon)
- May act aggressively Approaching from the side helps (clothes icon)
- (shower icon)
- (shower icon)

Vertical toolbar with icons for various activities.

Figure 29: Complete care ritual

Johannes de Wit
Meneer de Wit
04-11-1931
Alzheimer's

Take into account:
Deaf in left ear
Rheumatism in both wrists

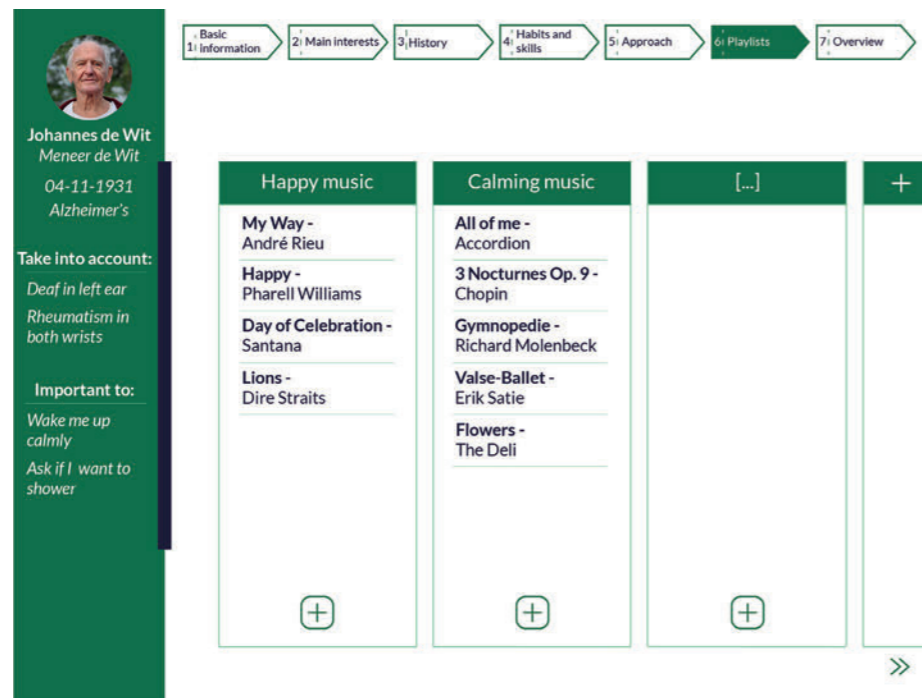
Important to:
Wake me up calmly
Ask if I want to shower

Navigation: 1: Basic Information, 2: Main interests, 3: History, 4: Habits and skills, 5: Approach, 6: Playlists, 7: Overview

Four empty vertical panels, each with a '+' icon at the bottom.

Figure 30: Empty play lists

Figure 31: Partly completed playlists



Appendix 9. Screens validation session 2

Figure 33: Overview of the steps of the intake procedure

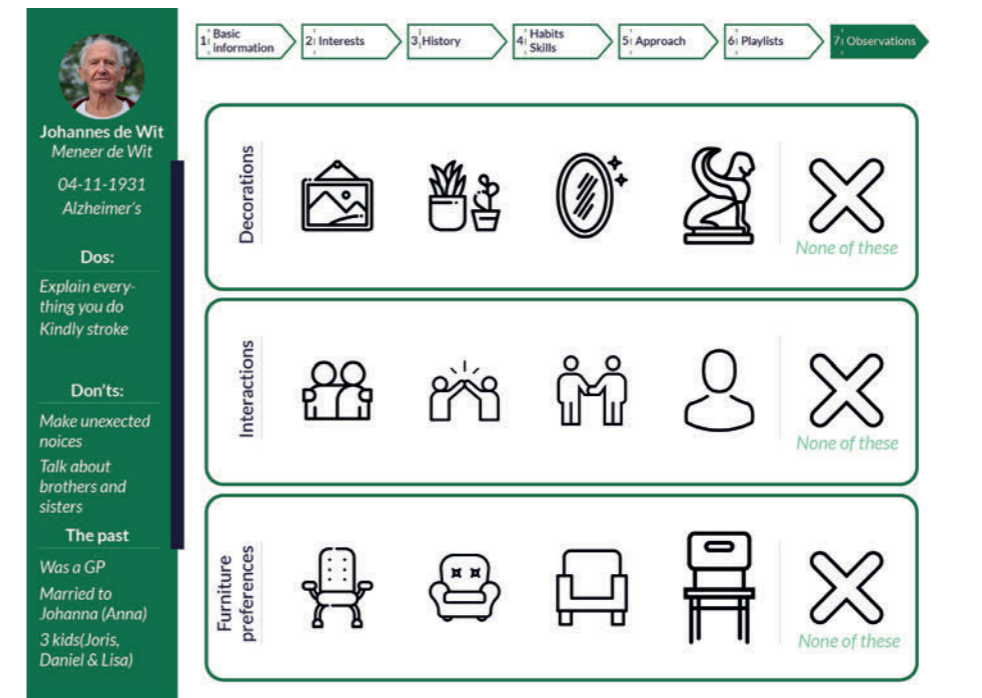


Figure 32: Overview

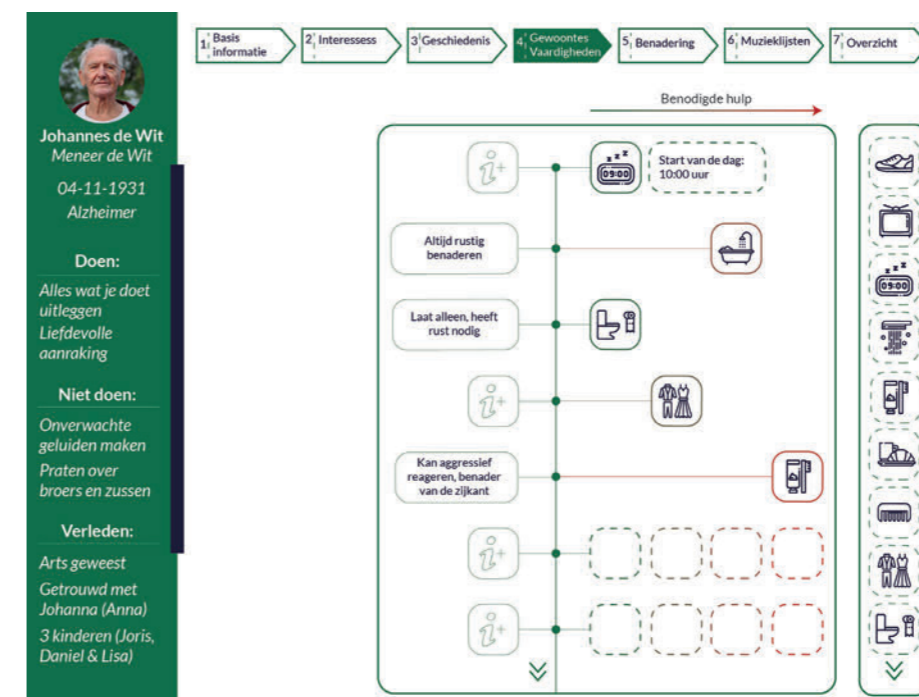
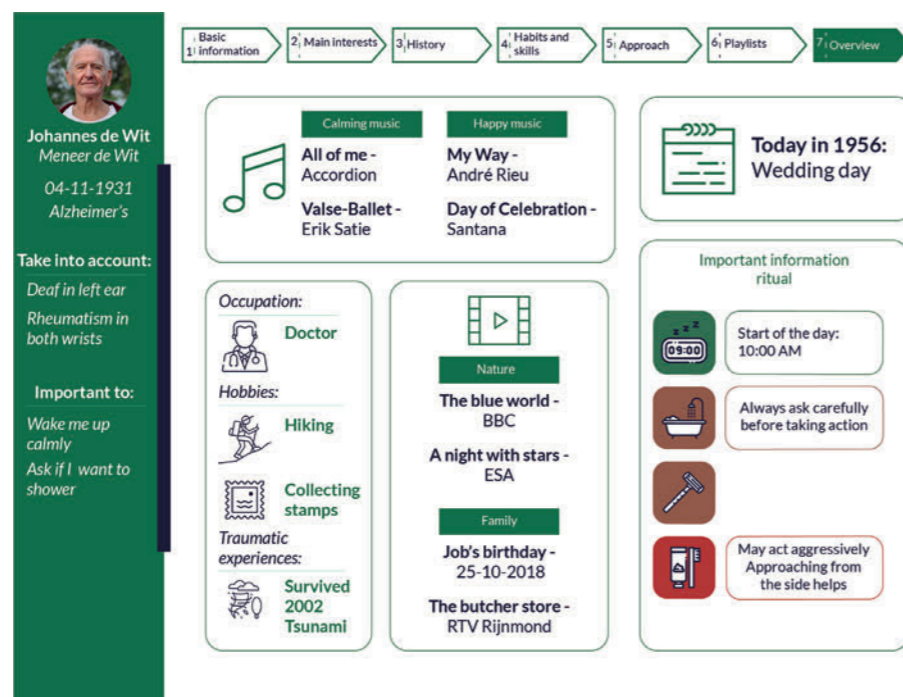


Figure 34: Progress of filling the care ritual

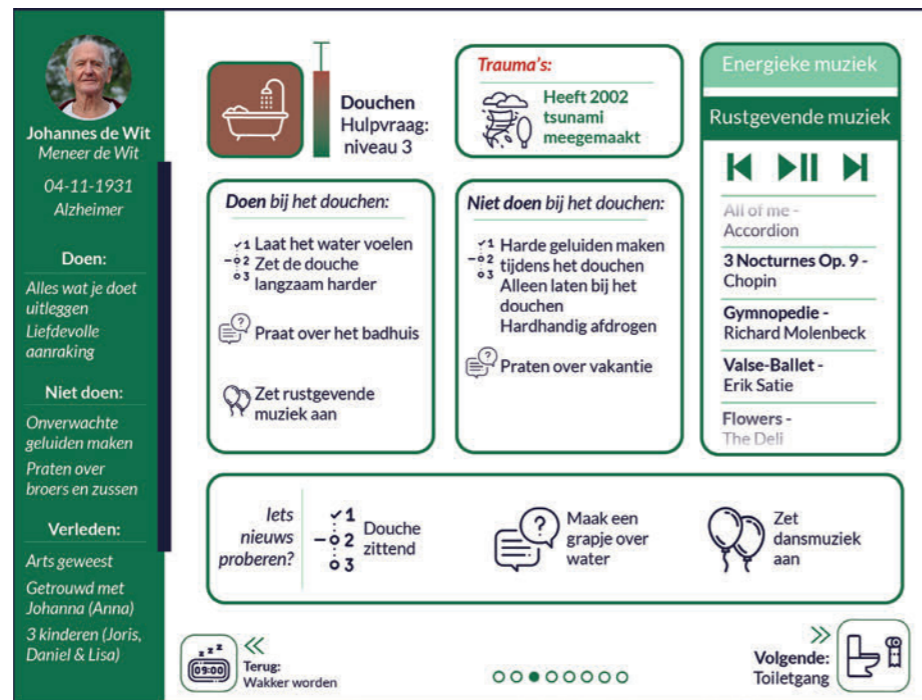


Figure 35: Overview during the care

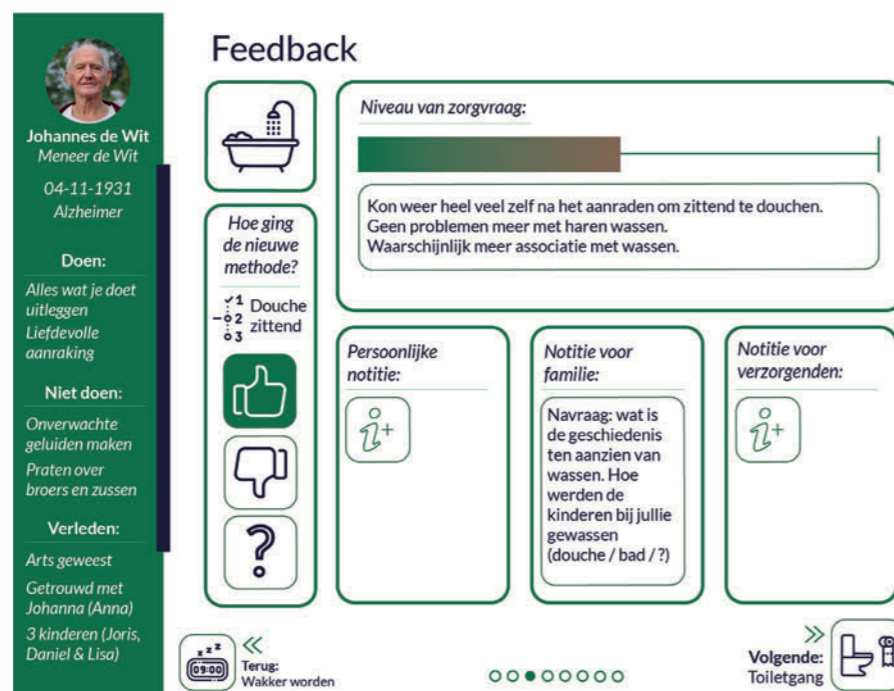


Figure 36: Feedback screen

Appendix 10. Questionnaire Validation session 3.

Vraag voor feedback

Beste verzorgenden,

Afgelopen september heb ik ook al jullie hulp gevraagd via deze weg, en als het mag, zou ik graag weer jullie feedback ontvangen.

De vragenlijst van vorig jaar ging over uw huidige ervaringen met het tandenpoetsen voor mensen met dementie. De lijst was onderdeel van mijn afstudeerproject aan de TU Delft en had als doel om een overzicht te krijgen van problemen die voorkomen bij het tandenpoetsen van mensen met dementie.

Immiddels loopt het project ten einde en is er een eindproduct.

Dit is een app voor een tablet geworden die verzorgenden kunnen gebruiken tijdens de zorg. De app helpt met het toepassen van persoonsgerichte zorg, zodat de zorg sneller en plezieriger kan verlopen. Het idee hier achter is dat als de gehele zorg plezieriger is, tandenpoetsen ook beter zal gaan.

Om te kijken of de app in deze vorm iets voor u zou toevoegen ben ik erg benieuwd naar uw feedback. Zou u de volgende vragen kunnen beantwoorden? Dit zal 5 tot 10 minuten duren.

De app is nog niet af, maar er zijn enkele voorbeelden van schermen te vinden in de vragenlijst.

Alvast heel erg bedankt!

Lot

De app:



Doel?
Makkelijk en snel persoonsgerichte zorg leveren, zodat de cliënt meer op het gemak is en de zorg plezieriger en sneller verloopt



Voor wie?
Vaste en tijdelijke verzorging, door de inhoud aan te passen aan de wensen van de verzorging

De functies van de app

De onderstaande vraag gaat over de verschillende functies van de app. Deze helpen met het begrijpen van het doel en de manier waarop de app invloed heeft op uw werk.

Hieronder zijn 3 van de schermen weergegeven. Kunt u naar de schermen kijken en dan de onderstaande vragen beantwoorden?

Scherm 1: Wordt gebruikt tijdens de intake. Hier vult de verpleging en de familie samen het zorgritueel in en noteren de hulpvraag en belangrijke informatie.

Scherm 2: geeft een overzicht van de belangrijkste methodes en de do's en don't's tijdens het douchen.

Scherm 3: geeft een overzicht van de gevraagde feedback na het leveren van de complete zorg. BELANGRIJK: niet alles hoeft hier ingevuld te worden.

Grafieken: De verschillende functies van de app over het verloop van de tijd dat iemand in het verzorgingstehuis woont weergeven.

Figure 37: Introduction + explanation of the app

Figure 38: Explanation above the questions of the perceived usefulness

Scherf 1: Gebruikt tijdens de intake

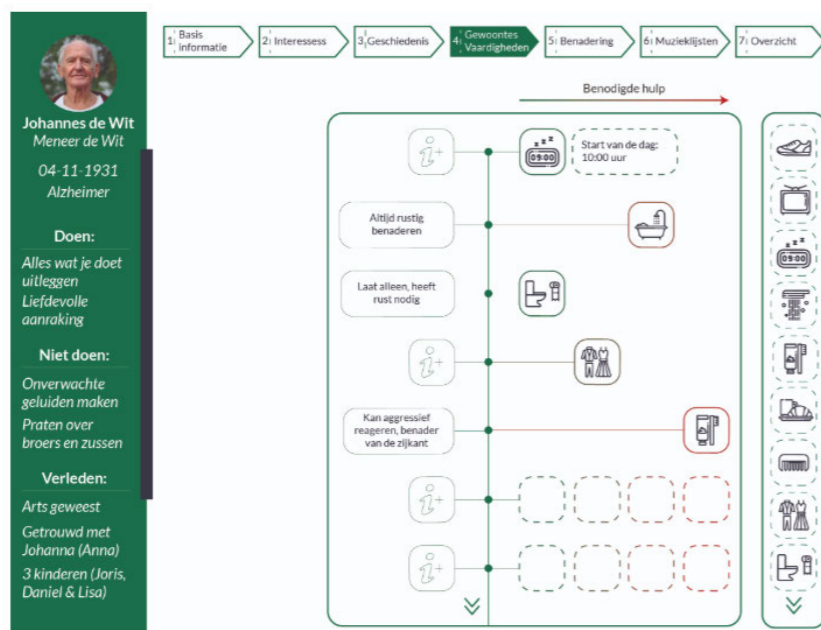


Figure 39: Screen 1: Used during the intake

Scherf 2: Gebruikt tijdens de zorg

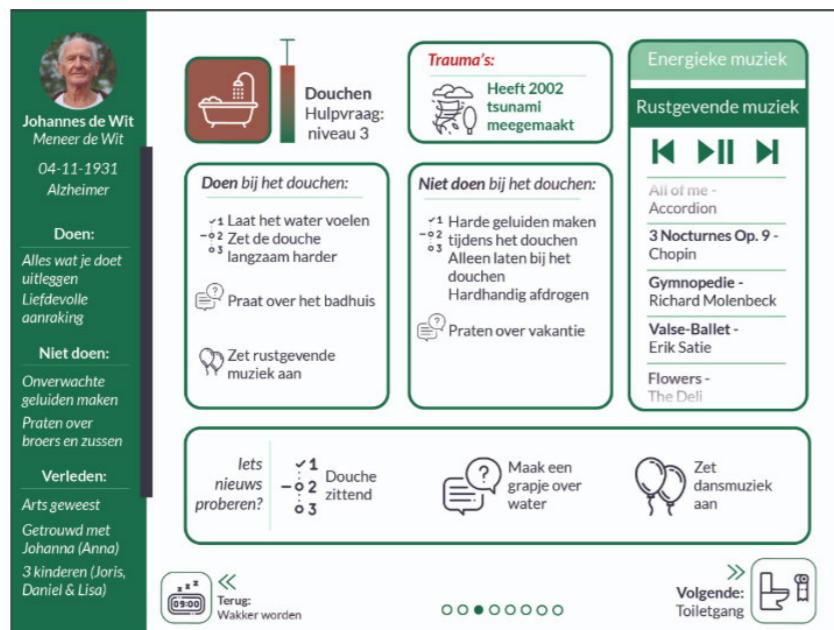


Figure 40: Screen 2: Used during the care

Scherf 3: Gebruikt na de zorg

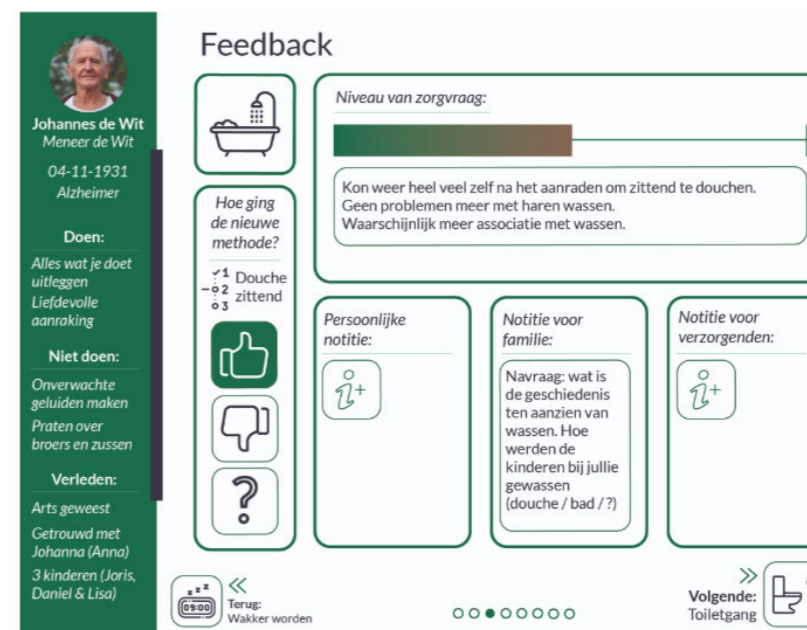


Figure 41: Screen 3: Used after the care

Grafieken voor veranderingen over de tijd

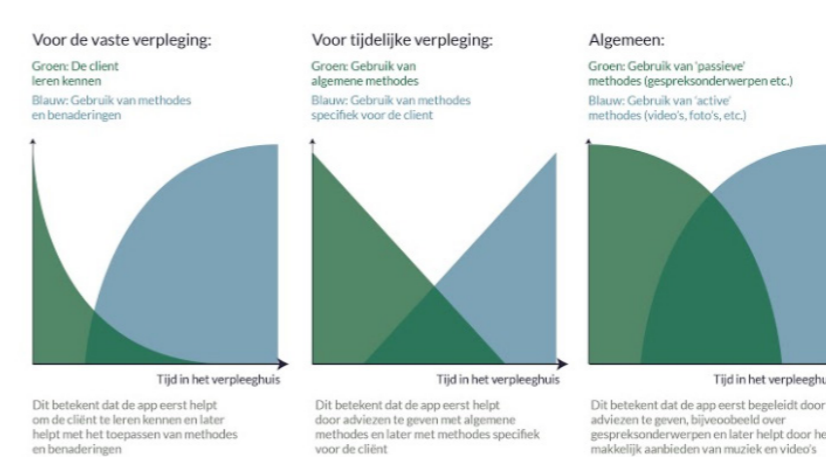


Figure 42: Graphs that show the difference in content of the app over time

Kunt u de onderstaande vragen beantwoorden? *

	Ze er mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Ze er mee eens
Het gebruik van deze app tijdens mijn werk kan mij helpen om taken sneller te vervullen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het gebruik van deze app zou mijn werkprestaties verbeteren	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het gebruik van deze app tijdens mijn werk zou mijn productiviteit kunnen verhogen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het gebruik van deze app zou mijn effectiviteit tijdens het werken kunnen verbeteren	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het gebruik van deze app zou het makkelijker maken om mijn werk te doen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik zou deze app nuttig vinden tijdens mijn werk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 43: Questions about perceived usefulness (Davis, 1989) translated to Dutch

Heeft u meer opmerkingen over het nut van de app tijdens uw werk?

Jouw antwoord

Figure 44: Do you have more feedback about the benefit of the app during your work?

Gebruiksvriendelijkheid van de app

De onderstaande vraag gaat over de gebruiksvriendelijkheid van de app. Deze helpen met het begrijpen van de manier waarop u de app zal gebruiken.

Hieronder zijn 3 van de schermen weergegeven. Kunt u naar de schermen kijken en dan de onderstaande vragen beantwoorden?

Scherf 1: Wordt gebruikt tijdens de intake. Hier vult de verpleging en de familie samen het zorgritueel in en noteren de hulpvraag en belangrijke informatie.

Scherf 2: geeft een overzicht van de belangrijkste methodes en de do's en don't's tijdens het leveren van de zorg tijdens het douchen.

Scherf 3: geeft een overzicht van de gevraagde feedback na het leveren van de complete zorg. BELANGRIJK: niet alles hoeft hier ingevuld te worden.

Grafieken: De verschillende functies van de app over het verloop van de tijd dat iemand in het verzorgingstehuis woont weergegeven.

Figure 45: Introduction about the ease of use

Figure 46: Questions about perceived ease of use (Davis, 1989) translated to Dutch

Kunt u de onderstaande antwoorden invullen? *

	Zeer mee oneens	Mee oneens	Enigszins mee oneens	Neutraal	Enigszins mee eens	Mee eens	Zeer mee eens
Het zal makkelijk zijn om te leren hoe ik de app moet gebruiken	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik zal het makkelijk vinden om ervoor te zorgen dat de app doet wat ik wil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mijn interactie met de app zal duidelijk en begrijpelijk zijn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik zal de interactie met de app flexibel vinden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Het zal makkelijk zijn om behendig te worden in het gebruik van de app	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ik zal de app makkelijk te gebruiken vinden	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Heeft u meer opmerkingen over de gebruiksvriendelijkheid van de app?

Jouw antwoord

Figure 47: Do you have more feedback about the ease of use?

Verdere vragen

Zou u de app gebruiken tijdens uw werk? *

- Ja
- Nee
- Misschien

Wat is de reden dat u dit antwoord geeft? *

Jouw antwoord

Is er een functie die nog niet in de app zit die wel relevant zou voor u? Zo ja, wat?

Jouw antwoord

Is er een functie die u niet relevant vind, maar die wel in de app zit? Zo ja, wat?

Jouw antwoord

Heeft u verdere opmerkingen over de app of over deze vragenlijst?

Jouw antwoord

Figure 48: Further questions

Figure 49: Results perceived usefulness per question

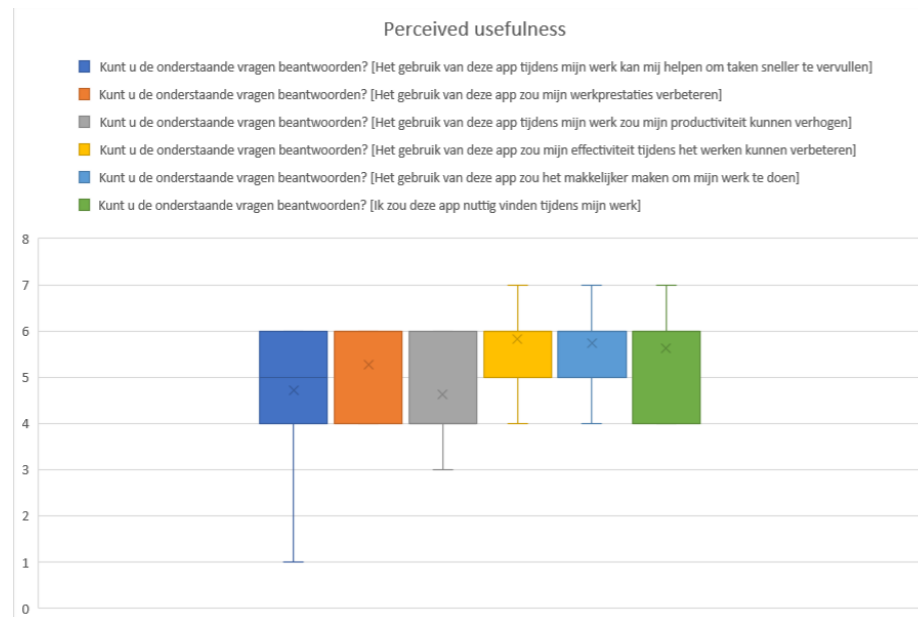
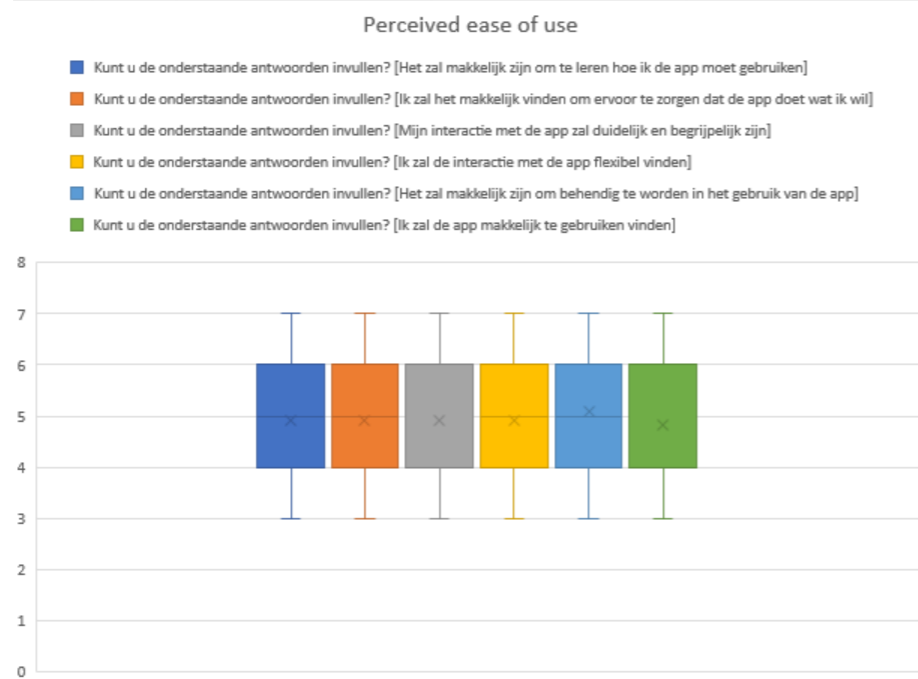


Figure 50: Results perceived ease of use per question





Have you already blinked today?